

IMPROVING PREECLAMPSIA OUTCOMES:
A HIGH-FIDELITY SIMULATION FOR
UNDERGRADUATE NURSING STUDENTS

by

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DEDICATION

I dedicate this professional project to our first born, heavenly son, Dawson. We lost him January 2, 2018, due to mismanagement of antepartum and high-risk intrapartum care, lack of communication and collaboration, and lack of transfer to a risk-appropriate care setting. The team were my colleagues, and the tragedy devastated the unprepared personnel. I believe I was chosen to endure this trauma and deep loss to serve as a change agent to improve system failures within healthcare. I will make it my mission, beginning with this project and throughout my career, to advocate for interprofessional education, collaboration, and evidence-based practice standards to promote positive patient outcomes. Thank you, angel son, for sending us your beautiful brothers Hudson and Thad. I also want to thank leaders in the obstetric profession, Dr. Fausett, Dr. Holbrook, and their care team for the therapeutic, compassionate, and diligent care that provided us with healthy, joyful outcomes during our subsequent two pregnancies. John, thank you for your pursuit of accountability and improved outcomes.

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ABSTRACT

Preeclampsia, a hypertensive disorder of pregnancy, commonly affects women and fetuses/neonates, significantly increasing the risk for morbidity and mortality. Underutilization of evidence-based practice standards intensifies complications. Montana has limited resources to care for high-risk pregnancies, especially in rural areas of the state. However, patient outcomes can be improved with standardized care and collaboration. Therefore, it is imperative that all hospitals in the state join forces to improve evidence-based practices for obstetric patients. This quality improvement (QI) teaching project aimed to inform future advocates, nursing students, of the evidence-based guidelines and collaborative tools available in Montana to care for maternal-fetal patients with preeclampsia. The QI project adapted a preeclampsia-focused high-fidelity simulation (HFS) scenario in collaboration with a school of nursing in Montana. The purpose of the HFS scenario was to aid undergraduate nursing students in developing knowledge, psychomotor (technical), and affective (values) skills to manage intrapartum care for a patient with preeclampsia. Senior-level nursing students participated in the simulation process including preparation, pre-briefing, scenario, and debriefing. The students were evaluated on meeting the safe-care measures for an HFS patient with preeclampsia while monitoring for fetal intolerance to labor. Qualitative data were collected based on Kirkpatrick's Four Levels of Training Evaluation tool. The data revealed the students' reactions to the simulation process, plans to apply what was learned, and how the teaching modality helped achieve the learning objectives. The QI teaching project subjectively and objectively improved the students' knowledge, psychomotor skills, and values in caring for a maternal-fetal patient with preeclampsia. Students were also provided with reference materials to use as registered nurses in the event of caring for patients who develop preeclampsia in healthcare facilities throughout Montana.

INTRODUCTION

Overview

This professional paper details a quality improvement (QI) teaching project. The QI teaching project adapted a preeclampsia-focused high-fidelity simulation (HFS) process, including preparation, pre-briefing, scenario, and debriefing, to educate senior-level students at a school of nursing in Montana. The educational materials provided a holistic approach to care, teaching nursing students to recognize, intervene, and advocate for risk-appropriate care for all patients who meet the criteria for preeclampsia. The simulation scenario focused on developing skills to assess and treat the condition during the intrapartum (laboring process) period. Chapter One details the burden of preeclampsia, the progress in Montana overcoming barriers to statewide use of evidence-based practices (EBP), and the microsystem assessment of the intervention subjects (nursing students/program/simulation center). The chapter summarizes by introducing the QI teaching project as a potential solution to help improve preeclampsia outcomes.

Preeclampsia is a pregnancy-induced, multisystem, hypertensive disorder that worsens with delays in diagnosis and management and deems the mother and fetus as high-risk patients (Preeclampsia Foundation, 2021d). Preeclampsia frequently affects the lives of pregnant women, unborn children, and families. On average, one in 12 women develop preeclampsia in the United States (Akalin & Sahin, 2020; Preeclampsia Foundation, 2023). Preeclampsia can happen to any pregnant/postpartum woman, regardless of a history of hypertension. Onset can occur any time after the 20th week of pregnancy and up to 6 weeks postpartum. The condition may rapidly

progress, placing the mother and baby at risk for morbidity and mortality (Preeclampsia Foundation, 2021d). Educating nursing students to advocate for EBP and collaboration to help alleviate the burden of poor outcomes is invaluable.

Epidemiology

According to the Preeclampsia Foundation (2023), an advocacy organization determined to improve healthcare practices, patient education, and maternal and fetal outcomes, preeclampsia “is a leading cause of premature birth and maternal and infant death, taking the lives of 76,000 women and 500,000 babies worldwide each year” (para. 4). In addition, preeclampsia causes 2.6 million preterm births and 4.5 million cases of intrauterine growth restriction (IUGR) worldwide each year. In the United States, preeclampsia causes 10,500 fetal deaths annually (Preeclampsia Foundation, 2021a). After delivery, maternal mortality risk continues with 75% of deaths occurring during the postpartum phase (Preeclampsia Foundation, 2022). Longitudinal data showed preeclampsia has continued to rise in the United States, with more than 1/3 of cases deemed severe. Rates were highest in nonmetropolitan areas, especially poorer areas. Increased incidence of preeclampsia may reflect improvements in diagnostic inclusion criteria, as well as increased prevalence of risk factors (Auger et al., 2016; Fingar et al., 2017).

Risk Factors

Certain women are at higher risk for developing preeclampsia, including, but not limited to, those with a personal or family history of preeclampsia; youngest or oldest for maternal age, rising most rapidly for women over 35; first pregnancy; multifetal gestation; in vitro conception;

personal history of being small for gestational age; more than 10 years between pregnancies; and socioeconomic deprivation. Furthermore, pre-existing conditions, including, but not limited to, hypertension, diabetes, renal disease, obesity, lupus, obstructive sleep apnea, coagulopathies, and antiphospholipid syndrome pose an increased risk for developing preeclampsia (ACOG, 2022; Auger et al., 2016; Fingar et al., 2017; Preeclampsia Foundation, 2021e; Society for Maternal-Fetal Medicine, 2022).

Morbidity and Mortality

According to Druzin et al. (2021), preeclampsia is the most common complication that severely affects pregnancies in the United States, but it is often underdiagnosed and undertreated. The data collected in 2018 by Maternal Mortality Review Committees (MMRC) showed that 50% to 70% of preeclampsia-related morbidity and mortality is preventable (Druzin et al., 2021). Contributing factors to preventable deaths include lack of patient/family knowledge of the need to seek care; providers delaying response, misdiagnosing, and ineffectively treating preeclampsia; and lack of coordination between providers and systems of care (Preeclampsia Foundation, 2018). Preeclampsia Foundation (2022) advocates for preventing preeclampsia-related complications and sentinel events by participating in state and national collaboratives to spread education to providers and the public, urging competent diagnosis and management of the spectrum of hypertensive disorders for every pregnancy.

