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Maternal-Early-Warning-System Education to Improve Registered Nurse Knowledge of and Appropriate Responses to Triggers

Dawn Marie Moore
Walden University

Walden University

College of Nursing

This is to certify that the doctoral study by

Dawn M. Moore

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. Sue Bell, Committee Chairperson, Nursing Faculty
Dr. Anita Manns, Committee Member, Nursing Faculty
Dr. Donna Bailey, University Reviewer, Nursing Faculty

Chief Academic Officer and Provost
Sue Subocz, Ph.D.

Walden University
2023

Abstract

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by

Dawn M. Moore

MS, Hunter College, City University of New York, 2004

BS, Mercy College, 2000

Project Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Nursing Practice

Walden University

February 2023

Abstract

The maternal early warning system (MEWS) is the single most reliable response tool to improve maternal outcomes in obstetrics. Recognition and response by nurses to the MEWS triggers was worrisome at the project site as the MEWS trigger to detect changes in the clinical conditions in obstetric patients was not applied consistently at the bedside. This project was developed to evaluate whether providing an education program on the application of MEWS to nurses in obstetrics at the practicum site would improve registered nurses' knowledge of and appropriate responses to the MEWS trigger alarms. A literature search targeting the key words *maternal early warning system*, *quality improvement*, *nursing competency*, and *health care outcomes* in sources such as CINHAL, Medline, EBSCO, and Cochrane Reviews as well as federal, state, and local databases was used to inform the project. The four levels of the Kirkpatrick model, reaction, learning, behaviors, and results, served as the framework for educating the nurses on MEWS. The design for the project with 40 obstetrics nurses included a pretest, staff education, an immediate posttest, and a 2-week retest. Data were collected using a 5-level Likert Scale delivered on a Qualtrics platform. The responses were recoded into two categories, high confidence and low confidence, and a chi-squared analysis was used to detect any significant differences in knowledge attainment by nurses. The pretest *Mean* (*M*) = 22.00, immediate posttest *Mean (M)* = 36.33; the 2-week posttest follow-up *Mean (M*) = 35.16. The social change, supported by this project, was improvement of nurses' recognition of MEWS trigger alarms and their reaction to reduce the occurrence of preventable maternal mortality and morbidity at the micro level.

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Dedication

This work is dedicated to the women in my life, my mother and daughter, who have encouraged and prayed with me throughout my journey. Special thanks to Dr. Sue Bell, who has been my mentor, confidant, and listening ears. To my Eternal Heavenly Father, who has kept me going amid the family illnesses, struggles, and disappointments in my life.

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Section 1: Nature of the Project

Introduction

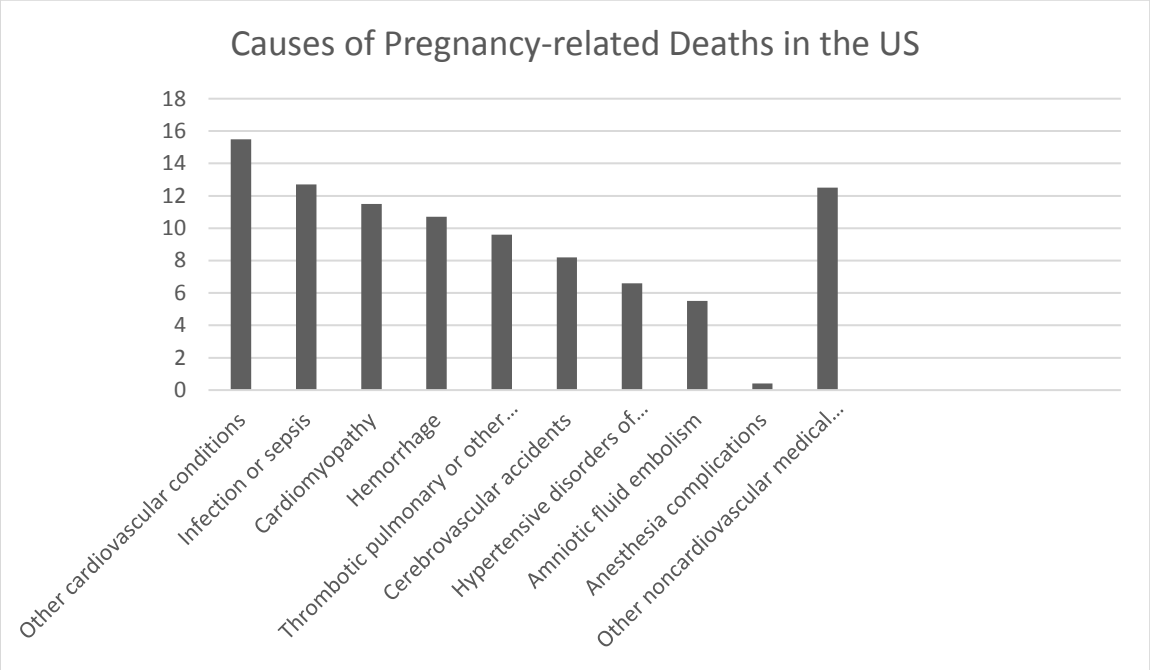
Maternal mortality in the United States has increased exponentially over the past 10 years, with the major impact occurring in low-income and socially deprived communities, an indication that changes are needed in the health care system (Collier & Molina, 2019; Joseph et al., 2021; PEWtrust.org, 2020; U.S. Department of Health and Human Services [HHS], 2020). Maternal mortality is defined as

> the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from unintentional or incidental causes. (World Health Organization [WHO], 2019, p. 9)

Causes linked to maternal mortality include hypertensive disorders of pregnancy, cardiovascular diseases, hemorrhage, decreased urinary output, social determinants of health, and sepsis (Chinn et al., 2020; Collier & Molina, 2019; Joseph et al., 2021; Petersen et al., 2019; Shields et al., 2016; Simpson, 2019; Tripathi et al., 2019; Wang et al., 2020 [see Figure 1]). Social determinants of health include where one lives, socioeconomic conditions, social status, education, health behaviors and beliefs, and community environment (Artiga et al., 2020; Joseph et al., 2021; Krieger, 2012; Wang et al., 2020).

Figure 1

Causes of Pregnancy-Related Deaths in the United States



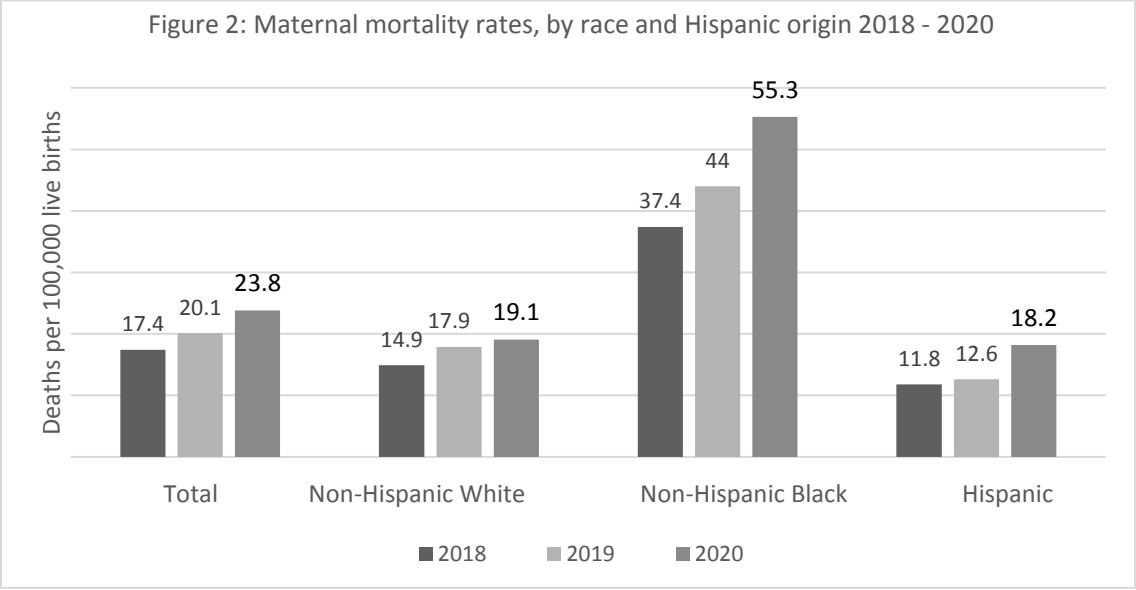
Note. From *Pregnancy Mortality Surveillance System*, by Centers for Disease Control and Prevention, 2020 (https://www.cdc.gov/reproductivehealth/maternal-mortality/preventing-pregnancy-related-deaths.html). In the public domain.

The incidence of maternal mortality in the United States is one of the highest in the developed world and is a national problem that was exposed during the COVID-19 pandemic (Robert Wood Johnson Foundation [RWJF], 2020). According to the Centers for Disease Control and Prevention (CDC, 2020), maternal mortality rose steadily from 2018–2020. In non-Hispanic Black women, the rate is 55.3 per 100,000 live births; for Hispanics, it is 18.2 per 100,000 live births; and in White women, it is 19.1 per 100,000 live births (CDC, 2020; Hoyert, 2022 [see Figure 2]). The stark differences in maternal mortality rates are a national concern and a challenge to the health care system. The

profound trend has been linked to disparities of health and inequitable treatment in communities of color and health care settings (Admon et al., 2017; Lima et al., 2017; Petersen et al., 2019). The American Public Health Association (APHA, 2015) has suggested that reducing the disparities in the maternal mortality rate is a human rights issue in the United States and that various organizations at the local, state, and federal levels should see it as an emergency.

Figure 2

Maternal Mortality Rates by Race and Hispanic Origin: United States 2018–2020



Note. From "Evaluation of the Pregnancy Status Checkbox on the Identification of Maternal Deaths," by D. L. Hoyert, S. F. G. Uddin, & A. M. Minino, 2022, *National Vital Statistics Reports, 69*(1), p. 3 (https://www.cdc.gov/nchs/products/index.htm). In the public domain.

The RWJF (2020) posited that maternal deaths have highlighted health inequities and health disparities in communities of color. Petersen et al. (2019) postulated that

racial, ethnic, and health disparities in pregnancy-related deaths are a burden on communities, which should cause health care organizations to educate direct-care providers to support initiatives to decrease the occurrence of maternal mortality. The PEW Research Trust (2020) expressed concerns that little is being done at the federal level to lower rates of preventable maternal deaths; therefore, changes must occur at the point of care by responding to the causes of maternal deaths to improve outcomes. It is imperative that obstetric nurses at the bedside recognize and respond in a timely manner to maternal clinical conditions contributing to maternal mortality.

Healthy People 2030 identified leading indicators of health to be improved within the next 10 years, which include the preventable causes of maternal mortality (see Table 1). The Surgeon General's call to improve maternal health suggests that more work is needed at all levels to reduce pregnancy-related deaths in the United States (HHS, 2020). How is it possible to achieve the envisioned goals of Healthy People 2030 and heed the Surgeon General's call to improve maternal health in the United States? Progress can be realized at the bedside through the Maternal Early Warning System (MEWS) to educate nurses on early recognition and responses to deteriorating maternal clinical conditions.

Table 1

Healthy People 2030 Maternal Deaths

Baseline	17.4 maternal deaths per 100,000 live births occurred in 2018
Target	15.7 maternal deaths per 100,000 live births
Numerator	Number of female deaths due to obstetric causes (ICD-10 codes: A34, 000-095, 098-099) while pregnant or within 42 days of being pregnant.
Denominator	Number of live births
Target-setting method	Percent improvement
Target-setting method details	10% improvement from the baseline

Note. From *Reduce Maternal Deaths—MICH-04: Data Methodology and Measurement*, by Office of Disease Prevention and Health Promotion, n.d., Healthy People 2030 (https://health.gov/healthypeople/objectives-and-data/browse-objectives/pregnancy-and-childbirth/reduce-maternal-deaths-mich-04/data-methodology). In the public domain.

