2018

Staff Education and Training for the Maternal Cardiac Arrest

Kimberly Sue Gililland
Walden University

Walden University

College of Health Sciences

This is to certify that the doctoral study by

Kimberly Gililland

has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

Review Committee
Dr. Barbara A. Niedz, Committee Chairperson, Nursing Faculty
Dr. Mary Terese Verklan, Committee Member, Nursing Faculty
Dr. Edna Baker Hull, University Reviewer, Nursing Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
2018

Abstract

Staff Education and Training for the Maternal Cardiac Arrest

By

Kimberly Sue Gililland

MSN, New Mexico State University, 2011

BSN, New Mexico State University, 2004

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2018

Abstract

Maternal cardiac arrest is among the most frightening events that can happen on the labor and delivery unit. A maternal arrest can have catastrophic results. Staff must be vigilant, competent, and ready to handle the maternal arrest emergency at all times. A maternal cardiac arrest requires coordination among multiple disciplines and precise performance is paramount in saving not one life, but two. The purpose of the project was to establish a clinical training course for maternal arrest intended for education to improve staff knowledge during a maternal cardiac arrest. Evaluation of the knowledge and skills were through an exam, participation in a mock maternal cardiac arrest, and annual competencies for all appropriate staff. Results of the advanced cardiac life support first time exam pass rate was 92% with 100% second time pass rate. The neonatal resuscitation protocol exam pass rate was 100% on the first attempt. Total pre confidence score for RNs *M 30.32,* SD = *4.34*, range = 15.0. Total post confidence score for RNs *M* = 40.14, SD = 3.24, range = 12.0. Total pre confidence scores for MDs *M = 37.91, SD = 2.51,* range = *9.0.* Total post confidence score for MDs M = 44.37, SD = 3.20, range = 12.0. Total pre confidence score for RTs M = 33.5, SD = 3.83, range = 9.0. Post confidence score for RTs M = 41.17, SD = 2.71, range = 8.0. All scores increased in a statistically significant way p=.000. The major themes that emerged from the debriefing were angst, rush, relief. Recommendations include an annual competency and frequent, monthly checks for skills. The impact on social change is a highly trained, competent, and confident hospital staff, which is a positive change for the critical access hospital.

Staff Education and Training for the Maternal Cardiac Arrest

By

Kimberly Sue Gililland

MSN, New Mexico State University, 2011

BSN, New Mexico State University, 2004

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

August 2018

Dedication

To all nurses and mothers; past, present, and future.

Acknowledgments

Thank you to my husband Roy Lee for putting up with me through all 17 years of nursing school. My educational journey has finally come to an end. I will be done after this, no more school! I love you! To my daughters Sarah, Kaylee, Harlee, and Rylee: know that the sky is the limit and you can achieve your dreams however big or little they are. I love you!!! To my colleagues, especially Dr. Anita Reinhardt, my professors, Dr. Verklan, Dr. Hull, and most of all Dr. Niedz: Thank you for all of your encouragement, support, and strength through this journey. To my preceptor and mentor, Laura Morgan: Thanks for putting up with me. I am not sure who had more fun during the journey, but it was a blast! To the Chicago Cubs: Thanks for finally winning the World Series in my lifetime! To my oldest and most dear friend Sue: Thanks for your unwavering support. I love you! And a final but most gracious thank you to my mother Barbara: you're the best! I love you!

Table of Contents

List of Tables

Section 1: Nature of the Project

Introduction

The maternal cardiac arrest is one of the most terrifying events that can occur in the labor and delivery unit. A maternal cardiac arrest can be disastrous with catastrophic results, not only for the patient and their family, but also for the medical and the nursing staff. A maternal arrest can mean the loss of both the child and the mother, which is the ultimate failure of the medical care system. The extreme rarity of the maternal cardiac arrest can leave facilities unprepared for the unusual but heartbreaking event. In a critical access facility, the luxury of having the obstetrician in house may not exist. Staff must be vigilant, competent, and ready to handle maternal cardiac arrest emergencies.

Maternal mortality in the United States is on the rise (Fisher et al., 2011). With women waiting until they are older to have children, the rise of obesity, rise of maternal recreational drug use, prescription drug abuse, the increase of preexisting medical conditions (Creanga, Syverson, Seed & Callaghan, 2017), and the escalating number of pregnancy complications physicians and nurses alike must be prepared for anything. While the global maternal mortality rate has declined over the last 25 years, the United States maternal mortality rate has risen from 16.9% to 26.4% (Zelop, Einav, Mhyre, & Martin, 2018). California indicated a decline, while Texas reported an abrupt increase from 2011-2012 (MacDorman, Declercq, Cabral, & Morton, 2016).

Specifically, in New Mexico, the maternal mortality rate for a 3-year period (2013-2016) was 22.4 per 100,000 live births (nmhealth.org, 2017). One of the key issues is that when resuscitating a pregnant mother, there are in fact two patients. The team must

be competent in advanced cardiac life support (ACLS) as well as have excellent resuscitation skills to save the lives of both the mother and the baby. While traditional ACLS applies, there are several differences specific to the pregnant mother that must be followed for a positive outcome. For example, a perimortem cesarean section within 4 minutes of pulseless electrical activity (PEA) may be necessary. The purpose of the project was to focus on the development and implementation of an evidence-based clinical education course that addressed the gap in knowledge of what to do in the event of a maternal arrest at the critical access facility. Section one will present the problem statement, purpose, nature of the project, and the significance to practice.

Problem Statement

Clinical education courses at the critical access hospital (CAH) includes basic life support (BLS), ACLS, and neonatal resuscitation (NRP). The problem is that there is no additional guidance or clinical education specific to management of the maternal arrest. Senior administrative and medical leaders and I have recognized that there is a need to improve recognition, readiness, and responsiveness to the maternal arrest emergency at the facility.

Although BLS, ACLS, and NRP mock cardiac arrests are performed routinely to ensure competency amongst staff, in the last seven years there has never been a mock maternal cardiac arrest at the facility. A mock maternal cardiac arrest would improve the current process, improve communication, improve response times and potentially, patient outcomes, as well as increase the proficiency and confidence of the nursing and physician staff (Fisher et al., 2011). The American Heart Association (AHA, 2015) stated that the

frequency of cardiac arrest in pregnant women is 1 in 12,000 admissions. The survival outcome of those arrests is greater than 50% (Zelop et al., 2018). Notwithstanding, the development and implementation of a clinical education program for the care of a pregnant woman in cardiac arrest is intended to improve staff preparedness and self-confidence in their ability to manage a maternal cardiac arrest at the critical access facility.

Purpose

The purpose of the project was to focus on the development and implementation of an evidence-based clinical education program that addresses the gap in staff knowledge of what to do in the event of a maternal cardiac arrest at the critical access facility. The staff needed to be trained in the specific needs of an arresting pregnant patient and the clinical education course helped the nursing and medical staff respond and treat the patient correctly. The facility lacked an education program for responding to a maternal cardiac arrest which is a potentially catastrophic event. Staff needed to not only be educated in the procedures for a maternal cardiac arrest but they also needed a hands-on experience (a mock cardiac arrest simulation) that ensured competency if a maternal cardiac arrest occurs. The small size of the facility also meant that the project extended outside of the obstetrics department and required the emergency room physician, nurses, emergency medical technicians (EMTs), and respiratory therapy (RT) staff involvement. These staff members formed teams that provided proper care to both the mother and the newborn and practiced their skills in a mock scenario.

A computer-based training (CBT) program combined with a competency exam and mock cardiac arrest simulation practicum ensured the staff had the necessary training and preparedness in the event a maternal cardiac arrest occurs. The practice-focused question that guides the DNP project is: Will the development of a clinical education course for the care of a pregnant woman in cardiac arrest improve staff preparedness and self-confidence in their ability to manage a maternal cardiac arrest at the critical access facility? Staff preparedness was measured with a pre and posttest, and mock maternal arrest simulation with newborn resuscitation. Self-confidence was measured with a post simulation confidence survey utilizing a 10-point Likert scale.

Nature of the Doctoral Project

Sources of evidence for the project included the Association for Women's Health, Obstetrics, and Neonatal Nurses (AWHONN), the cardiac arrest in pregnancy algorithm of the AHA, American College of Gynecologists and Obstetricians (ACOG), journal articles specifically related to maternal cardiac arrest as well as utilizing the Cumulative Index to Nursing and Allied Health Literature (CINAHL) through the Walden Library to research current nursing journals. Additional sources will be discussed in detail later in Section 3.

The overall purpose of the project was to educate the clinical staff about maternal cardiac arrest and the differences that must be considered. A computer-based learning activity for the facility was created that educated the staff on what a maternal cardiac arrest is, but how to act quickly and proficiently to increase the probability of saving the life of the mother and the baby. The staff took a pretest to determine knowledge prior to

the CBT and simulation. Staff then took the CBT course online. The staff took the same exam as a posttest and then participated in a high fidelity mock maternal/neonatal simulation to ensure the healthcare team are both competent and confident for any emergent obstetrical/neonatal emergency. The CBT and mock simulation will finally be incorporated into the facility's annual staff training.