Maternal Complications. There is a spectrum of hypertensive disorders during pregnancy, ranging from gestational hypertension to the most severe forms of preeclampsia (California Maternal Quality Care Collaborative, 2021). Preeclampsia Foundation (2021b) described one of

the most severe forms, HELLP Syndrome, which stands for hemolysis (breakdown of red blood cells and possible anemia), elevated liver enzymes, and lowered platelets. HELLP Syndrome occurs in 5% to 12% of preeclamptic patients and may present before classic symptoms, possibly misdiagnosed as viral or gallbladder issues. Additional maternal morbidity and mortality associated with preeclampsia may include, but are not limited to, the risk for liver failure, kidney failure, pulmonary edema, pulmonary embolism, amniotic fluid embolism, respiratory distress syndrome, disseminated intravascular coagulation, oligohydramnios, placental abruption, shock, cerebral vascular accident, cardiovascular accident, eclampsia (seizures), coma, and possible death. Women who develop preeclampsia are more likely to need intensive care unit (ICU) admission, blood transfusion, ventilation, a cesarean section, and a hysterectomy. Maternal long-term sequelae may include, but are not limited to, quadrupled risk of hypertension, doubled risk of cardiovascular and cerebrovascular diseases, diabetes, development of autoimmune conditions, thyroid disorders, blood clots, and shortened lifespan (Abraham & Kusheleva, 2019; Auger et al., 2016; Fingar et al., 2017; Preeclampsia Foundation, 2022).

Fetal/Neonatal Complications. According to the National Institute of Child Health and Human Development (NICHD), as part of the United States Department of Health and Human Services (DPHHS) (2017), preeclampsia is linked to problems with the placenta early in pregnancy and poses risks to fetal health, with a potential for long-term health consequences. Potential fetal risks during pregnancy include, but are not limited to, restricted growth due to inadequate oxygen and nutrients; preterm birth, with many potential risks associated with inadequate developmental time in the womb; neonatal disseminated intravascular coagulation; stillbirth if placental abruption occurs; and possible intrauterine or post-delivery death (Auger et

al., 2016; NICHD, 2017). In addition, long-term health risks may include “learning disorders, cerebral palsy, epilepsy, deafness, and blindness” with higher risks of “diabetes, congestive heart failure, and high blood pressure” later in life (NICHD, 2017, para. 4). Preventive screening, patient education, early recognition, and timely, interprofessional/interorganizational treatment of preeclampsia can help avoid maternal and fetal/neonatal comorbidities and fatalities in Montana.

Preeclampsia in Montana

Pregnant women living in rural Montana have limited access to obstetrical care, especially high-risk maternal-fetal care providers. Extensive travel distances prevent timely care during obstetrical emergencies, increasing the risk of maternal and fetal morbidity and mortality (Hung et al., 2017). The latest 2020 census data collection estimated that 680,426 (64.1%) of the 1,061,705 Montana residents live in rural areas of the state. Rural health disparities pervade Montana, as 52 of 56 counties qualify as a Medically-Underserved-Area (Montana Obstetrics & Maternal Support [MOMS], 2022). Montana has 49 critical access hospitals and 61 rural health clinics (Rural Health Information Hub, 2022). Pregnancy-related mortality ratios collected during 2016–2018 identified that rural communities in the United States had higher death rates than urban areas. Urban areas had a range of 15.7–17.9 deaths per 100,000 live births, while rural areas had a range of 19.5–24.4 deaths per 100,000 live births (United States Centers for Disease Control and Prevention [CDC], 2022). Rural healthcare facilities may lack the experience and resources necessary, such as skilled staff and a neonatal intensive care unit (NICU), to safely care for high-risk mothers and neonates.

Standardization of referring patients with preeclampsia to a perinatologist, a specialist in maternal and fetal medicine, can help ensure healthy outcomes. Transferring high-risk obstetric patients to birthing facilities prepared to provide specialized care to the mother and neonate must occur before emergency intervention is required. Lack of transfer to prepared facilities increases the risk of suffering unnecessary trauma and sequelae of preeclampsia, including preventable poor outcomes and possible deaths (Bernstein et al., 2017; CDC, 2022; Silva et al., 2019). It is imperative to achieve a commitment from all maternal stakeholders in Montana to implement the latest EBP standards and update policies and procedures to ensure high-risk patients are adequately assessed, diagnosed, treated, and, if necessary, transferred to a level-appropriate care facility.

Perinatologist Resources in Montana

Access to a perinatologist is most reliably found in urbanized areas of Montana, including Billings, Missoula, and Kalispell (MOMS, 2022; Origin Health, 2022). Origin Health, operated by one of the leading perinatologists in the state, is based out of Missoula and has outreach clinics in Great Falls, Butte, Helena, and Kalispell. Origin Health collaborates with rural obstetric providers and facilities to manage high-risk perinatal patients safely. Origin Health outreach clinics offer regular ultrasound resources and telemedicine appointments for patients needing specialized care. The Origin Health team of experts visits each outreach clinic at least once monthly (Origin Health, 2022).

Cost

The financial burden of preeclampsia presents a motivating factor to improve standards of care and promote positive patient outcomes. For example, the “estimated cost of preeclampsia in the United States was \$2.18 billion dollars in 2012, three times more than a normal pregnancy” (Preeclampsia Foundation, 2020a, para. 5). Premature infants and ill mothers may experience extended hospitalization costs, compounding the emotional and financial stress for families (Preeclampsia Foundation, 2022). Improving outcomes harnesses the power to decrease healthcare costs.

Funding to Improve Care in Montana

In recent years, Montana was one of only two states in the United States that did not have an MMRC to report mortality data to the Centers for Disease Control and Prevention (CDC). To remediate this, the Montana DPHHS was awarded two grants: the Health Resources and Services Administration (HRSA)-Montana Obstetrics and Maternal Support (MOMS) grant and the CDC Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE-MM) grant. Through the grants, the MOMS Program was established in 2019, initiating an MMRC to investigate pregnancy-related deaths and focus on preventing future maternal/infant deaths. Disparities in care exist in Montana, such as American Indian women having three times greater risk of severe maternal morbidity compared to Caucasian women; therefore, data must inform approaches to overcome such disparities, such as expanding systems of care (MOMS Program, Montana DPHHS, MPQC & AIM, 2022; Rural Institute & HRSA, 2022).

Grant Funding Accomplishments

Montana Obstetrics and Maternal Support Program

The MOMS Program has become a pillar for improving obstetric care throughout Montana as it “guides the multidisciplinary collaboration of maternal and perinatal health providers, programs, resources and initiatives to deliver training, resources and support to rural healthcare providers in Montana as they care for their perinatal patients” (MOMS, 2022, para. 4). Parenting resources, free for Montana residents, are available via the “newbaby&me”, YoMingo educational platform (see registration link in references). Once registered, users can access content via the website and/or download the app for quick access to evidence-based resources, updated by the Association of Women’s Health, Obstetric, and Neonatal Nurses (AWHONN). Families have access to a plethora of articles and videos including prenatal, labor and birth, and postpartum education. In addition, the platform has various tools and a milestone tracker. A tool titled Linking Infants and Families to Supports helps families find local and statewide perinatal resources. In addition, the signup process asks about pregnancy concerns and the administration from the MOMS Program capture concerns to link women/families to Montana resources (Jessica Halgren, 2022; newbaby&me-YoMingo Platform, 2023).