Maternal Early Warning System

The quest to create a public policy on maternal mortality started with the global Safe Motherhood Initiative in 1987 in Nairobi, Kenya (Stanton et al., 2018). Proponents of the initiative sought to lower maternal mortality globally with a combined effort to improve outcomes in preventable causes of maternal mortality (Stanton et al., 2018). This effort evolved into the start of an Early Warning System in the United Kingdom in 1999 for the general patient population and was introduced in obstetrics in 2011 by the Center for Maternal and Child Enquiries (CMACE); it was further recommended for rollout to all maternal hospitals in the United Kingdom (Nair et al., 2018).

In the United States during the 1990s, the National Partnership for Maternal Safety and Perinatal Collaborative, a stakeholders' leadership group, reviewed the

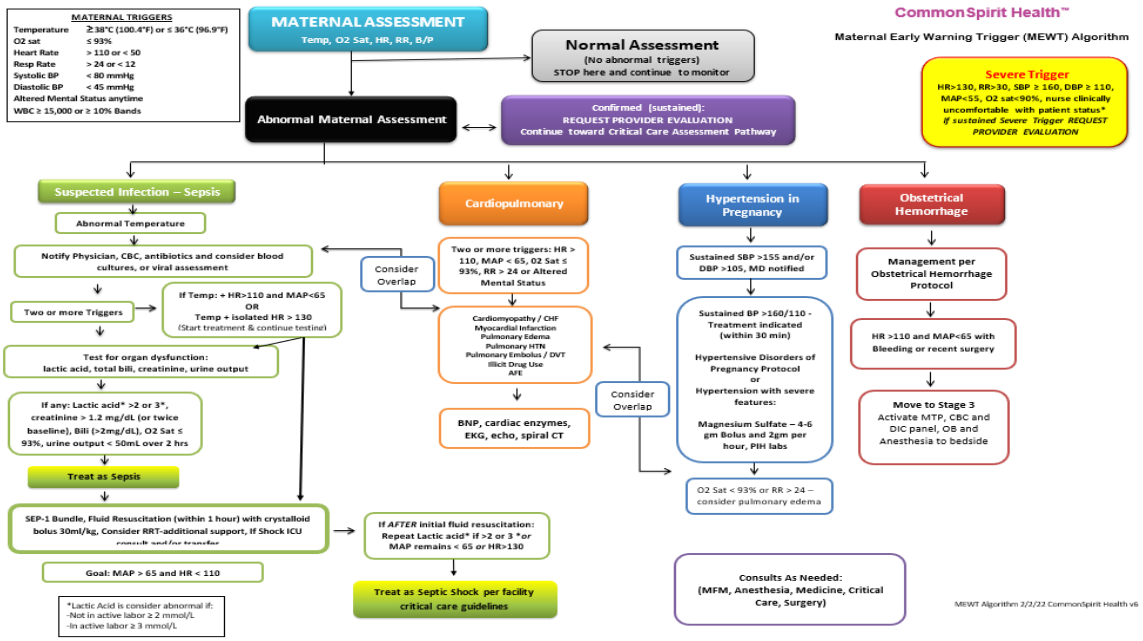
maternal-mortality rates from the CDC's Pregnancy Mortality Surveillance System (PMSS) and strongly advocated using MEWS in all obstetric settings in the United States (Friedman et al., 2018; Shields et al., 2016). Friedman et al. (2018) compared other patient safety issues, such as venous thromboembolism prophylaxis, and found failures in early recognition and response to MEWS in obstetrics settings, attributing the failure of timely response to a lack of coordination and education between nurses, providers, information technology, and leadership at the bedside. The American College of Obstetricians and Gynecologists (ACOG, 2020) also pointed to caregiver advocacy as a likely factor in lowering the occurrence of maternal mortality in the United States and called on organizations to equip their staff with the education and knowledge to use MEWS to improve early recognition and response to changes in maternal conditions. The authors postulated that delayed response at the patient's bedside often leads to catastrophic outcomes for maternity patients (ACOG, 2020).

The use of MEWS in obstetrics settings is known to have predictive importance in detecting changes in maternal clinical conditions and, with an appropriate response by nurses and timely communication among caregivers, improves maternal outcomes (Downey et al., 2017; Umar et al., 2019; Umar et al., 2020). The MEWS alarm criteria (see Figure 3) for early intervention include parameters for maternal heart rate, respiratory rate, blood pressure, oxygen saturation, decreased hourly urinary output, and signs of altered mental status or unresponsiveness; other indicators include hypertension, headache, visual changes, dyspnea, hemorrhage, and sepsis (Gillespie et al., 2018). The alarms vary from indications of sepsis to variable vital signs. Barriers to the effective use

of MEWS include a lack of education and training for caregivers, ineffective care, failure to respond in a timely manner to deteriorating maternal clinical conditions, and alarm fatigue (Friedman et al., 2018; Mhyre et al., 2014). The inconsistent use of MEWS has been identified as a knowledge and practice gap at the practicum site.

Figure 3

Maternal Early Warning Trigger Algorithm v6



Note. From *Maternal Early Warning Trigger (MEWT) Algorithm*, by Common Spirit Health, 2022 (https://www.wsha.org/wp-content/uploads/Shields-article.pdf).

Nursing Implications

Early recognition of maternal distress and response by nurses can improve outcomes for pregnant patients admitted to a health care facility, thereby contributing to the lowering of maternal mortality in the United States (Gillespie et al., 2021; Nove et al.,

2021). Assessing and enriching nursing knowledge, abilities, and competency through professional development are essential aspects of translating research to evidence-based practice (Jeffery et al., 2016; Shields et al., 2016). For quality improvement and outcomes in the delivery of health care, organizations are urged to educate obstetric nurses in early recognition and response to deteriorating maternal clinical conditions. Nurses are with their patients for long hours and thus are often the first to observe clinical changes. Gillespie et al. (2021) postulated that enhancing the confidence of nurses to communicate changes in the clinical conditions of maternal patients could avert catastrophic events leading to poor maternal outcomes.

This nursing education project was strategically planned to inform nurses and improve maternal clinical outcomes at the organizational level. The findings on the implementation and evaluation of the MEWS education program will be communicated to all stakeholders in the organization. The translation of the evidence-based research to the practice setting was done by introducing the evidence that MEWS is a documented clinical-decision support tool widely used in obstetrics to improve clinical outcomes (Shields et al., 2016).

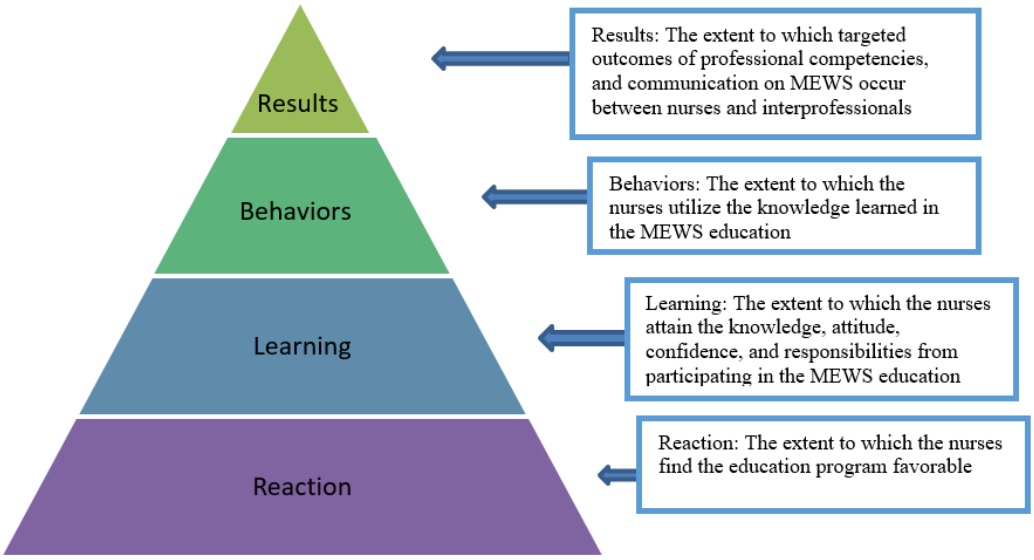
The four levels of the Kirkpatrick model were used for the evidence-based practice intervention for the obstetrics nurses at the practicum site. The Kirkpatrick model is an evaluation model that may be used to appraise training and education programs to determine if programs are valuable to the mission, vision, and values of an organization (Kirkpatrick & Kirkpatrick, 2016). The tenets of the four levels of Kirkpatrick's model are as follows (see Figure 4):

- Level 1: Reaction that speaks to the participant's engagement and their level of reaction to the program
- Level 2: Learning speaks to the participant's knowledge attainment, any change in attitude, and perceived improvement in nursing assessment skills
- Level 3: Behaviors speak to the application of the training, such as a translation of knowledge to practice
- Level 4: Results speak to the outcomes or whether the maternal patients or organization have benefitted from the new knowledge of the nurses or improvement in professional competency.

The Kirkpatrick model was applied to answer the following questions: What were the results of the education program? Was the program successful in changing the mindset of the obstetrics nurses and empowering them to recognize and respond to maternal events? The overarching goals were to close the knowledge gap among obstetrics nurses and improve the professional competencies in recognition and response to MEWS triggers reflects deteriorating maternal clinical conditions.

Figure 4

Kirkpatrick's Model: Levels of Evaluation as Applied to Maternal Early Warning System Education Program



Problem Statement

Organizational data showed that the MEWS application for obstetrics patients was not used appropriately, and parameters were not recognized in a timely manner by nurses at the practicum site. The nursing needs assessment revealed that nurses' recognition and response to changes in clinical parameters, such as vital signs, decreased urinary output, episodes of dyspnea, increased blood pressures, altered mental status, and signs of sepsis, were delayed. There was also a lack of critical thinking and clinical judgment on how to respond to deteriorating maternal clinical conditions, which led to a failure to communicate the patients' condition in a timely manner. The inherent problem was a knowledge gap that spoke to the lack of knowledge of the MEWS triggers and how to

respond to those changes in the clinical condition of maternal patients. This can be summarized as a knowledge deficit and practice gap in the correct use of MEWS requiring a nursing-competency educational intervention to avert any deterioration in maternal clinical condition and the nurse's failure to rescue. Downey et al. (2017) posited that the MEWS prognostic value is profound when used with critical thinking and clinical judgment in clinical decision-making to escalate the findings to the provider. According to Gillespie et al. (2021), nurses are with patients all the time and thus should be the first to recognize a patient's deteriorating condition.

One of the expressed barriers to timely recognition of and response to deteriorating maternal-clinical conditions is a shortage of nurses on a given shift. Nursing-staff shortages are presently a dire issue in health care and are linked to practice deficiencies, high workload, and negative patient outcomes (American Association of Colleges of Nursing [AACN], 2020; Haddad et al., 2022). A nursing shortage in obstetrics at the practicum site is a challenge threatening the translation of evidence to practice, including the appropriate use of MEWS. Nurse shortages can reduce the time nurses spend in continuing education, in-service education, and delivery of quality care to maternal patients (American Nurses Association [ANA], 2015). Numerous research studies have linked nursing shortages and quality outcomes (AACN, 2020; ANA, 2015; Haddad et al., 2022; Needleman & Hassmiller, 2009). The ANA (2015) has indicated that adequate nursing staff have a positive impact on quality outcomes and has referenced numerous research studies validating the relationship between nurse staffing, the translation of evidence to practice, and patient outcomes. Tamata et al. (2021)

hypothesized that nursing shortages and workload can also affect the implementation of evidence-based practice. The strategic plan for providing education on MEWS to obstetric nurses at the practicum site was guarded to thwart potential negative impacts on the implementation, evaluation, and dissemination of the project. The project for nursing education on MEWS served to bridge the identified knowledge gap in the obstetric setting. It is expected that the education program will close the knowledge gap among obstetrics nurses at the practicum site with improved nursing professional competency and enhanced critical thinking and clinical judgment skills in recognizing and responding to changes in maternal clinical conditions and communication of maternal assessment findings to care providers in a timely manner.