Significance

The stakeholders for the maternal cardiac arrest project were the labor and delivery nursing staff, medical/surgical, emergency room, and intensive care nurses, the obstetricians, family practice physicians, emergency room physicians, respiratory therapy, the house supervisors, anesthesia, and the operating room staff. Because of the unique size and dynamics of the organization, all staff needed to be trained and competent to assist in a maternal cardiac arrest. The patient and her family are also important stakeholders, as they depend heavily on the staff's competency and readiness for survival. A maternal cardiac arrest requires two separate resuscitation teams: one team for the mother and another team for the newborn, if the newborn meets the age of viability, therefore all staff members must be involved (Serengella, Pignotti, & Donzelli, 2008). If the newborn is viable, the second team will be needed to help with stabilization of the newborn and to prepare the newborn for transfer to the neonatal intensive care unit (NICU) for continuation of care. If the newborn is not deemed viable or is already deceased, the second resuscitation team is not required, but the additional hands and help are still beneficial to the maternal cardiac arrest team. These additional team members acted as runners or remained with the patient's family and keep them calm and as

informed as possible during the cardiac arrest. A member of the newborn team can also weigh, measure, and dress the newborn so the parents can see the baby to start the grieving process. The facility does not have a NICU and has only a level one newborn nursery and therefore the transfer of the newborn is necessary if the infant requires a higher level of care.

Potential contributions of the project included not only educating the local organization's staff but disseminating the maternal code education program to the remainder of the enterprise wide organization. The staff also developed an increased feeling of confidence and competence after the project was completed. While a maternal arrest is a rare event, there is always that chance it could happen, and when it is least expected. The maternal arrest clinical education project was successful at the small facility; the likelihood of disseminating it to the other seven regional hospitals in the healthcare network is in process.

Potential implications for positive social change were that the staff at the small critical access facility was trained for all types of emergencies and that they were prepared for the worst case obstetrical scenario possible. The labor and delivery staff was not only able to educate their patients about the risks of cardiovascular disease and ways to reduce the risk, but the staff was also better able to identify the patients that are at risk when they arrived in triage. The patients should feel better knowing that the staff is trained, competent, and prepared for all emergencies, including obstetrical. Knowing their facility is competent and ready may entice patients to continue using the facility and to recommend it to friends and family versus traveling more than 45 miles to the next

medical center for care. High-risk pregnant women who are primarily cared for at the tertiary center (approximately 190 miles away) will have increased confidence that if labor precipitates unexpectedly, that the CAH is adequately prepared to handle the situation safely. Patients realized the facility and its staff care about their patients and provided them with the best care possible close to home.

Summary

The maternal arrest, although rare, is a catastrophic event that can have disastrous outcomes. The incidence of maternal arrest as well as an increase of maternal mortality is alarming. With a greater than 50% survival rate nationwide (Zelop et al., 2018), more had to be done to help at the CAH so staff recognized the problem and acted quickly. Staff had to be trained, competent, and confident in maternal ACLS, and above all be ready to act in a moment's notice. Staff now have knowledge of the maternal-fetal framework in all efforts to save both the life of the mother and her baby.

Section 2: Background and Context

Introduction

The practice problem was that the critical access facility was not adequately prepared for a maternal cardiac arrest in a time when maternal deaths from cardiac arrest are on the rise (Fisher et al., 2011). Based on the rise of prenatal maternal complications (Kikuchi & Deering, 2017), staff needed to be trained and competent if a maternal cardiac arrest occurred. There needed to be a process in place that educated the staff. Therefore, the practice focused question that guided the DNP project was: Will the development and implementation of a clinical education course for the care of a pregnant woman in cardiac arrest, improve staff preparedness and self confidence in their ability to manage a maternal cardiac arrest at the critical access facility? In the second section, the concepts, models, and theories related to staff education are discussed as well as the general guidelines for preparedness for a maternal cardiac arrest. The education program ensured staff knew how important being prepared can improve maternal and newborn outcomes. Lastly, the Competency, Outcomes, and Performance Assessment (COPA) Model was discussed and how the model pertained to the maternal cardiac arrest clinical education project.

Concepts, Models, and Theories

The prevalent concepts associated with the project included communication, clinical decision making, and safety. I needed to make certain that I communicated confidently and quickly communicated with providers, other staff, the patient, and her or his family that I was making the correct clinical decisions based on evidence-based

practices, clinical education, and facility protocols. I ensured the preservation of not only the lives of the mother and the child, but also the safety of the staff. Reducing the risk can only be assured through enhanced staff teamwork, collaborative communication between medical teams, and supportive quality leadership practices. Poor communication among staff can lead to poor outcomes and increased liability and litigation (Cornthwaite, Edwards & Siassakos, 2013).

The model that was appropriate to the clinical education course is the Competency, Outcomes, and Performance Assessment (COPA) Model. The COPA model is a framework and process established by Lenburg, Klein, Abdur-Rahman, Spencer, and Boyer (2009) to promote initial and continuing competence by integrating:

Competence for contemporary practice

Outcomes to be achieved for practice

Performance of essential competencies

Assessment structured for competence

The COPA Model was used to identify the critical skills needed for practice, the most effective way to integrate those skills, and the most efficient methodology to teach these skills so that staff integrates them into practice (Lenburg et al., 2011). The COPA Model is used by many schools and the Quality and Safety Education for Nurses Institute (QSEN; Lenburg et al., 2009).

The theory relevant to the clinical education course project was Benner's stages of clinical competence theory. Benner's theory stated that a nurse goes through five different levels of proficiency in their career; from novice to advanced beginner to

competent, proficient, then expert (Benner, 1984). Benner also stated that once a nurse becomes "competent" He/she can practice safely but still needed to gain more experience in nursing practice (Garside & Nhemachena, 2013). The same held true for other clinical participants in the education program who are not nurses. Whether it was Benner's stages of clinical competence theory or Dreyfus's model of skill acquisition (Dreyfus & Dreyfus, 1980) many learners went through several stages of proficiency before becoming competent or be considered an expert in their field. Lyon (2015) reinforced this theory in her study with dental students. In the profession of nursing, and more specifically in the case of maternal cardiac arrest, skills specific to a pregnant woman may be lost if not practiced often. The maternal arrest preparedness clinical education course was needed in the facility to ensure the staff had and maintained competence specifically for responding to a maternal arrest and subsequent cardiac code blue.

Self-efficacy is a term used to describe one's beliefs that they can perform an action to accomplish a result (Bandura, 1982). Manojlovich (2005) extended Bandura's theory to apply to nursing staff and explained that nursing staff must believe in their clinical knowledge and critical thinking skills if they want to provide expert nursing care to their patients (Manojlovich, 2005). Bandura (1982) concluded that depending how a person sees himself, or how strong their self-efficacy is, depends on the amount of effort they will place on accomplishing a goal. Those with high self-efficacy tend to put forth more of an effort than someone with low self-efficacy (Bandura, 1982). Manojlovich (2005) also stated that self-efficacy is related to staff feeling vested in their job and independent in their practice and judgment. Akhu-Zaheya, Gharaibeh, and Alostaz (2012)

demonstrated that high fidelity simulation improves both knowledge and self-efficacy in the individual. Staff must engage in their own self-efficacy to perform at their best.

Salanova, Lorente, Chambel, and Martinez (2011) also applied Bandura's self-efficacy theory or social cognitive theory (SCT) to the nurse and their work setting. Therefore, Bandura's SCT is relevant to the project in that each staff member must believe in themselves and their knowledge base to perform during a high stress and high emotion situation like the maternal cardiac arrest (Bandura, 1982; Salanova, Lorente, Chambel, & Martinez, 2011). Believing in oneself or accomplishing goals also requires the help of others, as many goals cannot be achieved alone (Bandura, 2012). Staff members must have self-confidence in either their advanced life support or neonatal resuscitation skills that they can engage in the situation and perform with an excellent skillset (Lunenburg, 2011). Staff must be able to utilize critical thinking to perform during the cardiac arrest, almost in automatic mode, doing what needs to be done without question. Tyler et al. (2012) stated that self-efficacy is crucial to skill performance, and those staff who lack self-efficacy are more likely to perform nursing skills improperly than their peers who have high self-efficacy.

Eller, Lev, and Feurer (2014) conducted a qualitative study on the key elements of effective mentoring. There were 117 educator and trainee participant teams from 12 different universities in various regions of the United States and Puerto Rico. Participants of the study were in nursing (31%) or another related health science. Eller et al. surveyed each of the educator and trainee teams and found eight specific themes in their data to include communication, passion, inspiration, and role modeling. Effective

communication was one of the vital elements that helped trainees gain confidence and self-efficacy with their skills. The exchange of knowledge between the educator and the trainee was another key factor for the trainee to improve practice.

Stanley and Pollard's (2013) study on self-efficacy in nurses deals with the management of pain in the pediatric patient population. They sampled 25 pediatric nurses, and who were asked to complete two surveys, with the second survey specifically asking knowledge-base questions about nurses and self-efficacy in the pain management of pediatric patients. The six-question survey had high internal consistency, with a Cronbach's alpha of 0.81 (Stanley & Pollard, 2013). What Stanley and Pollard found is that there was not a significant relationship between knowledge and years of nursing experience and pediatric pain management (r= 0.050, p= 0.822); but, there was a significant positive relationship between the nurse's level of knowledge and years of experience (r= 0.404, p= 0.05). The nurses with more years of experience scored higher on the knowledge survey. The results of the pediatric pain and nurse self-efficacy study emphasize a need to offer continuing education to maintain a competent nursing staff, no matter the subject matter.