The MOMS Program has multiple extensions to improve education and standardize practice. Project Extension for Community Healthcare Outcomes (ECHO) provides specialized telehealth trainings for rural providers to promote consistency in education and care management. Project ECHO creates an opportunity for a primary obstetrician to gain knowledge and support to provide specialty treatment in rural areas. In addition, an expert consultation access line and telemedicine connection ensure rural providers have access to a perinatologist to

care for women experiencing high-risk pregnancies (MOMS Program, 2022). A mobile extension, Simulation in Motion-Montana (SIM-MT) deploys a training truck(s) that travels to provide HFS training to rural facilities that deliver less than 100 babies annually. Training focuses on, but is not limited to, “reducing medical errors, improving patient outcomes, [and] increasing team performance” (MOMS, 2022, Simulation Programming, para. 1). SIM-MT offers one to two trainings per year to the rural facilities, focusing on high-risk pregnancy complications, including preeclampsia (MOMS, 2022). To reach more professionals, the MOMS Program provides a virtual Simulation Leadership Academy (SLA) to all interested professionals, sending moderate-fidelity Prompt Flex manikins to enrollees who become certified in the design, implementation, and evaluation of simulation pedagogy, thus improving the capability of skilled professionals to provide ongoing education within rural organizations (MOMS Grant Coordinator, personal communication, November 9, 2022).

Severe Hypertension in Pregnancy Patient Safety Bundle. The MOMS Program funds the Montana Alliance for Innovation on Maternal Health (AIM) Program, which upholds a national commitment to aid birthing facilities while implementing perinatal patient safety bundles (PSBs), a consensus of the current best practice guidelines. According to Bernstein (2017), the PSBs reduce variation to improve outcomes and quality. The PSBs allow for adaptation to versatile settings; however, if key elements cannot be performed, procedures to ensure timely transfer to a capable setting are expected (Bernstein, 2017).

The Montana Perinatal Quality Collaborative (MPQC) recruits birthing facilities to voluntarily commit to participating in the statewide collaborative, guided by AIM. As of early 2023, 19 of 26 birthing facilities in Montana have been recruited, but there remains a need for

statewide participation. In December 2022, the MPQC began helping the participants throughout the state implement the Severe Hypertension in Pregnancy PSB to standardize care for hypertensive disorders of pregnancy and postpartum. The collaborative resources provide expert technical support and peer-to-peer support to achieve quality improvement without having to recreate processes that are proven to be effective during the implementation of PSBs. The Women's Health and Obstetrics unit at the Level II hospital where the nursing students attend clinicals is a committed AIM member, collaborating with other participating hospitals in the state to implement the perinatal PSBs. The implementation process for the Severe Hypertension in Pregnancy PSB will tentatively be completed by the end of September 2023. The collaborative strives for full and sustained implementation of the PSB in participating hospitals. By October 2023, the measurable goals are to reduce the rate of severe maternal morbidity associated with the spectrum of hypertensive disorders of pregnancy by 20% and narrow racial disparities by 25%. Sustainability efforts include the goal to spread to stakeholders not yet participating. Facilities are expected to submit process and structure measures quarterly and outcome measures annually (AIM, 2022; Holman et al., 2022; MOMS, 2022; MOMS Program Specialist, personal communication, November 9, 2022; MPQC, 2022; MPQC & AIM, 2022; Preeclampsia Foundation, 2022; Stephanie Burkholder-Yarrow, MPQC facilitator, personal communication, March 21, 2023).

The MOMS Program's Project ECHO Clinic held an educational Zoom meeting on February 28, 2023. The presenter, a maternal-fetal medicine specialist (perinatologist), discussed recommendations to smooth the implementation process of the Severe Hypertension in Pregnancy PSB. The presenter has experience from the statewide practice change in Ohio

and shared suggestions for effectively achieving implementation in Montana. The presenter stated that Pregnancy-Associated Mortality Review (PAMR) data support the need for statewide use of the PSBs. The presenter shared the statistical improvements that occurred in Ohio related to collaboration and system improvements; categories included timely treatment (+27%), appropriate medications (+7%), patient education received (+29%), follow-up at 72 hours (+170%), follow-up at 10 days (+22%), and patient received a blood pressure cuff (+84%).

Fellow meeting participants, advocates for maternal-fetal health, discussed concerns related to barriers to engaging physicians, nurses, and administration during implementation of the PSBs. The presenter suggested utilizing the PSBs as a roadmap and proposed starting at the top with administration to help educate the physicians about why participation and commitment are essential to success. Furthermore, leadership can help achieve a culture change by actively listening to those resistant to the new process to discover the barriers in place and collaborate to move forward. The presenter encouraged a paradigm shift, moving away from simply expecting staff to follow new policies and, instead, utilizing the Plan-Do-Study-Act (PDSA) model to implement small tests of change at the micro level and ramp up to larger tests of change to achieve better outcomes (Dr. Michael Marcotte, MFM & fellow meeting participants, personal communication, February 28, 2023).

The PSBs encompass five components the facility must implement to ensure standardized training and adherence to evidence-based practices (AIM, 2023; Dr. Michael Marcotte, MFM, personal communication, February 28, 2023), including:

1. Readiness: birthing unit, as well as, emergency department must have emergent meds stocked, policies in place to identify high-risk pregnant and postpartum women, and regular training and emergency drills.
2. Recognition and Prevention: recognize signs and symptoms of obstetric emergencies, accurately assess, and diagnose. Use a Preeclampsia Early Recognition Tool (PERT) with a staging system and escalation-of-care plan to ensure resources are available. Establish a culture of huddles, post-trauma debriefs, and multidisciplinary reviews.
3. Response: follow the diagnostic and treatment algorithms within the perinatal patient safety bundles to ensure timely, effective care.
4. Reporting and Systems Learning: review severe cases to determine root causes of larger systems issues. Track data to monitor outcomes and how well staff is following evidence-based procedures.
5. Respectful, Equitable and Supportive Care: shared decision-making, considering patient as part of team. Culturally sensitive education for staff and patients. Identify existing barriers to equitable care.

According to AIM, during 2016–2017, the Illinois Perinatal Quality Collaborative initiated the Severe Hypertension in Pregnancy PSB in 108 of 120 birthing facilities. The data collected during that time showed the percentage of patients who received treatment for new-onset severe hypertension within 60 minutes of detection increased from 41% to 89%. Furthermore, the statewide rate of severe maternal morbidity among patients delivering with hypertensive disorders decreased by 40% (AIM, 2022). These encouraging statistics in Ohio and

Illinois provide motivation for Montana to continue efforts to create an integrated care approach for hypertensive disorders of pregnancy.