Purpose Statement

The purpose of this project was to close the identified knowledge gap of the obstetrics nurses on MEWS triggers through education on how to recognize changes in parameters such as vital signs, oxygen saturation, urinary output, mental status, and signs of sepsis, with an immediate response of a nursing bedside assessment and evaluation of those changes in maternal clinical conditions. Therefore, the guiding question for this project was the following: Does an education program for obstetric nurses on the MEWS triggers at an acute-care hospital improve their knowledge of MEWS and professional competencies in recognition of and response to changes in maternal clinical conditions over a 2-week period? The intent of the education program on MEWS was to provide nurses with the necessary knowledge and tools to improve professional competency in recognition of and response to maternal clinical conditions at the bedside and, therefore,

reduce maternal mortality at the micro level. A well-designed, strategically planned nursing education program to enhance nursing assessment, proficiency, and competency is essential to improve nursing professional competency and practice and thereby improve patient outcomes (Jeffery et al., 2016). It is expected that the education program will bridge the practice and knowledge gaps and positively influence maternal outcomes on the obstetrics unit at the practicum site and organizational level, thus contributing to the lowering of maternal mortality rates at the state and national levels.

Nature of the Doctoral Project

The intent of the doctoral project was to determine whether an education program on MEWS for obstetrics nurses would improve maternal outcomes at the practicum site. The health care setting was an acute-care hospital in a metropolitan city of New York. It consisted of a 12-room labor and delivery unit, a postpartum recovery suite, a six-bed triage cubicle, a 32-bed mother/baby unit, a 25-bed high-risk antepartum unit, and a Level 2 neonatal intensive care unit. The design for the MEWS education involved recruiting obstetric nurses and administering a knowledge assessment pretest; conducting the PowerPoint MEWS education, immediately followed by a knowledge acquisition posttest; and then administering a 2-week follow-up posttest to assess knowledge retention of MEWS recognition and response clinical guidelines. The education on MEWS in the acute care setting was given to the nurses in obstetrics using interactive lunch-and-learn activities on all shifts. Posters with the MEWS algorithm and color reminders were displayed on the units along with journal articles for quick reference guides and clinical decision support.

According to Dudley-Brown (2021) and Braithwaite et al. (2013), the translation of evidence to practice supports and enhances nursing knowledge and interprofessional collaboration. The standardization of MEWS at the point of care in maternity settings is a significant measure to reduce the occurrence of undesirable maternal outcomes at the organizational level (ACOG, 2020). The translation of the evidence-based MEWS protocol should reduce undesirable outcomes among patients admitted with hypertensive disorders of pregnancy or patients who develop hemorrhage or sepsis, or who have a preexisting cardiac condition (ACOG, 2020). The translation of evidence to practice invariably encounters barriers across multiple systems within health care organizations (White et al., 2021). Therefore, it is imperative that barriers, such as knowledge gaps and/or differences in clinical practice, be identified and addressed on an ongoing basis. At the practicum site, factors that could influence the translation of evidence to practice are short staffing of nursing personnel, lack of inter- and intraprofessional collaboration, and inadequate leadership support for the project.

Designing, developing, and implementing nursing professional learning activities such as MEWS education can empower nurses to recognize and respond to undesirable maternal clinical conditions and communicate with confidence as channeled by critical thinking and astute clinical judgment (Gillespie et al., 2021; Gosiewski et al., 2017; Jeffery et al., 2016; Smith et al., 2021). The AACN (2006) suggested that doctoral nurses are poised to be change agents by using various methods to translate evidence to practice. Through this doctoral practice project, I sought to improve practice and outcomes at the practicum site using the following learning objectives:

1. Implement the MEWS tool in practice.
2. Recognize maternal patients who are at risk of undesirable clinical conditions.
3. Respond in a timely manner to maternal early warning system alarms.
4. Demonstrate professional clinical skills and knowledge in communicating MEWS findings to the interprofessional team.
5. Describe the effectiveness of interventions discussed in the MEWS tool.

Practice Question

The project addressed the identified clinical practice gap by answering the following question: Will Maternal-Early-Warning-System education improve registered nurses' knowledge of and appropriate responses to triggers over a 2-week period?

Participants

The participants were obstetric nurses from labor and delivery, high-risk obstetrics, and postpartum units. The education was expected to improve maternal outcomes in labor and delivery in the long-term, high-risk antepartum, and mother-baby units at the practicum site through knowledgeable application of the MEWS triggers algorithm. Adult learning can be facilitated in multiple ways, and it was expected that participants would embrace the education activities to improve their professional practice.

The three common learning domains, cognitive, affective, and psychomotor, as well as other domains of learning such as reading, reason, perception, decision-making, reasoning, and problem solving, were integrated in the learning process of the education program for the obstetrics nurses at the practicum site. According to Jeffery et al. (2016),

these domains are related to learning theories used as frameworks to plan, explain, and connect the principles of professional proficiency. Jeffery et al. explained the link between the domains and nursing proficiency; therefore, the expectations for the obstetrics nurses after completing the education program were increased knowledge of MEWS triggers and improvement in their professional proficiency at the bedside. Kirkpatrick's model was a strong fit that linked the identified learning domains and concepts to the nurses' capabilities of improving their knowledge of MEWS and then translating the acquired knowledge into professional practice.

Intervention

Notwithstanding the increased use of the MEWS throughout the United States, a knowledge gap concerning its application was identified at the practicum site warranting intervention. According to Kirkpatrick and Kirkpatrick (2016), the intervention should be designed to maximize the benefits for the intended staff-nurse participants and other stakeholders such as nurse managers, nurse educators, and patients, thus substantiating the benefits of the education program. The planned intervention was executed with a PowerPoint presentation (Appendix F), which satisfied the reading domain (Jeffery et al., 2016), discussions, clinical observations by the nurse managers, and pretests and posttests, which satisfied the cognitive, affective, psychomotor, reasoning, perception, problem-solving and decision-making learning domains (Jeffery et al., 2016). Zuckerwise and Lipkind (2017) postulated that improved clinical awareness and interventions are keys to reducing preventable causes of maternal mortality with effective and timely recognition and response to avert undesirable outcomes.

Other MEWS clinical awareness activities that were used to enhance nurses' professional competencies in obstetrics include quarterly lunch-and-learn events and interprofessional collaborative monthly grand rounds with the use of case studies and regional perinatal collaborative committee reports. According to Sharma et al. (2020), enhanced education and training of interprofessional health care members with the use of case studies in grand rounds are means of sustaining the momentum in professional competencies. The authors postulated that improving maternal outcomes is dependent on the acquisition and assimilation of knowledge within a network of advocates, which is a necessary step in the care of high-risk maternal patients (Sharma et al., 2020). These activities will be facilitated by the nurse educator and perinatal fellows at the practicum site.

Comparison

The MEWS has been used in maternity hospital settings around the world for early identification of and intervention for deteriorating clinical conditions in pregnant and postpartum patients, resulting in good outcomes (Friedman et al., 2018; Gosiewski et al., 2017; Shields et al., 2016; Smith et al., 2021). In comparison, the practice setting has not used MEWS due to lack of knowledge on how to use the MEWS trigger algorithm among the obstetric nurses.

Outcome

Measuring outcomes to assess quality improvement is linked to better care and is used as a benchmark to identify the strengths, weaknesses, opportunities, and threats to an organization (Stanik-Hutt, 2021). Kirkpatrick's model was used to measure outcomes,

and analysis by chi-squared test determined changes in knowledge of the obstetric nurses. The expected outcomes for the practicum site are enhanced professional efficiency and a change in the effectiveness and timeliness of care, which includes recognizing and responding to deteriorating maternal clinical conditions and bridging knowledge and practice gaps. According to Kirkpatrick and Kirkpatrick (2016), organizational stakeholders at the practicum site are expecting an improvement in maternal outcomes. The authors described outcomes as the return on expectation (ROE) that demonstrates the extent to which the education program captured the intent of translating the evidence, MEWS, to the clinical setting (Kirkpatrick & Kirkpatrick, 2016). The data collection and evaluation were done electronically with recognition, response time, and effectiveness of care as identified leading indicators of quality improvement in assessing the application of MEWS.

Time

The change in practice was needed immediately; thus, the expected timeframe for the post education rollout by the obstetric nursing staff was 1 month after completion of the education program. Therefore, it is expected that recognition and response to the deteriorating maternal clinical conditions will improve rapidly. Improvement data collection and ongoing evaluation of nursing practice in the recognition and response to MEWS triggers will be done by organizational leadership on a quarterly basis. This close follow-up is expected to identify reversion to old nursing care patterns and reinforce MEWS education to sustain the practice change.

Significance

Health care organizations in the United States have adopted the MEWS guidelines in obstetrics to enhance the delivery of care to obstetrics patients and escalate interprofessional communication about deteriorating maternal clinical conditions (Friedman et al., 2018). However, inconsistent use, along with lack of coordination and communication among disciplines, has led to missed cues in recognizing and responding to deteriorating maternal clinical conditions, thereby increasing adverse maternal outcomes at the practicum site. Reviews of clinical records and interviews of nurses at the practicum site also revealed a knowledge gap that could only be bridged through education with professional development activities to improve critical thinking and clinical proficiency. Jeffery et al. (2016) argued that providing professional development education will enhance competency, empower, and increase the confidence of nurses to meet the needs of the organization. The leadership of the organization in clinical practice and nursing education was on board, giving support to the nature of the proposed program. The overarching goal of the evidence-based practice education project was to empower obstetric nurses at the practicum site to be strong advocates for social change by being confident in recognizing, responding to, and communicating in a timely manner any adverse event or deteriorating maternal clinical conditions.

Advocating for social change in the care of maternal patients of color at the practicum site has broader implications for maternity care at the state level. According to Walden University (2020), leaders are change makers who lead and encourage system changes; those changes also apply to the broader community in which they live and work.

Working at the practicum site is an opportunity to lead the necessary changes in the care of pregnant women by educating obstetrics nurses to identify unspoken biases at the bedside that have led to a disproportionate number of non-Hispanic Black women who are dying from preventable causes of maternal mortality. Green et al. (2021) implied that implicit bias exists in health care that is visible in the care of non-Hispanic Black pregnant women that has contributed to an increase in maternal mortality rates in the United States. The authors suggested that standardized protocols and education on MEWS can be a change maker in optimizing the delivery of care to vulnerable pregnant women (Green et al. 2021)

Summary

Nurses are continually at the point of care, so their critical thinking skills and clinical judgment in recognizing and responding to adverse events or deteriorating maternal clinical conditions are of fundamental importance in optimizing the delivery of quality care and patient outcomes. The identified MEWS practice gap in recognizing, responding to, and communicating about deteriorating maternal clinical conditions warranted education to improve nurses' critical thinking, clinical judgment, and decision-making skills at the practicum site. The planned project was guided by the four levels of Kirkpatrick's model, with the desired outcome of enhancing and optimizing professional competencies and delivering the ROE of improved maternal outcomes at the practicum site after the practice change was accepted and sustained at the clinical site. The background and context of the MEWS education program, the theoretical framework, the

relevance of the project to nursing practice, and my role as the DNP student in this project will be discussed in the next section.

Section 2: Background and Context

Introduction

The application of MEWS at the practicum site is not consistent in caring for maternal patients admitted to the hospital with preexisting cardiovascular conditions, hypertensive disorders of pregnancy, or sepsis. This situation is compounded by the nurses' knowledge gap concerning MEWS. Both create significant issues with nursing compliance in activating the MEWS requirements. In obstetrics, maternal mortality rates are now a priority focus, with an urgent call for action directed to health care organizations to intervene and prevent casualty from the leading causes of maternal mortality in the United States (ACOG, 2020; Bellazaire & Skinner, 2019; Kaiser Family Foundation, 2020; New York State Legislature, 2019; Smith et al., 2021).