General Guidelines for Preparedness

Preparedness or being prepared is the physical and mental act of being ready for anything. While cardiac arrest is rare in the pregnant patient, the incidence is rising (Kikuchi & Deering, 2017). Management of arrest in the pregnant woman is complicated since there are two patients to resuscitate rather than one patient. The unique hemodynamics and pulmonary physiology in the pregnant woman create additional

complicating factors (Jeejeebhoy & Morrison, 2013). Physicians and nursing staff as well as responding ancillary staff must be prepared to engage in the incredibly difficult moment. No one expects a pregnant woman to arrest.

Jeejeebhoy and Morrison (2013) discussed these changes in management of the pregnant arresting woman to include aortocaval compression and positioning of the woman during compressions. The gravid uterus and weight of the fetus compress the aorta and inferior vena cava. Compression decreases venous return, reduces stroke volume, and cardiac output. To improve venous return, stroke volume, and cardiac output the healthy patient would be placed in a left tilt position. Positioning the arresting patient in a left tilt position reduces the effort of adequate compressions significantly. The arresting woman must be supine on a firm surface, so effective compressions at a depth of at least 2 inches can be achieved. The supine position allows for rapid intubation and defibrillation (American Heart Association [AHA], 2010). The other option that is effective with circulation is the manual left uterine displacement (LUD) maneuver (Jeejeebhoy et al, 2015). The staff member stands on the left side of the patient, cups and lifts the uterus off the great vessels. The staff member may also stand on the patient's right side and similarly push the uterus up and to the left (Jeejeebhoy et al., 2015). Careful consideration by that staff member is needed so as not to push the uterus downward further decreasing venous return and cardiac output. If the LUD maneuver combined with compressions does not return spontaneous circulation, the perimortem cesarean section is the next medical intervention and must be done within 4 minutes of

arrest and PEA to save the life of the mother. If the baby is of age of viability, then neonatal resuscitation becomes necessary after delivery.

Mhyre et al. (2014) discussed the relationship between preexisting medical factors contributing to maternal arrest including hypertension, cardiovascular disease, liver disease, and systemic lupus erythematosus (SLE). Delivery factors include anesthesia-related causes, hemorrhage, venous and amniotic fluid embolus, acute respiratory distress syndrome (ARDS), and sepsis. Mhyre et al. also discussed the importance of rapid peri-mortem cesarean section within four minutes to deliver the fetus as an intervention to treat the mother's arrest and potentially save the lives of both patients.

Hui et al. (2011) continued the discussion of preparedness by emphasizing the AHA 2010 guidelines for cardiopulmonary resuscitation and emergency cardiovascular care for maternal cardiac arrest. AHA's guidelines are a significant change for practitioners and are crucial to the survivability to the mother and possibly the newborn. The management of a maternal cardiac arrest requires a multidisciplinary team approach for the best outcome possible. All specialties including respiratory and anesthesia must collaborate and work as a team to save the two patients before them. Members of the maternal team must be certified in ACLS and BLS. The neonatal resuscitation team must be certified in neonatal resuscitation program (NRP; Hui et al., 2014). If return of spontaneous circulation (ROSC) fails within 4 minutes, peri-mortem cesarean delivery (PMCD) should immediately be performed at the bedside to meet the five-minute time limit per AHA 2010 recommendation. There is no time to transfer the patient to the

operating room. Zelop et al. (2018) stated that the quality of CPR decreases during transport and that the delay in the PMCD lowers the survival rate of mother, newborn, or both. Staff must be prepared and must know where the emergency cesarean section equipment is and be ready to perform the operation immediately. Zelop, Einav, and Martin (2018) also discuss the need for obstetric departments to have a well-stocked PMCD cart ready in a well-known area in the event it is needed. Hui et al, 2014 discuss the mnemonic BEAU-CHOPS as a method to memorize contributing factors of the maternal arrest, which is explained in Table 1.

Table 1

Explanation of BEAU-CHOPS mnemonic

Letter	Terminology
B	Bleeding, Disseminated Intravascular Coagulation (DIC)
E	Embolus
A	Anesthesia
U	Uterine Atony
C	Cardiac Disease
H	Hypertension
O	Other differential diagnosis
P	Placenta abruption, Previa
S	Sepsis

Lipman et al. (2014) discussed in great detail and length maternal arrest in their study and appraisal of the AHA 2010 guidelines. Lipman et al. also emphasized team strategies to improve the quality of the resuscitation and ensure better outcomes. One addition made by the authors is to prepare the mother for PMCD if her condition does not change or improve. Preparing the mother for immediate caesarean delivery will allow the cleansing solution for the sterile procedure to dry, thus saving minutes that can make the

difference between life and death. Lipman et al. (2014) also discuss BEAU-CHOPS and the importance of determining the underlying cause of the arrest, if there is one, so the problem can be resolved as soon as possible.

The professional nursing organization, AWHONN, currently does not advocate for obstetric staff to have ACLS (Lipman et al., 2014). The organization's current position that AWHONN holds is that the need for ACLS depends on the unit and the acuity of the patient population as well as the responsiveness of a cardiac arrest team to an obstetric emergency in that specific institution (AWHONN, 2017). AWHONN leaves it to each individual institution to consider whether or not the labor and delivery staff should be ACLS certified when caring for post anesthesia and postoperative women and their newborns as long as staffing guidelines are met (AWHONN, 2017).

Guidelines for Preventing Maternal Cardiac Arrest

Lipman et al. (2014) discussed the reduction or prevention of the maternal arrest. One of the main contributing factors for prevention is education of obstetric staff. Not only do obstetric nurses need education on the signs and symptoms of cardiac issues, but they also need to be educated on a thorough cardiac assessment, especially in a patient previously identified as at risk. Obstetric nurses do not routinely take advanced cardiac life support (ACLS) nor is it a unit/department requirement. If obstetric nurses take the ACLS course and pass it, long term retention of the material is poor (Lipman et al., 2014). At the same time, ACLS courses do not routinely address the maternal-fetal dyad and maternal arrest specific interventions such as BEAU-CHOPS or LUD. Lipman et al. (2014) also state that simulated cardiac arrests demonstrate substandard performance by

the team, which if not corrected, can lead to poor outcomes for both the mother and the baby.

Lipman et al. (2014) discuss key behavioral interventions for obstetric departments. Most importantly is effective communication. Without effective communication, the staff cannot respond appropriately, and the coordination of care fails. Communication errors can be reduced or eliminated during critical times if leadership/charge nurses verbally identify staff to perform tasks, retrieve equipment, medications, or call for additional staff. Effective communication will also assist with the effective delegation of tasks during such an emergency. Staff may also be assigned certain roles or responsibilities at shift change, so they know ahead of time what their role is during any emergency.

In addition to effective communication, all staff must know where emergency equipment is kept, to include maternal and neonatal resuscitation equipment. Zelop et al. (2018) discuss having a PMCD cart available at all times in addition to a newborn crash cart and an adult crash cart. Staff must also know their facility to include knowing where the entry to the obstetrics department is and how to enter if the door is secure/locked as well as having a familiarity with the department room layouts. Lastly, on occasion, a cardiac arrest blue light is activated, and staff pause to determine if that alarm is real or accidental. The delay in responding can decrease the minutes the mother has until a PMCD is necessary. Staff should immediately respond to the cardiac arrest until it is determined to be a false alarm.

Jeejeebhoy and Morrison (2013) explain that maternal arrest and cardiac arrest simulations are very effective in that knowledge, confidence, and staff performance improve greatly the more simulations are practiced. Simulations can be useful to all facilities in determining areas of strength and weakness as well as determining the education level and knowledge of the staff. Education and training of the staff must be a proactive approach. Areas known to have a maternal cardiac arrest include the emergency room, obstetrics department, and maternal intensive care units. Jeejeebhoy and Morrison (2013) recommend training programs be made available not only for the obstetrics staff, but for all staff. The training should be focused and specific to the maternal cardiac arrest due to physiological changes and the particular techniques needed to resuscitate a pregnant woman and her child. Huseman (2012) suggests unannounced mock code blue drills

Relevance to Nursing Practice

The nature of the pregnant patient is changing. According to McGregor, Barron, and Rosene-Montella (2015), the pregnant woman is three to four times higher cardiac arrest risk than a non-pregnant woman of the same age. Women are waiting until they are older to have children. Many more women are becoming pregnant with preexisting medical conditions like diabetes, hypertension, mitral stenosis, obesity, hyperlipidemia, and asthma (Schimmelpfennig & Stanfill, 2006). Pregnancy places additional stressors on the cardiac structures and is intensified in the older pregnant patient (McGregor et al., 2015). Pregnant women are also susceptible to motor vehicle accidents (MVAs),

domestic violence, both recreational and prescription drug abuse and overdose (Murphy & Quinlan, 2014).

Because the labor and delivery unit is the emergency room for pregnant women over 20 weeks gestation, nurses must be prepared for all types of pregnancy related illnesses and complications. Labor and delivery nurses caring for a pregnant woman need to be cognizant of the risk factors as well as being proficient in assessment and recognizing the physiologic changes and the signs and symptoms of cardiac arrest.

Local Background and Context

The facility is a 25-bed critical access hospital in rural southern New Mexico. The facility is owned by the tertiary care center more than 190 miles away. The facility has approximately 300 deliveries per year (practice site, 2018). Pregnant women considered high risk are scheduled to deliver at the tertiary care facility through consult with maternal-fetal medicine (MFM). However, there is always the possibility that a woman from out of town arrives in labor, one of the high-risk pregnant women arrives at the hospital in labor, or even a patient not previously identified as high risk will develop complications and not be stable enough for transfer as transfer guidelines for laboring women are very strict. There are two obstetrician/gynecologists on staff, but neither provider is physically present at the CAH 24 hours per day. The only provider in house is the emergency room physician. Staffing the labor and delivery unit includes two NRP certified RNs per shift with one tech only during the week day. The labor and delivery unit is staffed 14 RNs and one tech.