Levels of Care Assessment Tool (LOCATe). In 2021, as part of the MOMS Program's statewide needs assessment, Montana implemented the Levels of Care Assessment Tool (LOCATe) developed by the CDC to assess levels of maternal and neonatal care in Montana hospitals (Holman et al., 2022). LOCATe is a self-assessment tool that 25 of 26 Montana birthing facilities incorporated. LOCATe then classifies facilities into levels <I, I, II, III, and IV based on equipment, staff, and services. The results showed 20% of the surveyed facilities can provide level III neonatal care, but only 8% can provide level III/IV maternal care. The plan is to utilize the results to inform a risk-appropriate care system, ensuring birthing patients and neonates receive care with personnel and resources capable of providing optimal outcomes; a strategy that will require commitment from all healthcare facilities and maternal stakeholders (Holman et al., 2022). The MOMS Program offers to organize collaboration of leadership from all Montana hospitals, including rural hospitals without an obstetric unit, to aid perinatal providers in achieving statewide coordination of a risk-appropriate care system. Stakeholders must determine statewide needs for transport, training, and emergency protocols. In addition, strategies must be developed to manage resource scarcities and distance challenges (Holman et al., 2022). Critical access hospitals and facilities that self-assess as less than level III (ability to provide neonatal intensive care unit), should ensure collaboration with higher-level facilities to achieve timely transport of complex maternal patients (Holman et al., 2022).

Lived Experts Enhancing Quality Improvement. Another partner in advocating for improvements in preeclampsia is MoMMA’s (Maternal Mortality and Morbidity Advocates) Voices—a coalition that believes women and families’ lived experiences should be integrated into QI efforts. The American College of Obstetrics and Gynecology (ACOG) educates cohorts of healthcare professionals about the Lived Experience Integration framework, designed to engage patients in sharing lived experiences during PSB implementation and other QI efforts (Preeclampsia Foundation, 2022). “Starting in late 2022, MPQC-AIM formed a Steering Committee to provide direction and leadership to the MPQC activities, ensuring meaningful involvement of multiple sectors of maternal health care.” “The Steering Committee will include one to two lived experts (patient family partners) to ensure the voice of patients and their experiences are included in these QI efforts. (Stephanie Burkholder, personal communication, April 11, 2023).

Microsystem Assessment

Preeclampsia has far-reaching implications; beyond affecting families, it possibly impacts many clinical microsystems. Preparing a clinical microsystem to manage preeclampsia care holds merit. A clinical microsystem is the smallest unit within a healthcare delivery system, “composed of people, processes, technologies, and patterns of information that interact and dynamically transform one another. The clinical microsystem is the place where patients, families, and caregivers meet. It is the locus of value creation in health care” (Nelson et al., 2011, p. 2). This QI teaching project assessed a microsystem that prepares nursing students for practice, referred to within this project as the school of nursing (SON) to protect confidentiality. The student-learning outcomes and overall program goals at the SON prioritize evidence-based

practices, patient-centered care, ethical standards, innovation, interprofessional communication and collaboration, recruitment and retention of a qualified and engaged faculty, and contribution to improving healthcare for the local and regional communities (SON, 2022). The SON's learning outcomes and program goals benefit this project, as the goal is to inspire stewards to role model advocacy for EBP, as collaborative, patient-centered team members.

Simulation Clinical Objectives

1. "Demonstrate appropriate fetal and maternal assessments during simulation scenarios"
2. "Perform, analyze, and prioritize patient management for clinical situations involving the obstetric patient and family" (Instructor A, personal communication, Simulation Lab Information, n.d.).

Persons

Participants are senior-level nursing students taking the Nursing Care of the Childbearing Family course. The students are expected to graduate with a Bachelor of Science in Nursing degree. The fall 2022 semester cohort had 26 students, three of whom were males. The Spring 2023 semester cohort had 23 students, six of whom were males. The ages of students ranged from 21 to 45 years old. The cohort consisted primarily of Caucasian students. Each group had multiple students who worked in healthcare, such as certified nursing assistants and telemetry technicians.

Professionals

The nursing instructor has a Master of Nursing degree in nursing education. The instructor also works per diem as a registered nurse at the Level II community hospital's

Women's Health and Obstetrics unit, covering labor and delivery, NICU, and postpartum. The instructor is familiar with practicing the Severe Hypertension in Pregnancy PSB. The instructor dictates scenarios for the course cohort with help from the simulation center coordinator and technician. The coordinator has a Ph.D. and is responsible for policies and procedures, keeping up with guidelines and credentialing. The technician has a Bachelor of Science degree in humanities and is responsible for the technological aspects. The instructor described the faculty morale as great, with staff excited about the increased use of simulation and eager to learn (Instructor A, personal communication, September 3, 2022).

Patterns

The SON prioritizes active learning strategies to prepare for practice in the current healthcare system. The instructor is continuously updating content to reflect the latest EBP methods. The instructor looks to the Association of Women's Health, Obstetric, and Neonatal Nurses (AWHONN), a professional organization for nurses caring for women and newborns, and the ACOG guidelines for the latest care practices to incorporate into curriculum content, skills labs, and simulations (Instructor A, personal communication, September 3, 2022; SON, 2022).

Processes

Students complete nearly 1,000 clinical hours during nursing training, including skills and simulation labs, and clinical experiences in the healthcare settings of surrounding communities. Hands-on-learning and a low student-to-faculty ratio are priorities, with 20–30 students per cohort (SON, 2022). Each semester, the cohort is divided into three separate clinical groups to allow for a smaller number of learners during each experience. The instructor

described there is one credit-hour for clinical, simulation, and lab, which equals 45 hours of course work. Skills labs occur at the beginning of the semester and teach tasks such as interpreting tracings on the electronic fetal and contraction monitor (EFM), performing sterile vaginal exams, and practicing newborn skills. Three scenarios occur during the latter part of the semester, including fetal intolerance to labor, postpartum hemorrhage, and a vaginal delivery, totaling 9 of the 45 hours. The rotation through the three scenarios ensures that each student participates in at least one of the three scenarios as a nurse. Each student spends 2 clinical days with a preceptor, a nurse at the community hospital's Women's Health and Obstetrics unit, possibly assisting with labor and delivery, NICU, postpartum, and lactation alongside their preceptor. Each student also spends 1 day in an outpatient setting. Options include midwifery, obstetrics-gynecology clinics, family planning, and the community health center.

The simulation center has four suites, flexible for hospital, home, or clinical office settings. In addition, there is a nurse's station, a medication room, space for telehealth, and debriefing areas. The simulation center utilizes a technological program called Learning Space; it can control the audio-visual system, scenarios, rubrics, periodic automatic replacement (PAR) system for supplies, and functionality for the scenarios. Additionally, the simulation center has a state-of-the-art high-fidelity obstetric manikin, able to simulate labor phases, childbirth, and seizures. National League for Nursing resources are primarily used for scenarios. The nursing program does include interprofessional education (IPE) during other course(s) throughout the curriculum, but IPE is not included in this obstetric course (Instructor A, personal communication, September 3, 2022).