The call to action includes changes in the philosophy and practices of health care organizations to optimize leadership support of nursing education and decision-making on MEWS triggers at the bedside (Friedman et al., 2018; Gosiewski et al., 2017; HHS, 2020). When compared to other quality improvement initiatives in obstetrics, such as giving antihypertensive medications to patients with hypertensive disorders in a timely manner and preventing venous thromboembolism, MEWS is more a complex issue needing the involvement and support of leadership and all stakeholders (Friedman et al., 2018). Thus, the purpose of this project was to educate obstetric nurses in the appropriate application of the MEWS in practice, the actions for early recognition, and responses for deteriorating maternal clinical conditions. The guiding question was the following: Will

Maternal-Early-Warning-System education improve registered nurses' knowledge of and appropriate responses to triggers over a 2-week period?

Leaders of health care organizations are being implored to provide MEWS education to their nursing staff to improve nursing proficiency in recognizing and responding to deteriorating maternal conditions. The MEWS education program at the practicum site conformed to the rigors of Walden University's Doctor of Nursing Practice Staff Education Manual (2020) and was guided by the four levels of Kirkpatrick's model for evaluating the effectiveness of education programs (Kirkpatrick & Kirkpatrick et al., 2016). In this section, I address the support for the project by drawing on concepts, models, and theories for assessing adult education, considering the project's relevance to nursing practice, providing the context and background of the practice site, and defining my role as a DNP student in this project.

Concepts, Models, and Theories

The four levels of Kirkpatrick's model served as the theoretical framework to guide the program. According to Kirkpatrick and Kirkpatrick (2016), the four levels of training evaluations are reaction, learning, behavior, and results. According to Kirkpatrick's model, the planning of the program evaluation should be done in reverse, beginning with identification of the desired results or outcomes. In this project, enhanced professional competencies, early recognition, and response to deteriorating maternal condition in a timely manner as well as communication among interprofessional and intraprofessional care providers were the desired outcomes.

Concepts

Reaction

This is the concept whereby the nurses find the education appealing, advantageous, and significant to practice. Are they satisfied with the education they received? According to Kirkpatrick and Kirkpatrick (2016), reaction indicates the participants' experience and is key to data collection about the program.

Learning

This is the extent to which nurses gain knowledge, develop confidence, enhance attitudes, grow skills, and increase commitment, which is centered on the level of participation in the program (Kirkpatrick & Kirkpatrick et al., 2016).

Behavior

This is where the nurses apply what they have learned in the education program to practice. Kirkpatrick & Kirkpatrick (2016) argued that the key to this level is to strengthen, encourage, monitor, and reward participants for those vital performance behaviors that indicate improvement in practice. The authors discussed drivers for satisfied performance, which include coaching, work review, and giving rewards for improvement in practice (Kirkpatrick & Kirkpatrick, 2016).

Results

The results reflect the extent to which the targeted outcomes are realized because of the education program. Kirkpatrick and Kirkpatrick (2016) argued that the desired results are accomplished through the limitless endeavors of interprofessional and intraprofessional stakeholders. The results or outcomes from the education program positively reflected the strategic planning that was done, and the leading indicators demonstrated the bridging of the knowledge gap that existed among the obstetric nurses at the practicum site.

Theories

Kirkpatrick's model (see Figure 4) is a framework often used internationally to evaluate training both formally and informally; thus, it was the ideal logic model to evaluate the education program at the practicum site. The foundational principles of Kirkpatrick's model (Kirkpatrick & Kirkpatrick, 2016, p. 33) are as follows:

1. The end is the beginning.
2. ROE is the ultimate indicator of value.
3. Business partnership is necessary to bring about positive ROE.
4. Values must be created before they can be demonstrated.
5. A compelling chain of evidence demonstrates your bottom-line value.

The principles of Kirkpatrick's model have been used to evaluate many education and training programs in nursing (Bijani et al., 2018; Huang et al., 2021; Jones et al., 2018; Shinners & DeSilets, 2018) and were used as the framework to evaluate the effectiveness and outcomes of the obstetrics nursing education program on MEWS. It is

imperative that obstetric nurses are educated to improve their knowledge of the MEWS application, enabling them to recognize and respond in a timely manner to changes in maternal clinical conditions (Kirkpatrick & Kirkpatrick, 2016). According to the principles of Kirkpatrick's model, program planners should begin at the end and plan to satisfy the desired outcomes and establish what behavior changes they would like to see in the target participants that define the skills, knowledge, and mindset of the participants (Kirkpatrick & Kirkpatrick, 2016). The authors suggested that evaluators should begin an education or training program with participants not only addressing what they need to know, but also doing so in a way whereby the participants will react favorably to the program (Kirkpatrick & Kirkpatrick, 2016).

The ROE from stakeholders is the key determining factor when advocating for a change in nursing practice; thus, training and education are not enough to translate the evidence to practice, and a change in behaviors is necessary. Kirkpatrick & Kirkpatrick, (2016) postulated that changes in professional behaviors and ensuing results can only be accomplished by adhering to the rigors of a planned program; it is only then that the fifth principle, the value of early recognition and response to deteriorating maternal conditions, can be realized. Kirkpatrick's model has been widely used in health care to measure how effective nursing education and training have been in improving the attitudes, skills, and knowledge of nurses (Bijani et al., 2018; Cullinane et al., 2020; Heydari et al., 2019; Jones et al., 2018; Maddineshat et al., 2018). It was expected that the theoretical concepts of reaction, learning, behaviors, and results of Kirkpatrick's model, measured by administering a pretest, immediate posttest, and a 2-week posttest of

the MEWS education to obstetric nurses, demonstrated the value of the program in translating evidence to practice in the obstetric setting at the practicum site.

Relevance to Nursing Practice

The nursing education that was planned for this project showed the relevance of improving nursing professional competencies because it is a fundamental right of patients to receive the care providers are ethically required to deliver in the health care setting. Patients depend on their care providers to be knowledgeable about their diagnosis, care, and best practice guidelines, requires the nurse, who is a constant at the bedside, to be current and proficient in practice. *The Guide to the Code of Ethics for Nurses* from the ANA (2015) indicates that nurses are advocates for their patients, are professionally responsible for patient safety, and should protect the health and safety of patients by improving practices that are open to discussion. Provision 4 in *The Guide to the Code of Ethics for Nurses* stipulates that the nurse is accountable and responsible for the care of patients, and for nursing judgment, decisions, and actions (ANA, 2015). Recognizing and responding to MEWS trigger alarms are ethical issues for nurses guided in practice by the *Code of Ethics* to apply professional standards and responsibilities in advocating for patient care and safety.

Beneficence is another ethical principle applied in nursing practice that is the principle of "do no harm" (Beauchamp & Childress, 2021). Harm can be done in nursing practice in situations where there is a knowledge deficit in care providers. Care providers are obligated in their role to rescue their patients, and furthermore, nurses are required to be committed to the health, welfare, and safety of their patients in any circumstances

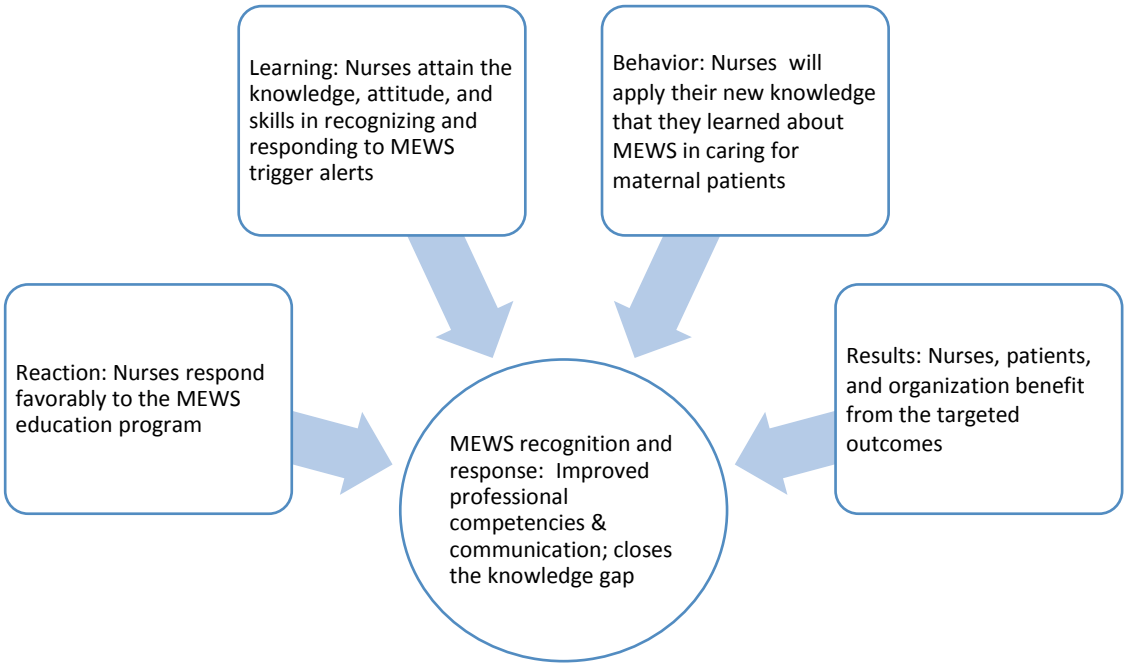
(ANA, 2015; Beauchamp & Childress, 2021). Chakhtoura et al. (2019) argued that the core principle in preventing harm to maternal patients is to use tangible interventions to avoid adverse events and maternal outcomes. Rescuing a maternal patient with a preventable event whose deteriorating clinical condition warrants immediate bedside assessment and evaluation when a MEWS trigger alarm is displayed is the duty of the nurse who is continually at the bedside (Gillespie et al., 2021). The preventable causes of hemorrhage, hypertensive disorders of pregnancy, cardiovascular conditions, and sepsis that contribute to maternal mortality have led to an increased awareness of the need for nursing education on the use of the MEWS tool to improve professional competency that conforms to ethical considerations at the practicum site (ANA, 2015; Friedman et al., 2018; Umar et al., 2020). The knowledge gap existing among nurses also contributes to variations in practice at the practicum site.

Even though there is an increased recognition of obstetrics safety initiatives, maternal mortality rates have increased exponentially in the United States (Zuckerwise & Lipkind, 2017). The ACOG (2019) committee on patient safety and quality improvement disseminated a policy document, *Clinical Guidelines and Standardization of Practice to Improve Outcomes* (p. e122), to obstetric-care providers and mentioned that there should be no difference in provider practices. Variations in practice posed an enormous problem in the delivery of patient care and the performance of critical tasks, such as recognition and response to changes in maternal clinical conditions; this should be the basis for quality improvement in the delivery of care to maternal patients. Obstetric leadership at the practicum site envisioned a change in nursing practice and professional competency

in recognizing and responding to MEWS trigger alarms as critical outcome measures in maternal care (see Figure 5).

Figure 5

Behavioral Path to Professional Competency



Local Background and Context

This education project for obstetric nurses was conducted at a 500-bed acute care metropolitan teaching hospital in the Northeast region of the United States with a labor and delivery unit, an antepartum unit, mother and baby units, and a Level 2 neonatal intensive care unit. Obstetrics certifications were not required but encouraged for nurses at the site.

Nurses at the facility were inconsistent in their care of maternal patients, rarely applying their critical thinking skills and clinical judgment for bedside assessment or in recognizing or responding to deteriorating maternal clinical conditions in a timely manner. An informal needs assessment conducted in obstetrics at the practicum site with

a chart review of nursing responses to changes in maternal clinical conditions showed varying response times and oral interactions while interviews with the nursing staff revealed inaccuracies in the nurses' knowledge of the MEWS algorithm and its application in caring for maternal patients. In the context of the inconsistencies in practice and the knowledge deficit among the obstetrics nursing staff, the education program on MEWS will endeavor to improve professional competencies in recognizing and responding to changes in maternal clinical conditions.