The facility has a nurse educator who is responsible for BLS and ACLS as well as other clinical staff training requirements, while the labor and delivery unit has two NRP certified instructors who are responsible for that specific training. There is no training, live class, or competency-based training (CBT) course on what the staff should do in the event of a maternal cardiac arrest. Because of the relevance to nursing practice, the project has been given priority in the organization.

Role of the DNP Student

The role of the DNP student was to serve as team leader for the project. I researched the most current evidence-based practices on maternal cardiac arrest; collaborate with the obstetricians and the family practice physicians, nurses, respiratory therapy, and the emergency room physician staff and formulated a clinical education course that included an education and training plan. I collected the data regarding maternal cardiac arrest and wrote the clinical education course for the facility. I collaborated with the facility educator and built a CBT course, utilized the ACLS and NRP competency checklists and exams, and the mock cardiac arrest simulation which was required for all staff. Staff members used a high-fidelity simulation manikin to complete the mock arrest. The cardiac arrest consisted of both maternal and neonatal pathways.

Because of the facility's size and relatively small staff, it behooved all staff members with direct patient care to take the course and participate in the cardiac arrest as any staff member may be called to assist with the maternal cardiac arrest. The teams included physicians, nurses, RT, techs, emergency medical technicians (EMTs),

paramedics, and the registered nurse (RN) house supervisors. All staff members were included as the maternal cardiac arrest emergency can happen at any time of the day or the night.

The motivations for the project and my role were simple: pregnant women are becoming more complex and the incidence of maternal mortality and morbidity is on the rise. Nurses must be more cognizant of the pregnant woman and the problems and disease processes she enters the prenatal period with as well as the sequelae that follows during labor and delivery and in the postpartum period. Nurses must be proactive and be prepared in the event such an emergency occurs. Ignorance is not bliss and can cause maternal or fetal death or both. Because the facility is also critical access, I feel that it is even more important to ensure the staff had the education and training necessary to respond to a cardiac arrest. I did not anticipate or foresee any bias for the maternal arrest project.

Summary

It is important for the project to utilize the most current and up to date evidence-based practices in maternal cardiac arrest. Not only were journals used, but also reputable web sites and the expert knowledge of physicians and other members of the healthcare team. The research and evidence collected were the basis for the clinical education program, the CBT and the education of the staff, the creation of the competency exams, simulation or mock cardiac arrest, and the evaluation of the entire process.

Section 3: Collection and Analysis of Evidence

Introduction

The practice problem for the doctoral project was that the critical access facility was currently nor satisfactorily prepared to manage maternal cardiac arrests in a time when maternal deaths from cardiac arrest are on the rise (Fisher et al., 2011). Because of the risk involved, all staff in the facility needed the specific training and be capable of assisting in the care of an arresting woman. It was essential to have an educational program in place to use as the basis for educating the staff. The development and implementation of a clinical education program for the care of a pregnant woman in cardiac arrest, improve staff preparedness and self-confidence in their ability to manage a maternal cardiac arrest at the critical access facility was developed. A mock cardiac arrest specifically designed to practice implementation of the maternal cardiac arrest guidelines was needed. The development of the DNP project and the education: (a) raised levels of knowledge and skills in staff members, (b) improved their confidence, and (c) raised the level of overall competence of the staffs' abilities to manage a maternal cardiac arrest. Section 3 discussed the problem, the gap in practice, and the practice focused questions. I also discussed sources of evidence used for the project, as well as an analysis of the project. Lastly, I discussed how I anticipated the staff to respond to the mock cardiac arrest.

Practice-Focused Question

The problem addressed for the project is that staff members' knowledge and skills to manage a maternal cardiac arrest are lacking. Not all staff are aware or familiar with

the signs and symptoms of cardiac issues leading to arrest or the specific steps in resuscitating a pregnant woman or caring for a preterm/term infant secondary to a peri-mortem cesarean section. The maternal cardiac arrest, although rare, is a tragic event that can have devastating results. The frequency of maternal cardiac arrests as well as the increase of maternal mortality over the last ten years is alarming. With a greater than 50% survival rate (Zelop et al., 2018), the CAH had to do more to address the clinical education gap in practice by helping staff to recognize the problem and react quickly. Staff had to be trained, be competent, and be confident in ACLS within a maternal framework in all efforts to save both the life of the mother and her child. The practice-focused question guiding the DNP project is: Did the development and implementation of a clinical education program for the care of a pregnant woman in cardiac arrest, improve staff preparedness and self confidence in their ability to manage a maternal cardiac arrest at the critical access facility?

Sources of Evidence

Published Outcomes and Research

Utilizing CINAHL, terms entered the search box are maternal code, maternal cardiac arrest, maternal arrest, and obstetrical emergencies. Timeframe for the search was limited to the last 7 years, from 2011 to the present time. Not only was CINAHL utilized, but the AWHONN website and AWHONN journals were searched, relevant studies were retrieved and reviewed specifically relating to nursing care of the pregnant woman in cardiac arrest. The AHA website was utilized specifically for the cardiac arrest in pregnancy algorithm as well as the ACLS exam and competency check sheet. The

American College of Obstetricians and Gynecologists (ACOG) journal articles specifically related to maternal cardiac arrest were examined for relevancy. The Walden Library was also useful in researching current nursing journals not associated with AWHONN or ACOG. Stanford University's ObLS program (Lipman, Daniels, Arafeh, & Halamek, 2011) is a simulation-based program and was an excellent resource for information for the project. The American Academy of Pediatrics (AAP) website was utilized for the NRP links, the NRP exam, and pertinent information regarding newborn care. The Advanced Life Support in Obstetrics (ALSO) program through the American Academy of Family Physicians (AAFP) was another resource specific to the project that will be utilized for purposeful data.

Evidence Generated for the Doctoral Project

Participants. Several open discussions with the medical staff of the facility as well as experts from the tertiary care center were held to determine not only their knowledge base needed for managing the maternal cardiac arrest, but also their willingness to participate in the project. These discussions took place over the phone, in person, or by email. The roles each provider served during the emergency were also discussed in detail. Nursing staff in the labor and delivery unit as well as other members of the healthcare team were interviewed to assess base knowledge level regarding response and care of the pregnant cardiac patient (Appendix B). These interviews were helpful in determining the content of the CBT course as well as the role each staff member plays during the cardiac arrest.

There were many active participants in the project. Two people, (my preceptor

and myself), participated in building the CBT program, competency checklist, and create the simulation cardiac arrest itself. There were two groups of participants; the project team and the staff participants. The project team consisted of one ED physician, one obstetrician, one pediatrician, one RT, four ED, ICU, medical/surgical nurses, and two labor and delivery nurses. The participants chosen for the project team were selected based on years' experience and expertise in their area as well as their interest in the project. None of the project team members at the facility have been involved in a maternal cardiac arrest. The only member with professional experience was the obstetrician from the tertiary care center. The project is following the Walden University Manual for Staff Education Project (2017) and will proceed to the Institutional Review Board (IRB) for ethical approval.

Procedures. The project team was assembled. The timeframe for development of the team between the announcement and acknowledgement or declination was four days. The facility educator was also a member of the team and had already acknowledged a willingness to participate. Team members then met, all evidence-based information on maternal cardiac arrest and cardiac arrest was presented, and an action plan was created to ensure all team members concurred. The preceptor and student developed the CBT module and designed the mock maternal cardiac arrest and cardiac arrest. The pre and posttest competency exams came from the American Heart Association ACLS course as well as the American Academy of Pediatrics Neonatal Resuscitation Program (NRP), 7th Edition course. These exams were used to ensure competency as they are known to have balance, independence, objectivity, and scientific rigor in accordance with continuing

education requirements. Finally, as project leader I presented the final product to the project team, and then it was disseminated to the remainder of the nursing staff for completion. Like an annual competency that the staff are required to complete, the maternal arrest/cardiac arrest CBT was incorporated into the facilities' annual clinical competencies list. The team also discussed how frequently to perform the mock cardiac arrests. Mock BLS, ACLS, and NRP cardiac arrests are run at a minimum of four times per year, with room to add mock drills throughout the year. Adding the mock maternal cardiac arrest simulation to the schedule was simple, as the maternal cardiac arrest could be run simultaneously with any of these current mock drills. The first attempt at holding a maternal arrest/cardiac arrest CBT competency within the context of the DNP project took no more than three weeks to complete.

The CBT course was incorporated into the software used by the organization. The exam given to each participant depended on role. Each test contained 50 multiple choice questions. Because the ACLS and NRP exams and competency check sheets were copyrighted and used with permission within their respectful course, the questions and check sheet were not presented in this DNP paper. Staff caring for the newborn was not expected to take the ACLS exam and vice versa. The pretest was to assess current knowledge and competency in each staff member's current role in the maternal cardiac arrest. Staff then took the online CBT module. Staff had to pass the pretest with a score of 85% or higher to proceed to the simulation where several scenarios were presented to incorporate multiple outcomes. All tests were collected for data that will be discussed in the results section.