The current process for simulation in this course includes preparation, pre-briefing, scenario, and debriefing. Students are required to prepare with the essential materials provided prior to the scenario, including signing consent forms, preparation of intrapartum drugs pertinent to the scenario, review of information from lectures and skills labs, assigned chapters in the textbook, and a pre-simulation online assignment (Instructor A, personal communication, September 3, 2022). Three to four students from each group perform the scenario, roles are defined as two to three nurses working as a team and one representing a family member. The other members of the group sit behind a one-way mirror and observe the scenario. Approximately 20 to 30 minutes are spent on the scenario, followed by 20 to 30 minutes spent on debriefing. If time allows, three to four of the observation members of the group execute the scenario, while the initial participants become the observers. Slight changes might be made to create the realism of the unexpected nature of a clinical setting. Then, debriefing occurs again. Students must keep the scenario and interactions confidential. Breaking confidentiality violates the nursing department's code of conduct policy. Respect is expected during debriefing and students are encouraged to highlight positives, while providing constructive feedback (Instructor A, personal communication, September 3, 2022).

Tanner's Clinical Judgment Model is the framework for debriefing and provides students with systematic reflection, guiding students through four sequential clinical reasoning processes, including notice, interpret, respond, and reflect (Tanner, 2006) (see the Theoretical Framework section for a detailed description of the model). The use of Tanner's Clinical Judgment Model aligns with the Next Generation, National Council Licensure Examination (NCLEX) by preparing students to go through similar steps expected by Next Generation NCLEX, including

recognize and analyze cues (notice and interpret), prioritize hypotheses, generate solutions, take actions (respond), and evaluate outcomes (reflect) (Betts et al., 2022).

There is a post-simulation assignment, which includes a reflective journal and the development of two care plans. Each care plan addresses a priority problem, with a nursing diagnosis(es), a goal/outcome, and four interventions with rationales and evaluations. Simulations are graded as pass/fail (Instructor A, personal communication, October 14, 2022).

Observations

On October 21, 2022, one of the groups in the fall cohort performed the fetal intolerance to labor scenario. The fetal intolerance to labor was caused by uterine tachysystole (frequent contractions), which led to uteroplacental insufficiency, inadequate blood flow to the placenta, diminishing transmission of nutrients, oxygen, and fetal wastes (Medical Dictionary, 2022). During pre-briefing the instructor reviewed previously learned content and skills to recognize category I, II, and III tracings on the EFM. Interpretation of the tracing is determined by assessing baseline, variability (positive health indicator if moderate, negative if minimal/flat line), accelerations (positive health indicator), and decelerations (head/umbilical cord compression and/or hypoxia). A category I tracing is normal, and students were taught to continue to monitor while supporting maternal coping during labor. Category II and III tracings may indicate a pathologic issue, such as uteroplacental insufficiency. To manage category II and III tracings, the instructor taught the students eight interventions to appropriately manage intrauterine resuscitation (see first paragraph of the Simulation Process subheading within the Implementation Procedures section in Chapter Three for further detail). The students performed

appropriate interventions to restore fetal blood flow and oxygenation, which allowed for continuation of the laboring process (AWHONN, 2017; Instructor A, personal communication, October 21, 2022).

On October 26, 2022, members of one group cycled through the postpartum hemorrhage (PPH) scenario twice. The students were instructed to consider any pregnant woman at risk for PPH and be prepared to treat. Pre-briefing included a PowerPoint presentation with risks, causes, prevention methods, and intervention techniques. The students were encouraged to call for help from an observing student nurse during the scenario, to manage continuous massaging of the fundus, a necessary intervention, and allow the team to focus on assessment and interventions. Unfortunately, the first group of students forgot they could call for an extra nurse and the patient was left with a boggy (soft) uterus and hypotension, while the nurses were task focused. The next group learned from the observation and debriefing and swiftly called for an extra student nurse who massaged the uterus until the combination of interventions, massage, and medications resulted in the simulation manikin's uterus firming up. The second group also appropriately lowered the head of the bed and raised the foot of the bed, to help with the hypotension caused from the hemorrhage. During the emergency intervention, the students had to call the lab and blood bank to manage patient care.

On November 17, 2022, one of the groups performed the vaginal delivery scenario. Pre-briefing involved a PowerPoint to review the interventions throughout the four stages of labor and newborn care. The scenario expected the students to act as rural emergency room nurses in Eastern Montana. The delivery was precipitous, meaning delivery occurred swiftly before a physician was present and care was provided by nursing staff. Three student nurses acted as a

team to manage the tasks of mother and baby. The students had to practice previously learned skills of monitoring contractions and variability on the EFM in conjunction with supportive care for the mother during the phases of labor. Similarly, after delivery, the nurses had to administer Pitocin and perform fundal massage to reduce the risk for PPH. During debriefing, reflection identified the nurses should have called the obstetrician sooner to notify the provider of a swiftly progressive birth. The students expressed pride in their teamwork.

Overall, the students were more confident and composed during the PPH and vaginal delivery scenarios than during the first experience when they managed fetal intolerance to labor. In addition, the students showed progression in catching the oversights made during previous cycles and performed the scenarios with a prepared approach, meeting nearly every step of the possible interventions. Observing skill development of the fall 2022 cohort showed promise for using simulation to prepare the Spring 2023 nursing students to manage preeclampsia.

Problem

Preeclampsia complications are largely preventable when appropriate care is provided promptly; however, prevention and management techniques are often underutilized (Akalin & Sahin, 2020; Preeclampsia Foundation, 2022). Informed providers may have a solution to this problem; therefore, the goal is to educate future advocates, nursing students, about the evidence-based guidelines and resources to improve preeclampsia care in Montana.

Significance

The microsystem assessment illuminated the possibility of integrating an HFS scenario specific to preeclampsia into the current nursing curriculum. Educating nursing students before entering the workforce may help disseminate the urgent message to consider all pregnant and postpartum women at risk for preeclampsia. After graduation, the nurses may practice in rural healthcare facilities throughout Montana. Because nurses perform attentive caregiving to antepartum, laboring, and postpartum patients, nurses must have appropriate knowledge and skills in recognizing, intervening, and advocating for the proper care of preeclampsia (Preeclampsia Foundation, 2022). HFS prepares learners to manage obstetrical emergencies, including preeclampsia, while allowing for a student-centered, safe learning environment. Furthermore, HFS provides a controlled environment to practice, repeat tasks without causing harm, replace or expand real clinical experiences, reflect on mistakes, and develop team-based communication skills (Abraham & Kusheleva, 2019; Akalin & Sahin, 2020; Chaudhari, 2019; Ennen & Satin, 2021; Raney et al., 2019; Silva et al., 2021; Tabatabaeian et al., 2018; Walker et al., 2014).