Role of the DNP Student

I identified a significant issue at the practice site and resolved to provide evidence-based education and intervention to the obstetrics nursing staff. The DNP student is a certified inpatient obstetrics nurse with a vested interest in lowering the increased incidence of maternal mortality in the United States and have in the past attended research seminars at the practicum site.

As I reviewed the underpinnings of *The Essentials of Doctoral Education* (AACN, 2006) and read journals from literature searches, my commitment to be an effective change agent increased considerably. As a change agent, I am motivated and committed to be a contributor to the improvement of professional competencies and practice at the bedside and lower maternal mortality rates within communities of color. Standards I, II, III, IV, VII, and VIII of the *Essentials of Doctoral Education* were used in the nursing education program (AACN, 2006). The AACN *Essentials of Doctoral Education* Standard II was aligned with the quality improvement initiative being facilitated by me in speaking to "organizational and systems leadership for quality

improvement and systems thinking" (AACN, 2006). Quality improvement is a competency inherent in my practice as a leader and advanced practice nurse seeking to intentionally change or improve the care delivered to my patients.

My role as the DNP student is to be a leader and change agent for quality improvement in practice. When planning and implementing changes in practice, I intend to utilize all available resources including, but not limited to, informatics and electronic media, to strategically plan for positive outcomes. This initiative on MEWS education requires members of the nursing staff and leadership to be onboard. As discussed earlier, the MEWS application is widely used in health care organizations to identify and respond to changes in maternal clinical conditions in a timely manner to avert negative outcomes and prevent maternal mortality. In my facilitating the project, the environment was scanned for any existing resistors among the nursing staff who theorized an increase in workload in the use of MEWS triggers when monitoring obstetrics patients.

As an advanced practice nurse, leader, and change agent, I facilitated the evidence-based approach to system changes, requiring necessary actions to change the mindset of nurses who were resisting. White et al. (2021) recommended that organizational system change be done in phases, with all personnel being involved in discussions for change. The planned change for the obstetric nurses was the education on MEWS to improve nursing professional competencies to detect and provide a rapid response to deteriorating clinical conditions in the vital signs, altered mental status, oxygen saturation, and urinary output of a maternal patient (see Figure 2; Tables 3 & 4).

Table 2

Maternal-Early-Warning-System Tool: Normal Parameters

Systolic blood pressure: mm/Hg	< 90 or > 160
Diastolic blood pressure: mm/Hg	> 100
Heart rate: beats per minute	< 50 or > 120
Respiratory rate: breaths per minute	< 10 or > 30
Oxygen saturation: % on room air	< 95
Oliguria: mL/hour for 2 ≥ hour	< 35

Note. From "Implementing Obstetric Early Warning Systems," by A. M. Friedman, M. L. Campbell, C. R. Kline, S. Wiesner, M. E. D'Alton, and L. E. Shields, 2018, *American Journal of Perinatology Reports, 8*, p. e80. Copyright 2018 by Thieme Medical Publishers, Inc.

Table 3

Maternal Early Warning Triggers: Yellow and Red Warning Parameters

"Yellow" triggers	
Systolic blood pressure: mmHg	< 80 or > 156–160
Diastolic blood pressure: mmHg	< 45 or > 106–110
Heart rate: beats per minute	< 50 or > 111–130
Respiratory rate: breaths per minute	< 12 or > 25–30
Temperature, degrees centigrade	≤ 36
Oxygen saturation: % on room air	90–93
Altered mental status	
"Red" triggers	
Nursing clinically uncomfortable with patient status	
Temperature, degrees centigrade	≥ 38
Respiratory rate: breaths per minute	> 30
Oxygen saturation: % on room air	< 90%
Heart rate: beats per minute	> 130
Systolic blood pressure: mmHg	> 160
Diastolic blood pressure: mmHg	> 110
Mean arterial pressure: mmHg	< 55

Note. A single red trigger or two yellow triggers requires evaluation by the provider. Abnormal vital signs must be sustained over at least 20 minutes to be considered triggers. From "Implementing Obstetric Early Warning Systems," by A. M. Friedman, M. L. Campbell, C. R. Kline, S. Wiesner, M. E. D'Alton, and L. E. Shields, 2018, *American Journal of Perinatology Reports, 8*, p. e80. Copyright 2018 by Thieme Medical Publishers, Inc.

The DNP student developed and facilitated the strategic education program, guided by Kirkpatrick's model as the theoretical framework, and the use of a PowerPoint presentation to review the MEWS criteria and trigger tools (see Tables 2, 3, and 4). The knowledge assessment pretest was completed by the nurses prior to the education. An immediate knowledge posttest was done following the education intervention, and a later a 2-week follow-up posttest (see Appendices A, B, and C) to evaluate nursing reaction, learning, behaviors, and knowledge attainment and retention to complete the project evaluation. There was no bias that negatively impacted the education and training program because the intervention was guided by the Kirkpatrick's model which is a training and evaluation framework that is used in other nursing education programs (Jones, et al., 2018; Shinners, et al., 2018).

The DNP student have been a certified labor and delivery bedside nurse and nurse educator for over 35 years who have seen a deterioration in the level of care given to pregnant women. The changes in the delivery of care are validated by researchers who compared the care delivery of the past to the present that have led to a documented increase in maternal mortality rates in the United States (Lima, et al., 2017; Lukebche, et al., 2022; Petersen, et al., 2019; & Simpson, 2019). This profound change in maternal mortality rates have been amplified during the last two years of the COVID-19 pandemic. Hence, the heightened concern of the DNP student is about the level of nursing care being delivered to the most vulnerable members of the community. A nursing knowledge gap exists in obstetrics on the MEWS trigger alerts and how to recognize and respond to those alerts and changes in maternal clinical conditions.

The motivating factors in leading the charge related to this health care issue are to bridge the knowledge gap on the MEWS trigger tool, improve nursing professional competencies, and empower obstetrics nurses to recognize, respond, and communicate changes in maternal clinical conditions. This increased knowledge of MEWS use will lead to social change at the bedside among interprofessional personnel and improve maternal outcomes at the practicum site. There are no biases from the standpoint of the DNP student, as no monetary compensation or rewards will be received for the education intervention aimed at obstetrics nurses at the practicum site.

Summary

The inherent commitment to pursue clinical excellence, quality improvement, and the delivery of quality health care in the obstetric population are hallmarks of the DNP nurse who is the change agent and leader in practice. As leaders and change agents, the DNP nurse identified the quality improvement needs in practice and strategically planned for change. Identification of a nursing knowledge gap in the obstetrics setting warrants immediate intervention and the planned education program was intended to empower nurses to be more confident of their critical thinking skills, clinical judgment, and ethical duties and responsibilities when caring for maternal patients. The improvement plan for the obstetrics nurses on recognizing and responding to MEWS alerts was guided by the framework, Kirkpatrick's four levels of training evaluation.

The decision to influence change is an essential attribute of doctoral nurses. The AACN (2006) advocates that DNP nurses should be engaged in influencing the reduction of undesirable outcomes in practice. It was postulated that the education program for the

obstetrics nurses positively influenced the nurses' recognition and early response to changes in maternal clinical condition in the organization, thereby satisfying the call to action for organizational and intraprofessional engagement at the micro level in lowering the maternal mortality rates that have increased significantly over the last five years in the United States (Bellazaire & Skinner, 2019).

Section 3: Collection and Analysis of Evidence

Introduction

The education intervention program was strategically planned to meet the needs of the obstetrics nurses in a metropolitan teaching hospital in the Northeast region of the United States. The identified knowledge gap on applying MEWS results in delayed recognition and response to changes in maternal clinical condition and then results in failure to communicate those changes, thus making it necessary to plan and execute an education program for all obstetric nurses at the site. Through the MEWS education program, I sought to improve professional competencies, empower the nurses to voice concerns and communicate about patient conditions, and optimize the delivery of quality care to obstetrics patients (Gillespie et al., 2021; Shields et al., 2016). It is the intent to change practice at the organizational level by translating the evidence-based MEWS application in terms of recognizing and responding in a timely manner to changes in maternal clinical conditions to improve maternal outcomes, thus contributing to lowering maternal mortality rates at the organizational level.

The theoretical framework for the education program for 40 nurses was Kirkpatrick's four levels of training and evaluation, where a pretest, an immediate posttest, and a 2-week follow-up posttest were administered to determine the effectiveness of the education program. The Likert scale with criteria *highly confident*, *confident*, *somewhat confident*, *fairly confident*, and *not confident* were categorized into two categories: high confidence and low confidence. High confidence incorporates the Likert criteria for *highly confident*, and low confidence incorporates the criteria for

somewhat confident, *fairly confident*, and *not confident*. Chi-squared test analysis was used to compare the two categories for acquisition and retention of knowledge by the obstetrics nurses to fulfill their roles as proficient care providers.

The purpose of this project is to close the knowledge gap on MEWS triggers through the education of obstetric nurses in the appropriate application of the MEWS in practice, the actions for early recognition, and responses to deteriorating maternal clinical conditions to improve maternal outcomes. In developing this project, I sought to answer the following question: Will Maternal-Early-Warning-System education improve registered nurses' knowledge of and appropriate responses to triggers over a 2-week period? In this section, I address the project methodology in relation to data sources, population, sample, data collection, and analysis and synthesis of the findings.

Practice-Focused Question

The practice-focused question was developed to determine whether an education program on MEWS application is effective in changing nursing practice, improving professional competencies, and increasing nursing communication to request a bedside assessment for changes in maternal clinical parameters, thus enhancing delivery of care to obstetric patients. Organizational data show that the MEWS application for obstetrics patients has not been used appropriately, and parameters have not been recognized in a timely manner by nurses at the practicum site, an acute-care hospital in a metropolitan city of New York consisting of a 12-room labor and delivery unit, a postpartum recovery suite, a six-bed triage cubicle, a 32-bed mother/baby unit, a 25-bed high-risk antepartum unit, and a Level 2 neonatal intensive care unit. The knowledge deficit and practice gap

in the correct use of MEWS required a nursing-competency educational intervention to avert the incidence of a nurse's failure to rescue.

The question that guided this project was the following: Will Maternal-Early-Warning-System education improve registered nurses' knowledge of system use and appropriate responses to triggers over a 2-week period?

The quantitative approach to answering the research question was an appropriate fit that aligned with the use of Kirkpatrick's model to evaluate the effectiveness of the education program. According to Kirkpatrick and Kirkpatrick (2016), the model is used to evaluate education and training with the use of questionnaires that measure the reaction, learning, and behaviors of participants to evaluate the effectiveness of an education or training program.

Sources of Evidence

Sources of evidence were obtained from an informal needs assessment of the obstetrics nurses at the organization and knowledge of the operational aspects of the MEWS algorithm requirements. A random 3-month chart review of vital signs documentation revealed missed opportunities to intervene in a timely manner and indicated a lack of critical thinking and clinical judgment skills in caring for obstetric patients. Even though the MEWS algorithm is being used internationally with acceptable outcomes, its sporadic use in the United States has led to failures in maternal settings, which have contributed to an increase in maternal mortality rates (Stanton et al., 2018; Umar et al., 2020). The purpose of the MEWS education program is to improve critical thinking and clinical judgment skills to enhance the application thereof for early

recognition and timely response to the deterioration or changes in maternal clinical conditions. To satisfy the intent of the intervention, a pretest to substantiate the knowledge gap was administered to 40 obstetrics nurses in the clinical area, followed by a PowerPoint presentation, an immediate posttest, and a 2-week follow-up posttest to measure the effectiveness of the MEWS education to the target population of obstetrics nurses.

A literature search of CINHAL, Cochrane Database Review, Medline, PubMed, EBSCO, Google Scholar, and ProQuest with Boolean language for terms such as *prevention of maternal deaths, nursing professional competency, nursing critical thinking, clinical judgment in nursing, MEWS education and application in nursing, recognition and response to changes in maternal clinical condition*, and *Kirkpatrick's model and nurse training* was performed. The level of evidence from the literature search revealed several Level IV and V peer-reviewed journal articles, which were case studies and qualitative studies; there were several Level I systematic reviews from Cochrane Database Review and other studies from independent peer-reviewed databases such as the Public Library of Science (PLoS ONE). Several peer-reviewed articles on the prevention of maternal deaths, the application of MEWS in obstetrics settings, the application of MEWS in the clinical setting, nursing professional competency, MEWS recognition and response, and the application of Kirkpatrick's model in the evaluation of nursing education and training were acquired. The literature on these search concepts will be discussed.