Groups of 10 were then be scheduled for each mock cardiac arrest simulation, six staff members responded to the maternal cardiac arrest and four staff members responded to the newborn resuscitation. The group consisted of obstetrics, family practice, and ED physician, RT, and 5 nurses. There was a total of four sessions: two on day shift, one on night shift, and one on a weekend day. Maximum participation was obtained with the simulation schedule. I also ensured that there are enough team members to care for the mother and the newborn. After the mock cardiac arrest was complete, the competency checklist (Appendix C) was signed off and kept on file in education for future reference.

Staff were also given a survey to take quickly immediately following the mock cardiac arrest utilizing the Likert Scale to evaluate and measure how confident (Appendix A) they were in fulfilling their specific role during a maternal cardiac arrest. The survey consisted of 10 questions and assessed confidence and self-efficacy pre and post maternal cardiac arrest education program. Staff took the survey in private and requested not to discuss answers with anyone. The survey in Appendix A was reviewed by an expert panel that included faculty, the nursing educator, the obstetrician, a family practice physician, and the medical director to establish face and content validity. The survey questions measured confidence as a proxy for self-efficacy and ask the staff how they felt both before and after the simulation. The survey questions truly evoke the role of the staff during the cardiac arrest. Internal consistency reliability of the survey was established using Cronbach's alpha. Confidence was measured on a scale of zero to 10, where zero signified no confidence and 10 signified total confidence. Numbers between one and nine signified the participant's level of confidence in their role. The staff survey was used to

evaluate the education program, not only to ensure the clinical education course implementation was successful, but also to ensure the course itself was successful in educating, readying, and preparing the staff for such an event. The survey was collected and results discussed in Section 4.

After each group of staff members completed the CBT, exam, simulation, and survey, a qualitative debriefing (Appendix D) was conducted to determine what went well, what needed improvement, and the staff's overall thoughts about the new clinical education course, competency and hands on simulation. Staff was also asked about their level of confidence and competence now that they completed the course. Staff was asked these open-ended questions "What were your thoughts about the simulation?" and "What were your feelings during the cardiac arrest?" The feedback will allow for changes to the CBT and the mock cardiac arrest, ensuring the staff was as educated and as competent in their role as possible. All members of the team needed to be ready, successful and be knowledgeable of the clinical education course.

In addition to the 10-question survey, the post simulation debriefing captured rich qualitative data on the mock cardiac arrest experience and will be summarized in findings. The data collected from the debriefings helped me to ensure the education and training for the mock maternal cardiac arrest was relevant to practice and necessary for the continued quality care the facility is known for.

Protections. Though participation in the competency and the mock cardiac arrest are a condition of the role, participation in the confidence survey and the qualitative debriefing was purely voluntary. To ensure ethical protection of the participants, both the

medical and nursing staff as well as other members of the health care team were asked if they were willing to participate with the project. An individual's written consent to participating in the project and the confidence survey will be summarized in the aggregate, will not identify any participant, and will remain safeguarded in a sealed envelope. The responses were not shared or disclosed to any other participants during or after the project is complete. There were not any incentives given for participation. If staff chose to withdraw from the development process, they could with no detriment to the project or their job role, though no staff withdrew. The competency exams were also kept in a sealed envelope and not shared or disclosed other than a pass or fail for the project. Permission to proceed was sought through the organization's IRB and the Walden University IRB following the educational manual with full support of the DNP project site leadership. The IRB approval number through Walden University was 06-26-18-0599704.

Analysis and Synthesis

The recorded debriefing was converted into a detailed transcript and then analyzed for common themes such as anger, anxiety, stress, pregnant woman, and sadness, which was coded and categorized into qualitative data. The qualitative data that was captured on how the staff was feeling at the time of the simulation, explore their personal experiences, and also answer the question as to if the clinical education program was effective in developing or enhancing the self-efficacy of the staff.

The 10-question survey demonstrated the level of confidence each member of the code team has before and after the CBT and simulation. I evaluated for internal

consistency reliability using Cronbach's alpha. Because findings were defined as interval level data, and there were 40 participants taking the survey, the data collected was large enough to demonstrate normality and met the assumptions of the parametric paired t test. Paired t tests based on the results of the confidence of the staff were done to compare levels of confidence before and after the mock simulation and to test the hypothesis that participant's level of confidence did increase because of participation in the mock maternal arrest. The level of confidence of the staff was used to make comparisons between paired groups of staff. For the project, the two groups that were tested with results later compared are the nurses and the physicians. Both groups were compared on competency and confidence both before and after the maternal cardiac arrest education program. Analysis of variance (ANOVA) was used to determine the statistical differences between groups.

Summary

Using only the most recent and reliable evidence-based practices, journals, and procedures for the maternal cardiac arrest project was pragmatic. The physicians, RT, and nursing staff had the most up to date information available to effectively run a maternal cardiac arrest to have the best outcome possible. The CBT, competency exam, and mock maternal cardiac arrest gave the physicians, RT, nurses and ancillary staff the tools they needed to be successful, competent, and confident. Section 4 is a discussion of the findings and recommendations.

Section 4: Findings and Recommendations

Introduction

The local problem was the staff at the CAH did not have adequate education and training to be prepared for a maternal cardiac arrest, nor were there mock simulations that included a mother and unborn child. Because the incidence of maternal cardiac arrest in the United States is holding steady at 1:12,000 admissions (Zelop et al., 2018), education surrounding maternal cardiac arrest and subsequent code blue is of the upmost importance at the facility. The purpose of the doctoral project was to develop and implement a clinical education program for the care of a pregnant woman in cardiac arrest, that improves staff preparedness and self-confidence in their ability to manage a maternal cardiac arrest at the critical access facility. Sources of evidence included the utilization of the Walden Library, the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), Cumulative Index of Nursing and Allied Health Literature (CINAHL), American College of Obstetrics and Gynecology (ACOG), The American Heart Association (AHA), and the American Academy of Pediatrics (AAP) for relevant guidelines and journals as well as evidence from experts in their field. Section 4 is a report of the findings, implications, and recommendations for the doctoral project. Data specific to maternal mortality were reviewed for the most current reporting annual dates and described in this project.

Findings and Implications

While all hospital nurses, techs, and respiratory therapy (RT) staff received the maternal cardiac arrest education computer-based training module, 40 staff members

participated in four different mock simulations. Staff members were broken down into two groups of 10, each of which attended a mock simulation. There were six staff members who participated in the mock Advanced Cardiac Life Support (ACLS) simulation while four members participated in the mock Neonatal Resuscitation Program (NRP) simulation. Each of these participants were required to take either the ACLS exam or the NRP exam, specifically related to their role. Each staff member took their required exam as the pretest. In the ACLS group, 24 staff members took the exam. Of the 24 who participated, 22 passed with a minimum score of 85% on the first attempt for a 92% first time pass rate. On the second attempt, the remaining two passed with greater than 85%. In the NRP group, all 16 staff members passed with at least an 85% on the first attempt for 100%. Additional evidence in support of the doctoral project was obtained through the pre- and post-exams, the recorded debriefing, and the confidence survey. Qualitative data in the debriefing captured relevant words which were highlighted and grouped together into common themes.

Confidence Survey Results

After each simulation, the staff sat in a quiet room to take their confidence survey. The confidence survey consisted of 10 questions and used the Likert scale from zero to 10, with zero equaling no confidence and 10 equaling total confidence. These surveys were placed in a folder and after all the simulations were complete; the surveys were analyzed to measure the confidence of the staff. There were a total of 40 participants, each answering the 10-question survey. There were 22 RNs, 11 MDs or DOs, and 6 RTs.

Most of the participants were female (73%) and 28% were male. Table 2 includes results from the self-confidence survey using the Likert scale.

Table 2

Self Confidence Survey Results

	Q 1 Pre	Q 2 Post	Q 3 Pre	Q 4 Post	Q 5 Pre	Q 6 Post	Q 7 Pre	Q 8 Post	Q 9 Pre	Q 10 Post
N	40	40	40	40	40	40	40	40	40	40
Mean	5.68	7.80	5.95	8.08	5.88	7.80	6.88	8.45	8.58	9.33
Std. Deviation	1.289	.992	1.679	1.095	1.305	1.091	1.067	.815	1.196	.572
Variance	1.661	.985	2.818	1.199	1.702	1.190	1.138	.664	1.430	.328
Skewness	-.636	-.404	-.431	-.648	.534	.170	-.006	-.429	-1.086	-.119
Std. Error of Skewness	.374	.374	.374	.374	.374	.374	.374	.374	.374	.374
Kurtosis	-.666	-.808	-.589	-.607	-.408	-.809	-.088	1.121	1.204	-.588
Std. Error of Kurtosis	.733	.733	.733	.733	.733	.733	.733	.733	.733	.733

Internal consistency was performed using Cronbach's alpha and was .889. The paired t-tests done compared the levels of confidence before and after the simulation which is explained in Table 3.