Purpose

The purpose of this QI teaching project was to adapt an HFS scenario to aid undergraduate nursing students in developing knowledge, psychomotor (technical), and affective (values) skills to manage intrapartum care (labor and delivery) for a patient with preeclampsia.

Aim 1

Adapt a preeclampsia-focused simulation process to meet the course's learning objectives and curriculum goals.

Aim 2

Evaluate using multiple tools (see Chapter Three) to assess the comprehensive integrity of the adaptation and continuously improve.

Aim 3

Utilize a modified version of the Kirkpatrick Four Levels of Training Evaluation tool to evaluate the learning outcomes and satisfaction of the training for the nursing students.

CHAPTER TWO

LITERATURE REVIEW

Introduction

Chapter Two, “Literature Review,” provides a holistic approach to preeclampsia care management. Included is a description of the search strategy, the theoretical framework, and a review of the literature on the following topics: (a) preeclampsia-based simulation research, (b) current best practice guidelines, (c) resources to improve current practice, and (d) research limitations.

Search Strategy

Databases searched included Montana State University (MSU) Library-Catsearch, Cumulative Index of Nursing and Allied Health Literature (CINAHL), PubMed-National Library of Medicine, and UpToDate. MSU Library-Catsearch produced the most relevant articles for this QI teaching project. The literature review focused on simulation as it related to preeclampsia and maternal or neonatal outcomes. Inclusion criteria selected articles specific to hypertensive disorders of pregnancy and obstetric emergency care in conjunction with simulation training. Exclusion criteria omitted any articles outside the scope of the literature review outline, articles dated before 2013, and experimental treatments not recommended by the current practice standards released in June 2022 by the Alliance for Innovation on Maternal Health (AIM) in collaboration with ACOG.

Filters used to narrow keywords were: 2013–2022, peer-reviewed, humans, female, preeclampsia, simulation, infant/newborn, hypertension, pregnancy outcome, pregnancy complications, obstetrical emergencies, preeclampsia epidemiology, hypertension in pregnancy, newborn/infant medical care, and English. The keywords “simulation and preeclampsia” produced 120 results; 13 were chosen based on the inclusion and exclusion criteria. To identify articles pertinent to the theoretical framework for this project, the keywords “simulation and theory” were used, but not filtered, producing 117 results. One article was chosen to present the theory for this QI project, “Tanner’s Clinical Judgment Model,” the original, research-based publication written by Christine Tanner, the developer of the model. Finally, references from pertinent articles were examined for expansion on topics, and 21 studies were identified for the literature review. A wealth of research and evidence-based gray literature was available related to preeclampsia (see table in Appendix E for organizations that advocate for improvements in maternal and fetal healthcare).

Theoretical Framework

Tanner’s Clinical Judgment Model is the theoretical framework for this QI teaching project because the nursing students are accustomed to its use during debriefing. The familiarity is expected to allow them to mindfully move through the steps of noticing, interpreting, responding, and reflecting during the debriefing of the preeclampsia-focused simulation. The research-based model originated in 2006 when a researcher, Christine Tanner, synthesized the research surrounding clinical judgment. Tanner (2006) described the model’s relevance in “continuous reappraisal and response” (para. 40) in rapidly changing clinical situations,

strengthening the model's significance for this QI teaching project as preeclampsia is a highly variable condition. Furthermore, Tanner expressed that the model applies to nurses and provides a framework to guide nurse educators "to help students diagnose breakdowns, identify areas for needed growth, and consider learning experiences that focus attention on those areas" (para. 40).

Tanner (2006) described the primary components of the model (see Appendix C for the template utilized by the SON). The first step, noticing, involves perceiving the situation, aided by clinical and practical knowledge, values, environmental culture (typical patterns of care), and scenario complexity. The second and third steps are interpreting and response, which occur in tandem as the nurse interprets the subjective and objective data and must determine the appropriate course of action. If a nurse recognizes a pattern, interpretation with an intuitive response may occur. Signs of patient improvement to the intervention confirms an appropriate course of action. If a nurse cannot make sense of the scenario, additional assessments are continued to reach an interpretation and appropriate response (Tanner, 2006). The last step, reflection, has two types. First, reflection-in-action; the nurse's ability to interpret the patient's response to an intervention and adjust as necessary during the scenario. Next, reflection-on-action occurs after the scenario. For example, during debriefing, nursing students at the SON are encouraged to start with the initial factors noticed about the patient scenario and move through how and when things changed. Next, the learners reflect on their interpretation of the scenario and each responsive action. Lastly, the learners reflect-on-practice and determine if the intended outcome was achieved and discuss improvements (Instructor A, personal communication, October 21, 2022).

Preeclampsia-Based Simulation Research

Simulation Training and Preeclampsia

In a study aimed to determine the impact of HFS on managing preeclampsia, Akalin and Sahin (2020) reported the intervention group who experienced HFS scored significantly better compared to the classically trained group in performing essential nursing interventions, including recognizing signs and symptoms and managing complications. Similarly, Raney et al. (2019) studied the impact of a nurse mentor program and simulation training on improving use of EBP to care for preeclampsia and eclampsia. The study focused on low-resource, rural settings. Overall, the participants showed improvements in using evidence-based steps during preeclampsia management. Raney et al. (2019) discovered simulation training enables teamwork, communication, leadership, and develops confidence. The nurse mentor program created a clinical discussion platform to evaluate cases and review guidelines, which diminished staff hierarchy and fostered collaboration between nurses and physicians. However, the results identified a great need for additional training and resources. Barriers to successfully implementing standardized preeclampsia care in rural settings included: physicians rarely present, knowledge gaps, staff hierarchy, resource shortages, such as ambulances and supplies, and long distances to higher-level hospital care (Raney et al., 2019).

According to Christian and Krumwiede (2013) preeclampsia is a high-risk, low-incidence emergency, which limits the exposure necessary for healthcare professionals to remain highly skilled and effective at managing the care. To compound the issue of limited exposure, training learners' new skills and maintaining those skills are complicated. Moreover, when a lack of skilled professionals combines with limited resources in smaller hospitals, the high-risk nature of

obstetric care is intensified. Christian and Krumwiede (2013) conducted a prospective cohort study using HFS, which showed improved self-efficacy, confidence in managing preeclampsia, and retention of knowledge at 8 weeks post simulation training.

Table 2.1. Articles that Reported Potential Benefits and Knowledge Gaps Surrounding HFS and Preeclampsia

Author/ Year	Study Design/Purpose	Methods and Sample	General Findings
Akalin & Sahin (2020)	Mixed-methods design	<ul style="list-style-type: none"> • 107 senior-level nursing students were randomly assigned to a control or experimental group. • The control group received classical training to manage preeclampsia, while the experimental group utilized an HFS scenario. 	<ul style="list-style-type: none"> • The higher post-test and retention of knowledge scores were statistically significant for the experimental group compared to the control group. • High satisfaction with HFS - facilitation of learning, improved self-confidence with decision-making skills and professional approach, provision of a safe learning environment, and a desire to utilize HFS for all clinical topics.
Christia n & Krumwi ede (2013)	Prospective cohort study	<ul style="list-style-type: none"> • n=49 • Studied self-efficacy in conjunction with preeclampsia and eclampsia management post high-fidelity human simulation. 	<ul style="list-style-type: none"> • Self-efficacy related to preeclampsia and eclampsia management significantly increased. • Evaluation at 8 weeks showed sustained results. • Satisfaction was positive. • Recommended evaluation of long-term retention.