Prevention of Maternal Deaths

Maternal death is used interchangeably with *maternal mortality*. According to the CDC (2020) and Hoyert (2022), maternal mortality rates have increased exponentially over the past 5 years (see Figure 1) despite health care policies introduced to reduce the trend. The worrisome trend in maternal mortality has increased awareness of measures needed to improve the quality of care given at the bedside. ACOG (2020) created and disseminated clinical guidelines for the care of maternal patients. However, ACOG reported that many of these guidelines are not consistently used in practice and emphasized the need to optimize the readiness of care providers in hospitals and emergency rooms across the nation, especially in the care given to non-Hispanic Black and American Indian/Alaska Native women who are at risk of dying from preventable causes of pregnancy-related deaths. The call for readiness necessitates an interdisciplinary approach to raise consciousness for the education of care providers in using the internationally approved MEWS tool to avert further maternal deaths (Collier et al., 2019; Gillespie et al., 2021; Shields et al., 2016; Stanton et al., 2018; Umar et al., 2019). The education on MEWS recognition and response to changes in maternal condition for obstetrics nurses is a part of the readiness approach to lower the incidence of adverse maternal outcomes at the micro level.

Critical thinking and clinical judgment are inherent in the care of maternity patients and are key concepts in patient safety measures in preventing maternal deaths. The deficiencies and knowledge gap that exist in obstetrics nursing at the practicum site are a hindrance to patient safety. Collie et al. (2020) postulated that health care

organizations should realize safety measures with education and training for nurses in recognizing and responding to early signs of changes in maternal clinical conditions. The authors mentioned that standardization of maternal care is of the utmost importance to prevent adverse events, and critical thinking and clinical judgment are needed in the provision and use of bundles such as MEWS trigger tools (Collier et al., 2020).

It is the expectation that nurses, who are point-of-care clinicians and a constant at the bedside, be competent to critically exercise their clinical judgment when caring for maternal patients and intervene in a timely manner to any changes in the patient's clinical condition. The education program for the nurses on the MEWS algorithm enabled and empowered the nurses in the organization to recognize and respond appropriately to alerts in changes to the vital signs of patients, decreasing urinary output, altered mental status, an elevated temperature, or any worrisome changes. ACOG (2022), Friedman et al. (2018), and Gillespie et al. (2021) stipulated that educating nurses and care providers is of paramount importance in improving maternal outcomes in hospital settings, and that education correlates with the empowering of nurses to use critical thinking and clinical judgment in their bedside assessment. Smith et al. (2021) stated that recognizing and responding to deteriorating maternal clinical condition is a challenge for nurses, and the use of track and trigger assessment tools such as MEWS is valuable in alerting nurses to those changes. However, early interventions are delayed, thereby increasing maternal morbidity and mortality (Smith et al., 2022). The MEWS education program for the obstetrics nurses will bring changes to enhance early intervention in maternal care at the organization.

Qualls et al. (2022) postulated that bedside assessment for the track and trigger MEWS tool, which is intended to cause an immediate response by nurses, was not being accurately recorded and thus rendered a minimal response to MEWS. The authors mentioned that incomplete documentation led to delayed recognition and response for a bedside assessment (Qualls et al., 2022). Hoppu et al. (2022) validated the nursing response as an inherent problem contributing to an increased incidence of maternal morbidity. Hoppu et al. argued that maternal hemorrhage, cardiopulmonary dysfunction, and preeclampsia patient had the highest incidence of response errors by nurses resulting in deterioration of maternal clinical conditions (Hoppu et al., 2022).

Nathan et al. (2018), in a Level 2 randomized trial, stipulated that high blood pressures, shock from hemorrhage, and sepsis were not detected in a timely manner at the bedside. The authors mentioned that accuracy of blood pressure measurement and monitoring of changes in maternal patients' clinical conditions were inadequate at best, warranting changes in observation and effective interventions by care providers (Nathan et al., 2018). Luebcke et al. (2022) reiterated that maternal admissions to the intensive care unit were increased because of the inability of bedside care providers to monitor, recognize, and respond to changes in the clinical conditions of patients throughout their pregnancies or on an obstetric unit. It is therefore imperative that improving nursing professional competencies be expedited at the organizational level.

Nursing Professional Competency

The translation of evidence into practice is the hallmark of nursing professional competency and is warranted at the practice site. Deficiencies in nursing actions and

knowledge gaps in responding to MEWS alerts at the practicum site are worrisome and are thus the focus of the change process. Nurses are bound by the ANA Code of Ethics to be safe practitioners, competent in their work, and advocates for their patients (ANA, 2015). The ANA (2015) argued that nurses should seek to improve their knowledge of the clinical condition of patients in their care to improve quality outcomes. Optimizing nursing competencies has also been addressed by the Association of Women's Health, Obstetrics, and Neonatal Nurses (AWHONN, 2020) in a practice bulletin aimed at lowering maternal mortality rates in the United States. AWHONN (2020) reiterated that nursing education on the MEWS trigger tool is required to improve the delivery of care to maternal patients and thus reduce maternal mortality rates. Augustino et al. (2020) postulated that implementing evidence-based practice is challenging, and every effort should be made to work through and overcome challenges to the program strategically planned for professional improvement. Henriquez et al. (2018) postulated that early recognition of and response to preventable causes of maternal mortality such as hemorrhage can be realized with education on clinical tools such as MEWS, which will contribute to improved professional competencies among nurses and interprofessional care providers.

Methodology

The methodology for the pre-experimental design involved a self-administered questionnaire survey delivered via Qualtrics, an electronic medium that could be easily accessed by the obstetrics nurses, followed by a PowerPoint presentation on MEWS. The intent of the education was to close the knowledge gap and enhance nursing professional

competencies in the recognition and response to MEWS triggers. According to Polit and Beck (2022), a self-administered questionnaire survey is a simple means of collecting data on behaviors and feelings, in this case, those of the obstetrics nurses in a pretest, immediate posttest, and 2-week follow-up posttest to evaluate the effectiveness of the education program. The questionnaires were grounded in the principles of Kirkpatrick's four levels of training evaluation by looking at the participants' reactions, learning, behaviors, and results to evaluate the effectiveness of the education program. The reasons for the education program were discussed with the participants. The inherent reasons for the program were the identified knowledge gap with an inability to recognize whether a patient needs help, delayed response to changes in maternal clinical conditions, the need to improve nursing professional competencies, and the fact that maternal mortality rates have increased exponentially in the United States.

Population and Sample

The population consisted of obstetrics nurses in an acute-care health care facility in a major metropolitan area in the Northeast, with a representative sample of 40 nurses. The nurses were recruited with flyers, lunch-and-learn activities, and direct communication and interaction.

Data Collection and Intervention

The evidence-based practice education was intended to bridge the knowledge gap and communication errors among obstetrics nurses that were documented by chart reviews and informal face-to-face meetings at the site of the health care organization. The MEWS education program was a pre-experimental design specifically targeting 40

obstetrics nurses in the organization. A pilot test was administered to a representative sample of five obstetrics colleagues prior to the start of the program. The purpose of the pilot test was to discover any misconceptions, unanticipated replies, or areas needing clarification, and to assess feasibility or factors that might mar the intervention (Kirkpatrick & Kirkpatrick 2016; Polit & Beck, 2022). The program was delivered via PowerPoint presentations with a prior pretest on MEWS application, response to an emergency, communication time, and intervention attitudes. An immediate posttest was administered after the presentation, with a 2-week follow-up posttest to evaluate learning outcomes, knowledge retention, and change in behaviors. The data collection was guided by Kirkpatrick's model (see Appendices A, B, C). The integrity of the data collected on the pretest, immediate posttest, and 2-week follow-up posttest were protected by Qualtrics, a proven data collection product.

Analysis and Synthesis

The pretest was compared to the immediate and 2-week posttest Likert scale data collection, which was summarized into two categories, high confidence and low confidence, and analyzed with chi-squared test in OpenEpi.com to ascertain the impact of the intervention and effectiveness of the MEWS education for the obstetrics nurses. OpenEpi.com is analytic software that is widely used in the health science, social science, and epidemiology fields. The data collection from the pretest, immediate posttest, and the 2-week follow-up posttest from Qualtrics was entered into OpenEpi.com by the DNP student. OpenEpi.com is an open-source web-based epidemiology statistics site that is widely used in health care and nursing research (Ghawadra et al., 2019; Long et al., 2016;

Predic & Neilson, 2017). The site was easy to navigate, and precise analytic information was obtained.

The project implementation was done on the days and night shifts and brought a sense of enthusiastic among the obstetrics nurses, as evidenced by their engagement in the MEWS education program, however, most of those nurses were new nurses with one to four years of nursing experience. All 40 participants readily accepted their role as change agents and advocates for change in practice at the bedside.

Ethical Considerations

The registered nurse participants completed the education on MEWS. All participants voluntarily completed the anonymous electronic pretest, posttests, and 2-weeks follow-up posttest via Qualtrics. There were no identifying markers of the participants. The return of the completed pretest, posttests, and 2-week posttest follow-up were considered consent to use the data in the aggregated report of findings. The DNP project followed the guidelines from the Walden University's Manual for Staff Education, and with approval from the Walden University Institutional Review Board (IRB).

Summary

The basis for the education program is the knowledge deficit and communication errors exposed among obstetrics nurses in the health care organization. The implicit deficiencies in professional competency with subsequent negative outcomes for the maternal population in the organization have contributed to the wider problem of an increased maternal mortality rate in the United States. The education program on MEWS

for the obstetrics nurses will improve professional competency and interprofessional communications by enhancing early recognition and timely responses to changes in maternal clinical conditions. The DNP proposed intervention is inherent in the translation of evidence to practice, as guided by the AACN DNP Essentials (2006), which will lead to quality improvement in the delivery of care by obstetrics nurses. The education program for the 40 nurses will be guided by the theoretical framework of the Kirkpatrick model with the four levels of evaluation: reaction, learning, behaviors, and results.

The education program is a pre-experimental design, delivered by a PowerPoint presentation with a pretest, an immediate posttest, and a 2-week follow-up posttest. A pilot test was administered to a subset of the obstetrics nurses to identify any misunderstandings, and to gain insights into whether any revisions in the pretests or posttests are needed prior to the intervention (Kirkpatrick & Kirkpatrick, 2016; Polit & Beck, 2022). The Chi-Squared Test analysis of the results was done in OpenEpi.com to evaluate the effectiveness of the education program in changing behaviors to apply the MEWS trigger tool in maternal care at the organization. Section 4 will present the results of the data analysis, recommendations, limitations, implications for DNP leadership, and considerations for future MEWS education in other health care organizations.

Section 4: Findings and Recommendations

Introduction

This section is a presentation of the findings and recommendations of the MEWS trigger tool education for obstetrics nurses at the practicum site. IRB approval for anonymous questionnaires was obtained from Walden University, though the organization does not require internal IRB approval for staff education. The implementation of the education program was done over a period of 3 days with both day and night-shift nurses. A pretest with six responses that identified familiarity and knowledge of the MEWS triggers algorithm (see Appendix A) was administered prior to the implementation of the MEWS education intervention. The immediate posttest with six responses (see Appendix B) and a 2-week follow-up posttest with a six-response questionnaire (see Appendix C) were administered to the 40 obstetrics nurses who attended the various education sessions at the practicum site.

The purpose of the MEWS education was to bridge the knowledge and practice gaps that existed among the obstetrics nurses in their recognition and timely response to changes in maternal clinical conditions. The perceived professional inefficiencies were obtained from chart reviews and short interviews of nurses on the units. The practice-focused question was the following: Will Maternal-Early-Warning-System education improve registered nurses' knowledge of and appropriate responses to triggers over a 2-week period?