Table 3

Paired t *Test Results*

		Paired Differences					*t*
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		
					Lower	Upper	
Pair 1	Q 1 Pre - Q 2post	-2.125	.686	.109	-2.345	-1.905	-19.580
Pair 2	Q 3 pre - Q 4 post	-2.125	.939	.148	-2.425	-1.825	-14.315
Pair 3	Q 5 pre - Q 6 post	-1.925	.971	.154	-2.236	-1.614	-12.538
Pair 4	Q 7 pre - Q 8 post	-1.575	.813	.129	-1.835	-1.315	-12.253
Pair 5	Q 9 pre - Q 10 post	-.750	.954	.151	-1.055	-.445	-4.972

		df	Sig. (2-tailed)
Pair 1	Q 1 Pre - Q 2post	39	.000
Pair 2	Q 3 pre - Q 4 post	39	.000
Pair 3	Q 5 pre - Q 6 post	39	.000
Pair 4	Q 7 pre - Q 8 post	39	.000
Pair 5	Q 9 pre - Q 10 post	39	.000

*All pairs significant at the p=.000 level

The results of the confidence survey demonstrate that before the mock simulation, the confidence of each participant was lower than the confidence of each participant after the mock simulation. Nurses and physicians had a greater increase in confidence than did the RT group. The results of the confidence survey correlate with ANOVA that was used to determine the statistical differences between the three groups, the RNs, MDs and RTs (Table 4).

Table 4

ANOVA Results Showing Differences Between RNs, MDs, and RTs

		Sum of Squares	df	Mean Square	F	Sig.
Total Pre- Confidence Score	Between Groups	424.716	2	212.358	14.392	.000
	Within Groups	531.182	36	14.755		
	Total	955.897	38			
Total Post Confidence Score	Between Groups	131.774	2	65.887	6.589	.004
	Within Groups	359.970	36	9.999		
	Total	491.744	38			

				Mean Difference (I-J)	Std. Error	Sig.
Total Pre Confidence Score	Scheffe	RN	MD or DO	-7.59091*	1.41847	.000
			RT	-3.18182	1.76914	.213
		MD or DO	RN	7.59091*	1.41847	.000
			RT	4.40909	1.94950	.092
		RT	RN	3.18182	1.76914	.213
			MD or DO	-4.40909	1.94950	.092
Total Post Confidence Score	Scheffe	RN	MD or DO	-4.22727*	1.16770	.004
			RT	-1.03030	1.45638	.780
		MD or DO	RN	4.22727*	1.16770	.004
			RT	3.19697	1.60485	.152
		RT	RN	1.03030	1.45638	.780
			MD or DO	-3.19697	1.60485	.152

The post hoc tests showed that although there is a statistically significant difference between the pre-test and the post-test overall, there is not a statistically significant difference in the change between RNs, MDs, and the RTs. The results indicated that the nursing and physician staff were not as confident prior to the mock simulation as they were after the mock simulation. It also demonstrated that the RT staff did not show as great an increase in confidence. Results from the Tukey pre confidence score for the RTs were *N*=6 and score of 33.5. The Scheffe pre-confidence score for the RTs were also 33.5. The Tukey post-confidence score was 41.17 and the Scheffe post-confidence score was also 41.17. Although there was a statistically significant change in scores between RNs and MDs/DO the RTs' scores did not change before and after the simulation. The RTs role in the arrest and code situation does not really change; it is either a newborn or an adult and their care/response is similar, airway and ventilation. The results also demonstrate the need to continue mock simulations to ensure the staff can maintain their level of confidence and competence in each role.

Postcode Debriefing Results

After each simulation, the staff sat in a quiet room to take their confidence survey. Once the staff completed their confidence survey they then participated in the debriefing. My preceptor reminded each group about the rules of a debriefing. I reminded each group that it was being recorded to gather rich data about the simulation. There was no time allotment for the debriefing.

Each debriefing was filled with emotion. Three common observations emerged during analysis of the recordings. These words were repeated multiple times by multiple

staff members in all four groups. The first and most relevant observation during the debriefing was fear, despair, sadness, reluctance, anxiety, stress, anxiousness, grief, frustration, anguish, and hopelessness. These words can be summarized with a single theme: angst. The second common theme was represented by the theme: no time. Words like: rush, hurry, scramble, commotion, and urgency emerged and represented the second theme, the idea that maternal arrest preparedness requires the ability to react in seconds. The third theme captured was relief, glad, ecstatic, and success indications of a positive outcome.

After all four teams ran through the simulation they sat down to retake their respective exam as a post-test. All 40 staff members passed their post-test on the first attempt, 100% success rate. All 40 team members successfully completed the competency checklist for their simulation.

Implications resulting from the findings are that the staff felt the need to be more prepared for this type of emergency. An annual competency-based test CBT with mock simulation will not be enough. Staff members expressed the idea that they want the hands-on training in a controlled simulation where learning is optimal. Staff members indicated that they want the maternal/fetal/neonatal simulation at least four to six times per year, if not more frequently. Many staff members mentioned that they were not prepared for a maternal cardiac arrest mainly because they do not expect a healthy mother to go into cardiac arrest. The night and weekend staff reported feeling left out, as these simulations or mock codes were conducted during the day when the nurse educator is working. Both the BLS and ACLS simulations are held once a quarter and NRP is twice

per year, but the staff felt that a monthly simulation with a mother and child should be done over the next six to eight months on all shifts to include nights and weekends ensuring that all the staff participate and gain more confidence in their skill. Having the staff competent and confident in their skills will be a positive social change and although the mock/simulations presented in this project were admirable, to make an indelible positive social change, more mock simulations are necessary to ensure staff preparedness for this rare, but tragic possibility. Members of the community will know their local CAH is prepared for all emergencies for all patients and in all situations. At the same time, the facility will be prepared to care for their own in the event such as a heartbreaking event happens.

Staff felt too, that while they possessed the skills to perform ACLS and NRP, that they needed to work on the emotional component after the simulation/code was over. Staff needed that time to digest and understand what happened and why, and the addition of counselor and chaplain will be integral components of a successful debriefing. My preceptor suggested we incorporate Code Lavender, which is not only a new program to the whole organization, but specifically for staff in stressful situations like any type of arrest, code, death, disaster, or significant trauma in the emergency department ED. The patient does not necessarily have to die, but the pressure of any code or high stress situation can be enough to incapacitate staff, so institution of the Code Lavender in the eventuality of an actual maternal cardiac arrest can be an important adjunct to addressing staff needs.

Recommendations

The first recommendation is implementing the Code Lavender and utilizing the purple tea lights as suggested by the Code Lavender program director. Calling a Code Lavender at any of the organization's facilities activates the Employee Assistance Program (EAP) team that consists of the facility's upper management and support staff, who can be an immediate and strong supportive presence during any difficult time.

Another recommendation was adding the maternal cardiac arrest CBT module and simulation to the annual clinical competencies. By adding the CBT and simulation to the annual competency, it would ensure the staff on all shifts receive the training, plus there will be written documentation to support the training. Staff would take the CBT as part of their regularly assigned training, then check off their competency during a skills fair. The skills fair, as in years past, will accommodate all shifts to ensure completion of required competencies.

The last recommendation was to add the maternal cardiac arrest and code to all staff onboarding the facility. New staff receiving orientation would also go through BLS and ACLS with a teaching point related specifically to the maternal cardiac arrest and code. Placing maternal cardiac arrest and code in orientation would ensure all new staff receive the training and gain confidence and competence prior to working in their respective units.

Contribution of the Doctoral Project Team

My preceptor was instrumental in my project. She had the knowledge and the resources to make sure the project went smoothly and successfully. With her background

in education and teaching BLS and ACLS, she helped me design mock simulation codes that were as realistic as possible, ensuring all aspects of ACLS from medications to rhythms were covered. Her great knowledge of the CBT design program also ensured the education for the staff was clear and understandable with the right amount of content. She also made significant contributions to the project, namely introducing the Code Lavender program to the facility so it can be utilized in all appropriate situations.

The mock maternal simulation codes were very successful and it will be implemented in the facility. Staff felt that it was a positive experience and that "We could never practice too much." The CBT will be added to the annual learning requirements for all clinical staff with a mock simulation code to complete the competency. The CBT, competency checklist, confidence survey, and findings will be disseminated to the organization's other facilities in the hopes it will also be adopted and become a regular component of annual refresher training for all clinical staff.

Strengths and Limitations of the Project

There were several strengths of the project. The main strength was that I was able to bring a new educational opportunity to the staff, and one that is appropriate and significant to the patient population that we provide services for. It also was a poignant reminder that labor and delivery is not always a happy unit, and that sometimes there are outcomes that are not optimal.

A second strength was the coming together of a clinical staff. Each member of the staff is a part of a great team and through collaboration, hard work, dedication, and communication, positive outcomes can be achieved, but we all must work together. These

simulations reinforced the need to listen, to be heard, to work hard, to communicate, to anticipate, to critically think, and to provide the best possible nursing care during the worst possible scenario. These code scenarios brought the staff closer together, and reminded us all that we are not just a nurse, or a technician, or RT, or the ICU, but a team. Lastly, due to the rise in incidence of maternal cardiac arrest, there was an abundance of information to pull from; making me feel like the project was truly important and relevant.

The major limitation to the project was that the high-fidelity simulation manikin acquired a glitch, and there were three distinct times it did not work as expected during the mock code simulation. However, together with my preceptor, and the ED physician, we were able to complete each mock simulation just as if the manikin had not developed the technical problem. The simulation newborn worked without any problems, and the family practice physicians appreciated the opportunity for intubation and line placement.

Recommendations for future projects utilizing a high-fidelity simulation manikin would be to ensure the manikin software is up to date and that the manikin is functioning properly. Starting up the manikin and performing a test prior to the mock simulation would reduce the risk for glitches similar to what I encountered. It may also be possible to partner with the local university and utilize their simulation lab as well as their expertise in the simulation arena.