Table 2.1. Articles that Reported Potential Benefits and Knowledge Gaps Surrounding HFS and Preeclampsia Continued

Author/ Year	Study Design/Purpose	Methods and Sample	General Findings
Raney et al. (2019)	Mixed methods – quantitative and qualitative eval	<ul style="list-style-type: none"> • Compared nurse mentees' first and last participation in SIM to evaluate the proportion and efficiency of EBP processes completed. • Semi-structured interviews with trained mentors to explore barriers and enablers to high-quality preeclampsia and eclampsia care. 	<ul style="list-style-type: none"> • Post SIM training, nurse mentees gathered more key patient history data, and performed more key management steps. • Only 1 of the nurse mentees showed statistically significant improvement in EBP. Despite improvements, nurse mentees had difficulty understanding preeclampsia vs. severe preeclampsia; administering magnesium sulfate was especially challenging.
Tabatabaeian et al. (2018)	Randomized-control-trial	<ul style="list-style-type: none"> • n=30 midwives per group. Intergroup comparison to evaluate simulation-based training, a blend of virtual simulation and lecture, and lecture on care for preeclampsia and eclampsia. 	<ul style="list-style-type: none"> • Simulation-based training scored significantly higher ($P<0.001$). • Simulation is better for retaining critical skills, such as managing eclampsia and magnesium sulfate poisoning – two life-threatening emergencies.

Table 2.1. Articles that Reported Potential Benefits and Knowledge Gaps Surrounding HFS and Preeclampsia Continued

Author/ Year	Study Design/Purpose	Methods and Sample	General Findings
Yang (2021)	A quasi-experimental non-equivalent control group pre- and postintervention design	<ul style="list-style-type: none"> • n=65 students; 35 experimental, 30 control group. • Tanner's Clinical Judgment Model - applied to the pre-simulation briefing. • Two experts observed, increasing the validity compared to self-report. 	<ul style="list-style-type: none"> • Post-intervention, no difference in knowledge between groups. • Recommended reduction in online learning time to decrease the amount of preparation knowledge expected of students. • The experimental group had significantly higher levels of critical thinking skills and confidence than the control group.

Interprofessional Simulation and Preeclampsia

According to Abraham and Kusheleva (2019), managing preeclampsia requires communication with the patient and the many potential professionals caring for pregnant women; therefore, simulation is ideal for developing team-based skills to manage complex care. Abraham and Kusheleva (2019) recommended including emergency and family physicians in simulation trainings that utilize IPE to improve outcomes in communities with limited access to obstetric care. In addition, Musits et al. (2020) discussed the importance of simulation in providing real-time feedback to professionals during decisions and interventions. Moreover, interprofessional sharing of perspectives helped to diminish departmental silos and improve communication.

Table 2.2. Articles Related to Interprofessional Simulation Training for Preeclampsia

Author/ Year	Study Design/Purpose	Methods and Sample	General Findings
Abraham & Kusheleva (2019)	Observational study – objective and subjective data	<ul style="list-style-type: none"> • n=30 residents. • A critical action's checklist was used to evaluate the residents. • Questionnaire pre and post simulation measured confidence in diagnosis and management of preeclampsia and eclampsia. 	<ul style="list-style-type: none"> • Confidence in caring for the emergency scenario improved after the simulation scenario with a p-value <.001, showing statistical significance. • The residents showed competence in the management of hypertension and preeclampsia. • None were able to prevent an eclamptic seizure. • The residents reported that the simulation experience was immensely valuable, as they had infrequently been exposed to eclampsia.

Table 2.2. Articles Related to Interprofessional Simulation Training for Preeclampsia Continued

Author/Y ear	Study Design/Purp ose	Methods and Sample	General Findings
Joudih et al. (2021)	A longitudinal study, no intervention group	<ul style="list-style-type: none"> • The estimated proportion of complicated deliveries. • Implemented a high-intensity nurse-mentor program focused on diagnosing high-risk pregnancies, management, and teamwork. • TEAMSTEPPS framework used for improving teamwork and communication. • Large-scale analysis of comprehensive emergency obstetric and neonatal readiness measured trends in diagnosis and management for high-risk pregnancies. 	<ul style="list-style-type: none"> • Preeclampsia and eclampsia cases were small; unable to assess the clinical significance of changes in treatment. • Diagnosis of hypertensive disorders of pregnancy (HPD) significantly increased. • Potentially effective comprehensive QI approach.
Lavelle et al. (2021)	Exploratory observational study	<ul style="list-style-type: none"> • n=62 providers; n=17 recorded scenarios • Evaluated using Temporal Observation Analysis of Teamwork framework. • Interprofessional simulation training to manage deterioration in pregnant women. 	<ul style="list-style-type: none"> • Scenarios with better outcomes were attributed to shared leadership and dissemination of the interventions' rationale to the team. • Delegation and lack of shared leadership were associated with poorer clinical performance.

Table 2.2. Articles Related to Interprofessional Simulation Training for Preeclampsia Continued

Author/ Year	Study Design/Purpose	Methods and Sample	General Findings
Musits et al. (2020)	Observational study, post simulation eval survey	<ul style="list-style-type: none"> • Multidisciplinary sim scenarios to train emergency medical providers to respond to obstetric emergencies when assistance is unavailable. • The preeclampsia-seizure case was a standardized patient (SP), high-fidelity for communication and mental status changes. • Standard sim eval form (scenario overall, relevance to training, faculty effectiveness at facilitation and debriefing). 	<ul style="list-style-type: none"> • Satisfaction related to learning from obstetric specialty and overall simulation experiences. • Success attributed to interdepartmental-collaborative model.
Siaulys et al. (2019)	Non- experimental, before and after study	<ul style="list-style-type: none"> • Followed the World Health Organization's reproductive health strategy to collaborate with private and public sectors using a partnership model to maximize the availability of health services. • Training in emergency obstetric care. • Compared pre- vs. post-course test scores. • 340 professionals, nurses, and physicians. 	<ul style="list-style-type: none"> • Significant improvements in knowledge scores. Post the hypertension module, scores improved by 55%. • High satisfaction scores. • Collaboration requires strategic organization and a strong commitment from the organizations.