The sources of evidence for the MEWS education project were obtained from chart reviews and interviews with the obstetrics nurses, a literature search on MEWS

triggers, and the recognition and response time of obstetrics nurses to the bedside of a patient when her clinical conditions were deteriorating. The literature search was done with the use of Boolean language to identify research articles on MEWS triggers, obstetrics nurses' professional competencies, and knowledge and practice gaps on MEWS at the bedside. Friedman and colleagues (2018) argued that educating nurses can make a difference in the lives of maternal patients who are in their care by nurses adhering to the principles and guidelines that may be obtained in organizational policies. Chi-squared test was used to obtain a comparative analysis of the data collected from the pretest, immediate posttest, and 2-week posttest.

The education intervention was given via a PowerPoint presentation that included statistics on maternal mortality rates by ethnicity (see Figure 2), MEWS vital signs parameters (see Table 2), and the MEWS algorithm that outlines response criteria for when MEWS triggers should elicit an appropriate response from nurses (see Figure 3). Data were analyzed using OpenEpi.com to conduct chi-squared tests and reflected the objectives of the education intervention. Kirkpatrick's four levels of training evaluation was the framework that was used to evaluate the effectiveness of the MEWS triggers tool education intervention. The results and implications of the education program are identified in this section.

Findings and Implications

The sample of 40 experienced nurses with between 1-20 years of service from the population of obstetrics nurses, participated in the 30-minute MEWS education program. Years of nursing experience had no significance in the results of the statistical analysis.

Implementation of the education was done during obstetrics safety meetings, small groups, shift huddles, and one-to-one encounters when there was a shortage of nursing staff and increased activities in the labor room, postpartum, and high-risk units. The data collection tools asked for years of nursing experience and response criteria of *highly confident, confident, somewhat confident, fairly confident,* or *not confident*. The data collection by pretest, immediate posttest, and 2-week follow-up posttest reflected the reaction, learning, behavior, and result aspects of Kirkpatrick's four levels of training evaluation. The reaction and learning criteria in the pretest and immediate posttest were summative evaluations on attitudes, participation, knowledge, and skills acquisition before and after the education intervention. The 2-week follow-up posttest evaluated the response criteria with a 6-item questionnaire that reflected knowledge acquisition, professional competencies, and performance improvement of the obstetrics nurses over a 2-week timeframe.

Procedures

The education program on MEWS triggers for the obstetrics nurses was primarily done via a PowerPoint presentation, with poster boards and individual handouts containing key information such as the vital signs parameters (see Tables 2 & 3), the MEWS trigger algorithm (see Figure 3), and journal articles on maternal nurses' response to MEWS triggers. The 40 obstetrics nurses who participated in the education program were given a pretest to explore their knowledge of MEWS (see Appendix A), followed by an immediate posttest (see Appendix B) to gauge the nurses' reaction to and learning from the education on the MEWS algorithm (see Figure 3) and the "Yellow" and "Red"

zones maternal clinical condition parameters (see Tables 2 & 3). A 2-week posttest was done as a self-reflection on knowledge attainment and retention, change in practice behaviors, and attitudes towards recognition and appropriate responses to MEWS triggers at the bedside (see Appendix C). The pretest, immediate posttest, and 2-week posttests were compared and analyzed, and learning scores were obtained to evaluate knowledge attainment, skills acquisition, changes in the nurses' attitudes in recognizing the early signs of deteriorating maternal conditions with timely response, and improvement in nurses' professional competencies to MEWS triggers.

Results

Participants' years of experience ranged from 1 to more than 20, but 87.5% had between 1 and 8 years of experience; nurses' experiences had no bearing on the MEWS education and were not used in the analysis. However, the nurses' years of experience was an unexpected finding, and it is recommended that this information be used for further study on the association between nurses' experience, maintaining MEWS knowledge, and practice and professional competencies. For each of the six questions, participants could answer using the 5-point Likert-type scale ranging from *highly confident* to *no confidence*, with responses collapsed into two categories, high confidence and low confidence, for chi-squared analysis. Comparisons were made between the pretest and immediate posttest to assess changes due to the educational intervention.

In a second analysis, I examined retention by comparing the posttest to the 2-week follow-up. Significant changes were determined using a one-sided test at the 0.05 level as the educational intervention was expected to increase confidence in the nurses.

Comparing the pretest to the posttest, I found statistically significant changes in three of the items: “I am familiar with the maternal early warning system (MEWS) algorithm (Q1),” “I was trained in the application of the MEWS algorithm (Q2),” and “I do not have the necessary knowledge and skills to apply the MEWS algorithm at the bedside (Q6).” There was no significant change from pretest to posttest for “I always contact the care provider for any changes in a patient’s condition (Q3),” “I am comfortable discussing the patient’s condition with the primary care provider (Q4),” and “I am eager to hear about the maternal early warning system (MEWS; Q5).” Additionally, there was no significant change between the immediate posttest and the 2-week follow-up, indicating that nurses remained confident in their understanding of the new information.

The comparative scores were calculated to obtain the mean and standard deviations of the immediate posttest and 2-week follow-up posttest. The post learning scores for the nurses were calculated from the number of question responses for the immediate posttest and the 2-week follow-up posttest. The mean for the high confidence level responses were 22.00 for the pretest, 36.33 for the immediate posttest, with a standard deviation of 0.75, and 35.16 for the 2-week follow-up posttest, with a standard deviation of 1.77. The post learning score for the immediate posttest was 90.8% and for the 2-week follow-up posttest was 87.5%. The learning scores validated that learning was achieved from the MEWS trigger education program by the numbers obtained from the confidence levels of the nurses in both the immediate posttest and 2-week follow-up. A

summary of the categorized questionnaire responses, values, and frequency with the corresponding *p*-values are reflected in Table 4.

Table 4

Maternal-Early-Warning-System Education Results

	Question 1			Question 2		
	Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
High confidence	6	37	34	7	37	36
Low confidence	34	3	3	33	3	4
P value	NA	< **0.001**	0.241	NA	< **0.001**	0.5
	Question 3			Question 4		
	Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
High confidence	37	35	35	38	37	32
Low confidence	3	5	5	2	3	8
P value	NA	0.356	0.632	NA	0.5	0.096
	Question 5			Question 6		
	Pretest	Posttest	Follow-up	Pretest	Posttest	Follow-up
High confidence	36	36	37	8	36	37
Low confidence	4	4	3	32	4	3
P value	NA	0.644	0.5	NA	< **0.001**	0.5

The implications for nursing are profound in terms of quality improvement, professional competencies, and the need to safeguard communities and the most vulnerable citizens, pregnant women. System changes are warranted at the micro level to encourage nurses to be up to date on their obstetrics competencies, including MEWS recognition and response. According to Gillespie and colleagues (2021), nurses are poised to make changes in their organizations and communities simply by adhering to the MEWS guidelines at the bedside by recognizing and responding to changes in maternal

clinical conditions. This will help to bring about social changes through advocacy for improved maternal outcomes.

Recommendations

The education intervention was prompted by an identified knowledge gap and lack of nursing professional competencies on MEWS triggers among obstetrics nurses in the labor and delivery, postpartum, and high-risk units at the organization. It is recommended that attentiveness be maintained in keeping the momentum of nurses' enthusiasm for the MEWS education, with continuing education on MEWS triggers, recognition, and response to changes in maternal clinical conditions in obstetrics. Maintaining professional competencies and knowledge is of paramount importance to mindfulness of behaviors and attitudes in the delivery of quality care in obstetrics. Gillespie and colleagues (2021) postulated that heightened awareness of maternal mortality rates and near misses in the United States as well as educating nurses on MEWS are vital responses in delivering quality care to the maternal population. The authors found an association between understanding MEWS triggers and knowing when to respond and how to intervene among obstetrics nurses. Furthermore, nurses' confidence was enhanced in knowing they were equipped with the necessary knowledge to intervene in a timely manner (Gillespie et al., 2021).

Therefore, it is my recommendation as a DNP nurse that periodic quarterly organizational follow-up surveys be done to ensure continued vigilance and surveillance of the obstetrics nursing staff in recognizing and responding in a timely manner to MEWS triggers. Furthermore, my preceptor, nursing professional education, and the

research department (NPD) were asked to continue efforts in keeping the momentum and enthusiasm of the obstetrics nurses who expressed a heightened sense of awareness of the MEWS triggers. Additionally, it is recommended that the NPD generate a MEWS policy to guide nurses in advocating for changes in delivering care to the maternal population and the MEWS criteria, with the "Yellow" and "Red" triggers included in the electronic health record (EHR) whereby data on MEWS trigger recognition and timely response can be easily collected.

The preceptor was recruited to conduct monthly audits of MEWS trigger recognition and response time with chart reviews, or by the EHR data collection tool for recognition and response time. The preceptor has also been asked to share the results of monthly audits and matrix with me, and as needed, I will volunteer to mentor nurses in upholding the obstetrics standards of care in delivering quality care.

The obstetrics leadership, including the labor and delivery and high-risk managers, were encouraged to have monthly "lunch-and-learn" sessions for nurses to share stories of professional development and engage in reflective journaling on how MEWS education had improved their professional performance and optimized the care given to maternal patients. The suggestion for an obstetrics journal club was made to the senior nursing leaders at the bedside. Another important recommendation is to ensure adequate nursing staff to maintain nurse/patient ratios to avert shortcuts in the delivery of care and/or exhausted nurses who are fatigued and may ignore alarm alerts because of fatigue from exhausted nurses.

Alarm fatigue can deter recognition of and response to MEWS trigger alarms. Lewandowska et al. (2020) argued that alarm fatigue is a concern that may reduce nurses' response to monitoring alarms, and that measures should be taken to inform nurses of unique sounds that apply to maternal monitors. It is my recommendation as a DNP student that longitudinal research be done to analyze the impact of MEWS education and practice change of the obstetrics nurses on maternal outcomes at the micro and macro levels. Polit and Beck (2022) suggested that the desired outcome of any evidence-based practice (EBP) change should be a continuous self-evaluation of the target nurses with inquiries related to the EBP.

Strengths and Limitations of the Project

The translation of evidence to practice is often a difficult and intricate pathway for the DNP nurse. Collaboration is an important aspect in translating evidence to practice, I enthusiastically collaborated with other nursing stakeholders, such as the high-risk and labor and delivery managers and assistant managers, to make the MEWS education a reality for the obstetrics nurses. The project was strengthened with the use of the Kirkpatrick's four levels of training evaluation model, which has been used in other evidence-based nursing training and education projects (Ardahan-Sevgili & Yardimci, 2020; Cullinane et al., 2020; Downey et al., 2017). Another strength of the MEWS education project was the support from the nursing education department and administrative nursing leaders for translating evidence to practice. According to Augustino et al. (2020), the complexity of translating evidence to practice requires support by leadership and other stakeholders. Organizational readiness is a strength, as

evidenced by the overwhelming support by interprofessional and intraprofessional members at the practicum site.

One limitation was the specificity of MEWS education to obstetrics nurses from one organization and one practice setting. However, other early warning systems, such as rapid response, have been used in similar applications of nursing with success in health care clinical practice, and MEWS is widely used internationally in obstetrics (Friedman et al., 2018; Umar et al., 2020). The dissemination plan and an analysis of self will be discussed in the next section.

Section 5: Dissemination Plan

It is postulated that many DNP students do not pursue dissemination of their scholarly work because of the tedious aspects of settling with traditional publishers (Arends & Callies, 2022). The DNP project reflects a scholarly production by a hard-working nurse who is poised to change practice by disseminating her DNP practice project as a voice to others in nursing (Smith-Stoner, 2018). Because it is reflective of advanced nursing practice and leadership and a contribution to practice change, dissemination is a requirement of the AACN (2015). Dissemination will contribute to my growth and development as a scholar and expert practitioner and to my career goals as an advanced practice nurse (Smith-Stoner, 2018).