Summary

There were 40 staff members who participated in four different mock simulations. Staff members were broken down into two groups of 10. Six staff members who

participated in the mock ACLS simulation while four members participated in the mock NRP simulation. Each of these participants was required to take either the ACLS exam or the NRP exam, specifically related to their role. Once the simulation was complete, the participants took their confidence survey and participated in a debriefing. The overall confidence in both the nursing and provider staff increased, while the confidence in the RT stayed relatively the same. Three key themes resulted from the debriefing to include angst, rush, and ecstatic. Recommendations include implementation of Code Lavender, annual training for clinical staff, and incorporation of the maternal code into onboarding of clinical staff. Section 5 is a discussion of the dissemination plan for the maternal code project.

Section 5: Dissemination Plan

Introduction

The local problem was the staff at the CAH did not have adequate education and training to be prepared for a maternal cardiac arrest, nor were there mock simulations that included a mother and unborn child. It was essential to have an educational program in place to use as the basis for educating the staff. The development and implementation of a clinical education program for the care of a pregnant woman in cardiac arrest, to improve staff preparedness and self-confidence in their ability to manage a maternal cardiac arrest at the critical access facility was developed. Section 4 was a discussion of the results of the mock simulation, confidence survey, debriefing, and recommendations. Section 5 will include the dissemination of the project.

The maternal cardiac arrest mock simulation code was a success overall. The CBT will be incorporated into the clinical staff's annual competencies. All clinical staff from patient care technicians to nurses, RT to physical therapy (PT) will be required to take the CBT and pass the exam. Once the CBT is completed, the staff will participate in hands on simulation to ensure competency. The competency checklist will be placed in the staff learning management system for recordkeeping. Mock simulations will also be scheduled throughout the year to maintain staff diligence and competency.

The audience for the project included clinical staff who had hands on direct patient care. Staff members who can benefit most from the project include RT, PT, nursing staff, techs or patient care technicians, medical assistants, nursing assistants, and providers including medical doctors (MDs), doctors of osteopathic medicine (DO),

physician assistants (PA), and nurse practitioners (NP). The venue will be a hospital or medical center as well as in the outpatient clinic setting. Nursing faculty and physician faculty could also be trained so they can incorporate the simulation into their curriculum. The findings of the project will be disseminated first to the clinical managers by the student and her preceptor during a clinical manager meeting. The focus of the meeting will be to discuss the project and its need to be incorporated into annual competency training for all clinical staff. The project findings will then be disseminated to the main facility's education department.

Analysis of Self

As Practitioner

The maternal cardiac arrest project was a very important one for me. As a labor and delivery nurse, the idea of a healthy mother going into cardiac arrest was not something I even wanted to think about. It was not until I was sitting at the American Academy of Pediatrics NRP summit in 2016 when the subject was discussed. I was sitting there thinking that a maternal cardiac arrest and code could not possibly happen where I work. The presenters were discussing the need for all staff to be trained and to be ready, but highlighted the most important points for the neonatal resuscitation team. It was at that moment I knew I had to implement the maternal cardiac arrest scenario at the DNP project site.

As a labor and delivery nurse of 18 years, I can honestly say that I have never had to deal with the maternal aspect of resuscitation. Some may call it lucky, as do I, but nevertheless nurses caring for pregnant mothers need to be educated, trained, and

competent to handle the worst possible scenario. The research I have done for the project has not only expanded my horizons, but it has enabled me to become a better nurse. Yes, I have become a better nurse as a result of this project. I love learning and labor and delivery is my passion. I felt connected to the project in that I felt that I had something to contribute. That contribution was knowledge, passion, determination, and commitment. As a former professor in nursing school, that drive to teach the staff is very rewarding. It is a complete pleasure to watch the staff appear uncomfortable at first, then slowly but surely work their way through the simulation, and then feel confident at the end.

As Scholar

My long-term professional goals are to shift from staff nurse to the nurse manager of the labor and delivery unit. It is here that I want my professional practice passion to flourish, by bringing in the newest evidence-based practices to the staff. We are a team and I feel that the staff will be more confident and competent in their skills if they have the opportunity to learn as I have. I feel that a nurses' education should never stop. Our patients deserve the best care possible and that is made possible by research and inquiry. Labor and delivery is a specialty with a unique patient population and unique medical complications that can turn an ordinary delivery into a fight for two lives. I love where I work as well, and hope to work my way up to director of nursing (DON) before the end of my career. I am well on my way.

As Project Manager

The maternal cardiac arrest project was enjoyable from beginning to end. My preceptor made it possible to keep going, offering her expertise in many areas to include

the computer-based training and simulation. Just when I would hit a roadblock, she would help me find the solution so I could keep going. The hospital staff also made the project worth doing, as each one of the staff members felt that the maternal cardiac arrest mock simulation was of great value to their practice.

Discussion of the Completion of the Project

One of the challenges was the difference in maternal mortality data from year to year and deciphering which reporting agency was most accurate. The other challenge that I faced was that I wanted to implement everything right now in the moment, something that I obviously could not do all at once. I realized that there is a process and that in order to get things approved, one must follow the process.

This scholarly journey helped me really grow as a person and as a registered nurse. I gained so much appreciation for my peers, my coworkers, and my preceptor. I find that to be passionate about something can be both good and bad. When a student has the drive and the initiative to follow her or his dreams, then it is good. When you have to suppress your passion, it takes your energy away and makes you feel not worthy of yourself or your profession. I was passionate about this project. Our small critical access facility should not be left out of a great opportunity because we are small. I feel that we need to lead the way and demonstrate our passion and our commitment to our patients. We need to share in our passions, continue to learn, and continue to make a difference. Fisher et al. (2011) reminded us that performing routine mock maternal cardiac arrest simulations will continue to improve the current process, improve communication, improve response times and potentially, patient outcomes, as well as increase the

proficiency and confidence of the nursing and physician staff. Lipman et al. (2014) also stated that simulated maternal cardiac arrests most often result in substandard performance by the team, which if not corrected, can lead to poor outcomes for both the mother and the baby. The mock simulations and annual refresher training will ensure outstanding team performance and if a true maternal code occurs, a positive outcome for both the mother and the baby.

Summary

Maternal cardiac arrests and subsequent codes are rising in the United States. More pregnant women have medical conditions and pregnancy related complications than ever before. Labor and delivery units must be prepared to take on the challenge of not only recognizing cardiac issues, but be competent and confident to care for these women. All clinical staff must know what to do in the event a pregnant woman suffers cardiac arrest, as time is critical to the survival of the baby and the mother. It must be possible to perform a perimortem cesarean section within four minutes of pulseless electrical activity (PEA). There must be two teams of competent staff to care for the mother and the baby. Communication and collaboration must be flawless between the team members in order to successfully resuscitate the mother and the baby. There are no second chances, are you ready?

References

Akhu-Zaheya, L. M., Gharaibeh, M. K., & Alostaz, Z. M. (2013). Effectiveness of simulation on knowledge acquisition, knowledge retention, and self-efficacy of nursing students in Jordan. *Clinical Simulation in Nursing*, *9*(9), e335-e342.

American Heart Association. (2010). Highlights of the 2010 American Heart Association Guidelines for CPR and ECC. Retrieved from http://www.heart.org/idc/groups/heart-public/@wcm/@ecc/documents/downloadable/ucm_317350.pdf

American Heart Association. (2015.) Statement is first to address cardiac arrest during pregnancy. Retrieved from http://news.heart.org/statement-is-first-to-address-cardiac- arrest-during-pregnancy/

Association of Women's Health, Obstetric, and Neonatal Nurses. (2017). [Position Statement]. Advanced cardiac life support in obstetric settings. *JOGNN, 46*, 117-118.

Association of Women's Health, Obstetric, and Neonatal Nurses. (2017). Member center. Retrieved from http://www.awhonn.org/general/custom.asp?page=MemberCenter

Bandura, A. (1982). Self-efficacy mechanism in human agency. *American Psychologist*, *37*(2), 122.

Bandura, A. (2012). On the functional properties of perceived self-efficacy revisited. *Journal of Management, 38*(1), 9-44.

Benner, P. (1984). *From novice to expert: Excellence and power in clinical nursing practice.* Menlo Park, CA: Addison-Wesley.

Centers for Disease Control and Prevention (CDC). (2017). Pregnancy morality surveillance system. Retrieved from https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pmss.html

Cornthwaite, K., Edwards, S., & Siassakos, D. (2013). Reducing risk in maternity by optimising teamwork and leadership: an evidence-based approach to save mothers and babies. *Best Practice & Research Clinical Obstetrics & Gynaecology*, *27*(4), 571-581.

Dreyfus, T. E. & Dreyfus, H.L. (1980), A five-stage model of the mental activities involved in directed skill acquisition, storming media. Retrieved from http://www.stormingmedia.us/15/1554/A155480.html

Eller, L. S., Lev, E. L., & Feurer, A. (2014). Key components of an effective mentoring relationship: A qualitative study. *Nurse Education Today*, *34*(5), 815-820.

Fisher, N., Eisen, L. A., Bayya, J. V., Dulu, A., Bernstein, P. S., Merkatz, I. R., & Goffman, D. (2011). Improved performance of maternal-fetal medicine staff after maternal cardiac arrest simulation-based training. *American Journal of Obstetrics & Gynecology*, *205*(3), 239-e1.

Garside, J. R., & Nhemachena, J. Z. (2013). A concept analysis of competence and its transition in nursing. *Nurse Education Today*, *33*(5), 541-545.

Hoek, T. L. V., Morrison, L. J., Shuster, M., Donnino, M., Sinz, E., Lavonas, E. J., ... & Gabrielli, A. (2010). Part 12: Cardiac arrest in special situations. *Circulation*, *122*(18 suppl 3), S829-S861.

Hui, D., Morrison, L. J., Windrim, R., Lausman, A. Y., Hawryluck, L., Dorian, P., &

Wax, R. S. (2011). The American Heart Association 2010 guidelines for the management of cardiac arrest in pregnancy: consensus recommendations on implementation strategies. *Journal of Obstetrics and Gynaecology Canada*, *33*(8), 858-863.

Huseman, K. F. (2012). Improving code blue response through the use of simulation. *Journal for Nurses in Professional Development*, *28*(3), 120-124.

Jeejeebhoy, F. M., & Morrison, L. J. (2013). Maternal cardiac arrest: a practical and comprehensive review. *Emergency Medicine International*, 2013.

Jeejeebhoy, F. M., Zelop, C. M., Lipman, S., Carvalho, B., Joglar, J., Mhyre, J. M., ... & Page, R. L. (2015). Cardiac arrest in pregnancy: a scientific statement from the American Heart Association. *Circulation*, CIR-0000000000000300.

Kikuchi, J., & Deering, S. (2017). Cardiac arrest in pregnancy. In *Seminars in perinatology*. WB Saunders.

Lenburg, C. B., Abdur-Rahman, V. Z., Spencer, T. S., Boyer, S. A., & Klein, C. J. (2011). Implementing the COPA Model in Nursing Education and Practice Settings: Promoting Competence, Quality Care, and Patient Safety. *Nursing Education Perspectives*, *32*(5), 290-296.

Lenburg, C. B., Klein, C., Abdur-Rahman, V., Spencer, T., & Boyer, S. (2009). The COPA Model: A comprehensive framework designed to promote quality care and competence for patient safety. *Nursing Education Perspectives*, *30*(5), 312-317.

Lipman, S., Cohen, S., Einav, S., Jeejeebhoy, F., Mhyre, J. M., Morrison, L. J., ... & Suresh, M. S. (2014). The Society for Obstetric Anesthesia and Perinatology

consensus statement on the management of cardiac arrest in pregnancy. *Anesthesia & Analgesia*, *118*(5), 1003-1016.

Lipman, S., Daniels, K., Arafeh, J., & Halamek, L. (2011.) The case for OBLS: A simulation-based obstetric life support program. *Seminars in Perinatology. 35*(2), 74- 79.

Lunenburg, F. C. (2011). Self-efficacy in the workplace: implications for motivation and performance. *International Journal of Management, Business, and Administration*, *14*(1), 1-6.

Lyon, L. J. (2015). Development of teaching expertise viewed through the Dreyfus model of skill acquisition. *Journal of the Scholarship of Teaching and Learning*, 88-105.

MacDorman, M. F., Declercq, E., Cabral, H., & Morton, C. (2016). Is the United States Maternal Mortality Rate Increasing? Disentangling trends from measurement issues Short title: US Maternal Mortality Trends. *Obstetrics and Gynecology*, *128*(3), 447.

Manojlovich, M. (2005). Promoting nurses' self-efficacy: a leadership strategy to improve practice. *Journal of Nursing Administration*, *35*(5), 271-278.

McGregor, A.J., Barron, R., & Rosene-Montella, K. (2015). The pregnant heart: Cardiac emergencies during pregnancy. *American Journal of Emergency Medicine. 33*(2015), 573-579.

Mhyre, J. M., Tsen, L. C., Einav, S., Kuklina, E. V., Leffert, L. R., & Bateman, B. T. (2014). Cardiac arrest during hospitalization for delivery in the United States, 1998–2011. *Anesthesiology: The Journal of the American Society of*

Anesthesiologists, *120*(4), 810-818.

Murphy, N., J., & Quinlan, J. D. (2014). Trauma in pregnancy: Assessment, management, and prevention. *American Family Physician. 90(*10), 716-724.

New Mexico Department of Health. (2017). New Mexico selected health statistics annual report 2016. Retrieved from https://nmhealth.org/data/view/vital/2112/

Salanova, M., Lorente, L., Chambal, M.J., & Martinez, I.M. (2011). Linking transformational leadership to nurses' extra-role performance: The mediating role of self-efficacy and work engagement. *Journal of Advanced Nursing, 67*(10), 2256-2266. doi: 10.1111/j.1365-2648.2011.05652.x

Schimmelpfennig, K., & Stanfill, T. (2006). One hospital's journey. *Nursing for Women's Health*, *10*(4), 306-311.

Serengella Pignotti, M., & Donzelli, G. (2008.) Perinatal care at the threshold of viability: An international comparison of practical guidelines for the treatment of extremely preterm births. *Pediatrics, 121*(1), e193-e198.

Stanley, M., & Pollard, D. (2013). Relationship between knowledge, attitudes, and self-efficacy of nurses in the management of pediatric pain. *Pediatric Nursing*, *39*(4), 165.

Tyler, S., Bourbon, E., Cox, S., Day, N., Fineran, C., Rexford, D., & Ward-Smith, P. (2012). Clinical competency, self-efficacy, and job satisfaction: Perceptions of the staff nurse. *Journal for Nurses in Professional Development*, *28*(1), 32-35.

Walden University. (2017). Manual for staff education project. Retrieved from https://academicguides.waldenu.edu/ld.php?content_id=32804379.

Walton, P. (2012.) Maternal Cardiac arrest: You have 4 minutes, are you ready? *JOGNN*: *Journal of Obstetric, Gynecologic, Neonatal Nursing. 41*(s1), S112.

Yanhua, C., & Watson, R. (2011). A review of clinical competence assessment in nursing. *Nurse education today*, *31*(8), 832-836.

Zelop, C. M., Einav, S., Mhyre, J. M., & Martin, S. (2018). Cardiac Arrest during pregnancy: Ongoing Clinical Conundrum An Expert Review. *American journal of obstetrics and gynecology*.

Appendix A: Likert Scale for Confidence Survey

Please rate your level of confidence using a scale of 1 to 10, where one equals no confidence and ten equals extremely confident.

1. What was your level of confidence on maternal/newborn cardiac arrest before the CBT?
2. What is your confidence level now?
3. A. What was your level of confidence participating in a maternal cardiac arrest before the course?
4. What is your confidence level now?
5. B. What was your level of confidence participating in a newborn cardiac arrest BEFORE the course?
6. What is your confidence level now?
7. What was your level of confidence in the recognizing the physiologic changes during triage/shift assessment in a pregnant woman BEFORE the course?
8. What is your confidence level AFTER the course?
9. How would you rate your emergency care skills BEFORE taking the course?
10. How would you rate your emergency care skills AFTER taking the course?
11. How willing would you be to respond to a maternal/newborn cardiac arrest BEFORE taking the course?

12. How willing would you be to respond to a maternal/newborn cardiac arrest AFTER taking the course?

Appendix B: Base Level Knowledge of Maternal Cardiac Arrest

1. Please tell me what your basic level of knowledge is with maternal cardiac arrest.
2. Would you know what to do if a pregnant woman went into cardiac arrest on the labor and delivery unit?
3. Would you be able to effectively administer chest compressions until the code team arrived?
4. Did you know the left uterine displacement increases circulation in the pregnant mother?
5. Did you know that a pregnant mother can receive a shock through the defibrillator even if the baby is still in utero?

Appendix C: Mock Code Competency Checklist

Critical Performance Steps (Patient is in OB Triage)	Done Correctly
Patient is 24 years old, 34 weeks gestation and complains of shortness of breath and chest pain, and then collapses on bed. RN checks for responsiveness-taps woman "Are you okay?"	
Activates Code Blue, checks breathing, checks pulse	
Performs high quality CPR until help arrives, directs first responder to perform LUD	
Start oxygen, IV, defibrillator pads; When ED MD arrives divide into 2 distinct teams	
Team 1 responds to mother, Team 2 prepares for baby	
Team 1 ensures proper airway management, appropriate cycles of CPR, manages rhythm, medication administration	
Team 2 is ready at warmer, RN, RT, MD present, neonatal crash cart open, ready	
Team 1 prepares for perimortem cesarean section by minute 3 of PEA, OB/GYN or ED physician to perform	
Team 1 Perimortem cesarean section after minute 4 of PEA	
Resuscitation of viable neonate begins for team 2	
Team 1 continues with resuscitation of mother/closure of surgical incision until ROSC, post-cardiac arrest care or death Team 2 continues with resuscitation of newborn until stable/MD determines not viable	

Name:_____TEAM #:_____
Instructors initials:_____ Date:_____ Pass:_____ Fail:_____

Appendix D: Post Simulation and Mock Code Debriefing

The purpose of this debriefing is for education, quality improvement, and emotional processing after the maternal cardiac arrest simulation; it is not to blame anyone for anything that went wrong. Everyone's contribution is welcome.

What went well?

Mom's code

Baby's code

2. What would you do differently next time?

3. Were there any safety or equipment issues identified?

4. How can patient care be improved next time?

5. In this specific situation, dealing with one code can be hard enough. How did you feel, or what were your feelings responding to a pregnant mother in cardiac arrest knowing there was also an unborn baby involved?

6. What were your thoughts about this type of simulation?