The MEWS-triggers education for practice change is a profound intervention that warrants widespread dissemination in the organization. Acceptance of the practice change initiative by obstetrics nurses is of paramount importance to the dissemination of the project results. Therefore, dissemination of the MEWS education will be done in a variety of ways. Communication of the project will be done throughout the organization and in an open forum digital platform, abstract or poster presentations, video presentations, oral public presentations, print publications, or multimedia, or by other digital electronic means (AACN, 2015; Arends & Callies, 2022; White et al., 2021).

According to Arends and Callies (2022), dissemination is an important aspect of the scholarly advancement of a DNP student in communicating a project that will benefit other stakeholders, including the practice site and leadership. One of the most recent trends in the dissemination of scholarly work is via an open forum.

Smith-Stoner (2018) argued that an open digital forum is the best dissemination platform that one can choose for a DNP project. According to Kesten and Hoover (2022), an open forum is widely reached by many other organizations and individuals and bypasses costly traditional publishers. This DNP project will be disseminated in an open-access repository to inform a variety of obstetrics health care entities and stakeholders, including nursing educators, health care leadership and providers, and the public at large (Kesten & Hoover, 2022).

Analysis of Self

I have gained a lot of knowledge, along with collaborative and leadership skills, throughout my doctoral journey and preparation for this project on MEWS education for obstetrics nurses. I was exposed to various analytical methodologies that strengthened my project management skills; engaged as a change agent at the practicum site; and collaborated with interprofessional members of health care. The execution of the MEWS education project provided valuable lessons in evaluating training methods, the application of strategic planning in project management, and how to manage the inherent challenges of translating evidence to practice. According to the AACN (2015), DNP scholarly discourse personifies a change leader who is constantly engaged in practice improvement. During my doctoral journey and presence at the practicum site, I learned valuable lessons in the formation of professional relationships with various stakeholders that enabled me to secure interest and buy-in among the nurses and nursing leadership that facilitated the implementation of the project.

Among the many challenges experienced during the project were changes in leadership at the organization and difficulties encountered in communicating with the leaders. There was a lengthy wait for project approval that led to time management issues in delivering revisions and subsequent IRB approval. Implementation of the MEWS education project went smoothly because of the relationship formed with the nursing staff. Furthermore, the doctoral journey enabled me to enhance my skills and heightened my opportunities to assess the value, relevance, and integration of multiple perspectives to the decision-making process. I am now able to see beyond a "black-and-white solution" approach and have learned to appreciate the "grey areas," recognizing that there may not always be one right answer.

As facilitator for project planning and development, I deemed it necessary to guide the obstetrics nurses in bridging the gap by acquiring knowledge on MEWS triggers and improvement in professional competencies. My experiences on the doctoral journey broadened my goal for successful evidence-based-project implementation by providing me with the ability to interpret evidence, to explain and summarize that evidence, and to compare the information with current health systems and the status of patients. This is aligned with the DNP essentials, as it will help me contribute to nursing science by evaluating, translating, and disseminating research into practice (AACN, 2006; McCauley et al., 2020).

Summary

The MEWS education for obstetrics nurses was intended to bridge the knowledge gap and improve professional competencies with early recognition and appropriate

responses to MEWS triggers. Given the high incidence of maternal mortality in the United States and the negative trends in preventable factors (Freidman et al., 2018), I sought to contribute at the micro level by educating nurses on early recognition of and response to MEWS triggers. The MEWS education for the representative sample of 40 obstetrics nurses was implemented with a PowerPoint presentation, poster boards, and journal articles during safety rounds, with brief-and-debrief huddles and one-to-one encounters when the units were busy. Kirkpatrick's four levels of training evaluation guided evaluation of the project with the concepts of reaction, learning, behavior, and result. A comparative analysis of the pretest, immediate posttest, and 2-week posttest was done to ascertain knowledge acquisition, improved professional competencies, and knowledge sustainability of the obstetrics nurses in the early recognition and appropriate response to MEWS triggers in delivering care to maternal patients.

The quality improvement in practice was embraced by nurses who were enthused with the education program, which was embraced by the preceptor and nurse leaders in the organization. The DNP project contributed to social change at the organizational level by educating the obstetrics nurses to recognize and respond to MEWS triggers as they occur in the maternal population.

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Appendix A: Pretest—Maternal-Early-Warning-System Education Program

Target Population: Obstetrics nurses
Instructions: This questionnaire is intended to explore your knowledge on the maternal early warning system (MEWS) prior to an education program. Your answers will help in improving future educational programs for obstetrics nurses. Please indicate the number of years you have been a nurse, then your ratings to the responses:

HC: Highly Confident, **C**: Confident, **SC:** Somewhat Confident, **FC**: Fairly Confident, **NC**: Not Confident
How many years of nursing experience do you have?
◯ 1- 4 years
◯ 5 – 8 years
◯ 9 – 13 years
◯ 14 – 20 years
◯ Over 20 years

Criteria	Highly Confident (HC)	Confident (C)	Somewhat Confident (SC)	Fairly Confident (FC)	Not Confident (NC)
Responses	5	4	3	2	1
I am familiar with the maternal early warning system (MEWS) algorithm					
I was trained in the application of the MEWS algorithm					
I always contact the care provider for any changes in a patient's condition					
I am comfortable discussing the patient's condition with the primary care provider					

I am eager to hear about the maternal early warning system (MEWS)					
I do not have the necessary knowledge and skills to apply the MEWS algorithm at the bedside					

Appendix B: Immediate Posttest— Maternal-Early-Warning-System Education Program

Target Population: Obstetrics nurses
Instructions: This questionnaire is intended to evaluate your reaction and learning of the maternal early warning system (MEWS) after the education program. Your answers will help in improving future educational programs for obstetrics nurses. Please indicate the number of years you have been a nurse, then your ratings to the responses:

HC: Highly Confident, **C**: Confident, **SC:** Somewhat Confident, **FC**: Fairly Confident, **NC**: Not Confident

How many years of nursing experience do you have?
◯ 1- 4 years
◯ 5 – 8 years
◯ 9 – 13 years
◯ 14- 20 years
◯ Over 20 years

Criteria	Highly Confident (HC)	Confident (C)	Somewhat Confident (SC)	Fairly Confident (FC)	Not Confident (NC)
Responses	5	4	3	2	1
What I learned from this education program about MEWS will help me to care for maternal patients					
I am clear about what is expected of me when caring for maternal patients					
I believe it is worthwhile for me to apply what I learned about MEWS					
I am committed to applying what I learned about MEWS in caring for all pregnant women					
I am clear about what is expected of me when caring for at-risk or low-risk maternal patients					

Appendix C: Two-Week Posttest—Maternal-Early-Warning-System Education Program

Target Population: Obstetrics nurses
Instructions: This questionnaire is intended to evaluate your knowledge, perceived skills, and attitude after the education program on the MEWS algorithm and triggers including the "Yellow" and "Red" zones of parameters. Your answers will help in improving future educational programs for obstetrics nurses. Please indicate the number of years you have been a nurse, then your ratings to the responses:

HC: Highly Confident, **C**: Confident, **SC:** Somewhat Confident, **FC**: Fairly Confident, **NC**: Not Confident

How many years of nursing experience do you have?
◯ 1- 4 years
◯ 5 – 8 years
◯ 9 – 13 years
◯ 14- 20 years
◯ Over 20 years

Criteria	Highly Confident (HC)	Confident (C)	Somewhat Confident (SC)	Fairly Confident (FC)	Not Confident (NC)
Responses	5	4	3	2	1
In my practice, I consistently apply what I learned about MEWS trigger tool to recognize and respond to changes in maternal clinical conditions					
I am seeing positive results from the MEWS education program among my colleagues in recognizing and responding to changes in maternal clinical conditions					
I have seen an impact in the following areas of maternal patient care: • Increased delivery of quality care by the nursing staff					
I am more confidence in communicating MEWS					

parameters to the care provider					
I have seen an increase in my patients and family satisfaction levels					
The MEWS triggers education program has changed the behaviors of my colleagues in communicating abnormal findings to the care providers					

Appendix D: Pilot Test: Maternal-Early-Warning-System Education Program

Target Population: Obstetrics nurses
Instructions: This questionnaire is intended to explore your knowledge on the maternal early warning system (MEWS) prior to an education program. Your answers will help in improving future educational programs for obstetrics nurses. Please indicate the number of years you have been a nurse, then your ratings to the responses:

HC: Highly Confident, **C**: Confident, **SC:** Somewhat Confident, **FC**: Fairly Confident, **NC**: Not Confident
How many years of nursing experience do you have?
◯ 1- 4 years
◯ 5 – 8 years
◯ 9 – 13 years
◯ 14- 20 years
◯ Over 20 years

Criteria	Highly Confident (HC)	Confident (C)	Somewhat Confident (SC)	Fairly Confident (FC)	Not Confident (NC)
Responses	5	4	3	2	1
I am familiar with the maternal early warning system (MEWS) algorithm					
I was trained in the application of the MEWS algorithm					
I always contact the care provider for any changes in a patient's condition					
I am comfortable discussing the patient's condition with the primary care provider					
I am eager to hear about the maternal early warning system (MEWS)					
I do not have the necessary					

knowledge and skills to apply the MEWS algorithm at the bedside					

Source: Kirkpatrick and Kirkpatrick (2016).

Appendix E: Permission Letter to Use Maternal Early Warning Trigger Tool

Dawn M. Moore, DNP(c), MS, RNC-OB, C-EFM

Walden University, School of Nursing
dawn.moore2@waldenu.edu

Dr. Laurence Shields
Maternal Fetal Medicine
Marian Regional Medical Center
Santa Maria, CA
Laurence.shields@dignityhealth.org

April 12, 2022

Dear Dr. Shields

Re: Flow Diagram for MEWT Tool

I am writing to request copyright permission for the Flow Diagram for MEWT Tool, which I am using in a research education program for registered nurses for my DNP translation of evidence to practice project. The MEWT Tool is intended for education purposes only and I am truly excited to bring this important education to registered nurses in a major healthcare organization in New York. My research topic is:

Maternal-Early-Warning-System Education to Improve Registered Nurse Knowledge of and Appropriate Responses to Triggers

My research study on maternal mortality is a concern and there is not much research on educating nurses to use the tool. Can you please send me a digital copy of the MEWT Tool for use as a table in my project and for the education presentations? Thanks in advance for your help in this endeavor. Kindly indicate your permission below in your return email or an email with your permission:

Yours Respectfully,

Dawn Moore, DNP(c), MS, RNC-OB, C-EFM

[x] Permission granted

[ ] Permission granted with the following restrictions: Yes, with request that I may receive a summary of your findings.

Thank you,
Larry Shields

Appendix F: PowerPoint Outline

Time frame: Presentation 30 minutes
Q & A: 10 Minutes

1. Topic: Education on Maternal Early Warning System (MEWS)
2. Welcome & Administration of Pretest
3. Learning Objectives:
    a. Cognitive:
        i. Identify the critical parameters of maternal early warning system (MEWS) triggers
        ii. Describe the effectiveness of intervention discussed in the MEWS trigger tool
    b. Affective:
        i. Recognize changes in maternal clinical condition from the MEWS triggers
        ii. Respond to MEWS triggers in a timely manner
    c. Psychomotor:
        i. Implement the MEWS trigger tool in practice
        ii. Demonstrate the acquisition of professional knowledge and clinical skills in communicating MEWS findings
4. What is the Maternal Early Warning System (MEWS)
5. Historical background of MEWS
    a. Chronological background of MEWS
    b. Impact on maternal population
    c. Maternal mortality rates in the U.S.
    d. Causes of maternal mortality
6. Gaps in the delivery of maternal care at the bedside
7. Why do we need improvement?
8. MEWS trigger tools: Algorithm & parameters
9. Research validation on MEWS: Local, state, & federal
10. Nursing: Professional improvement & responsibilities
11. Case study
12. Q & A
13. Administration of immediate posttest