Table 2.2. Articles Related to Interprofessional Simulation Training for Preeclampsia Continued

Author/ Year	Study Design/Purpose	Methods and Sample	General Findings
Walker et al. (2014)	Quasi- randomized trial	<ul style="list-style-type: none"> • n=12 intervention hospitals; n=450 professionals • PRONTO: low-tech, highly realistic, emergency obstetric and neonatal simulation-based team training. • Provided in 24 public hospitals. • Two modules, topics included preeclampsia and eclampsia, teamwork, communication, and others. 	<ul style="list-style-type: none"> • Knowledge and self-efficacy of providers and nurses significantly improved for all tested topics, including preeclampsia ($p < .001-.009$). • Teamwork scores improved and maintained. • 44% decrease in hospital-based neonatal mortality rate post interventions at eight-month evaluation. • Sim-based training coupled with team-training can save lives in low-resource settings.
Zhao et al. (2019)		<ul style="list-style-type: none"> • Train-the-Trainer program. • Used Kirkpatrick Model (2006) for program evaluation, measuring reaction, learning, behavior change, and results. • Role-play and debriefing of preeclampsia. 	<ul style="list-style-type: none"> • Recommended future simulations include the students to reduce gaps in knowledge. • Sim trainers were trained for 16 hours and still felt this was insufficient preparation. • Recommended extending time in training.

Validation of a Preeclampsia-Based Simulation Scenario

According to Silva et al. (2019), there is not an abundance of literature to support the validation of simulation in conjunction with women's health and obstetrics. To design and validate a simulation scenario to manage proper care of severe preeclampsia, Silva et al. (2019) used Guilbert and Adamson's (2016) "five stages: overview, scenario, scenario design progression, debriefing and assessment" (para. 10). The validation process occurred onsite with an adequate number of judges experienced in nurse education or obstetrics to critique and provide recommendations to the professionals who acted out each of the stages. The evaluation tool to be used for critiquing learners was assessed for impartiality and the ability to help educators facilitate a debriefing that allowed for deep learning by systematically directing reflection. The judges were tasked with ensuring integrity, reproducibility, and alignment with clinical simulation standards, including the latest evidence. The Content Validity Index score for the scenario was 1.0, meaning 100% of the judges agreed on its validity.

Current Best Practice Guidelines

Prevention

It should be universal practice that obstetric clinicians comprehensively screen every pregnant woman for individual and family risk factors that contribute to preeclampsia (see Risk Factors within the Epidemiology section). If a woman has one or more risk factors, the clinician should prescribe a dose of at least 81 mg of aspirin daily, starting at 12–28 weeks' gestation, optimally before 16 weeks and continued throughout pregnancy, to attempt to prevent or stave off the onset of preeclampsia (ACOG, 2022; Kay et al., 2021; Society for Maternal-Fetal

Medicine, 2022). According to Rolnik et al. (2020), the complex pathophysiology of preeclampsia involves:

Suboptimal trophoblastic invasion leads to an imbalance of angiogenic and antiangiogenic proteins, ultimately causing widespread inflammation and endothelial damage, increasing platelet aggregation, and thrombotic events with placental infarcts. Aspirin at doses below 300 mg selectively and irreversibly inactivates the cyclooxygenase-1 enzyme, suppressing the production of prostaglandins and thromboxane and inhibiting inflammation and platelet aggregation (Rolnik et al., 2020, para. 1).

The effect is important during vasculature remodeling in early pregnancy and reduces the incidence of preterm preeclampsia, ultimately reducing length of stay in the NICU (Rolnik et al., 2020). Preeclampsia can affect any pregnant or postpartum woman; therefore, every obstetric patient and family needs education regarding the signs and symptoms to monitor and report. If a pregnant woman has preeclampsia symptoms, the immediate performance of a thorough maternal and fetal assessment promotes timely interventions that can potentially prevent complications (Preeclampsia Foundation, 2022).

Diagnostic Criteria

According to the Preeclampsia Foundation (2022), diagnostic assessments include basic blood chemistries, including complete blood count, creatinine, liver enzyme levels, and uric acid; thyroid examination; and urinalysis to assess for proteinuria, protein in urine indicating kidney injury, which may or may not be present, regardless of organ injury. The latest guidelines released by ACOG base the diagnosis on meeting the following factors: persistent hypertension during pregnancy or postpartum, possible elevated proteinuria, new development of thrombocytopenia (decreased blood platelets), symptoms of kidney and liver alterations, fluid in lungs, visual disturbances, and seizures (Preeclampsia Foundation, 2022).

High blood pressure is traditionally defined as blood pressure of 140/90 or greater, measured on two separate occasions 6 hours apart. Severe high blood pressure, which is a reading at or greater than 160/110, requires treatment right away, both during pregnancy and in the first weeks after delivery (Preeclampsia Foundation, 2021d, para. 4).

Signs and Symptoms. Concerning symptoms include “headaches, abdominal pain, shortness of breath or burning behind the sternum, nausea and vomiting, confusion, heightened state of anxiety, and/or visual disturbances such as oversensitivity to light, blurred vision, or seeing flashing spots or auras.” (Preeclampsia Foundation, 2022, para. 3). Furthermore, it is imperative that women and the providers monitor for swelling in the face or hands and sudden weight gain of more than three pounds in a week (Preeclampsia Foundation, 2021c). The pregnant patient should be provided with a blood pressure monitor and educated on how to properly assess at home. Readings should be recorded in a journal to determine trends and concerns. For postpartum women experiencing hypertension, a few weeks may be considered normal; however, three months postpartum, hypertension is considered chronic, and treatment is essential (Preeclampsia Foundation, 2022).

Screening Measures. According to Preeclampsia Foundation (2021c), current screening methods may contribute to inadequate or overuse of care procedures due to the variable presentation of preeclampsia. Onset may be early or late in pregnancy or postpartum and gradual or sudden. Therefore, preeclampsia patients should be seen more frequently than uncomplicated pregnancies and may experience more testing and ultrasound assessments. An important fetal screening, a nonstress test (NST), measures fetal growth and ensures normal blood flow through the umbilical cord and placenta. Continuous fetal monitoring may be required depending on the

severity of symptoms (Preeclampsia Foundation, 2021c). Uterine artery doppler, combined with other predictive tools, helps identify preterm preeclampsia in up to 75% of cases and fetal growth restriction in 55% of cases (Pedroso et al., 2018).

Treatment

Once preeclampsia is detected, treatment depends on gestation, the health of the mother and baby, and the disease progression. Monitoring health indicators of the fetus occurs in conjunction with measuring growth. The goal is to reach 37 weeks' gestation; however, preterm delivery will occur if the infant and/or the mother is in danger. Diligent lab testing monitors maternal kidney and liver function as well as blood clotting factors. Antihypertensive administration is titrated to keep blood pressure below severe ranges. If blood pressures exceed high ranges and/or any signs of seizure or stroke are present, administration of magnesium sulfate is used to prevent maternal seizures, with the concurrent goal of neuroprotection for the fetus. Before preterm delivery, steroids may be necessary for fetal lung development (Preeclampsia Foundation, 2022). The infant is most safely delivered in a facility prepared to care for specialized needs of fragile newborns (Preeclampsia Foundation, 2021a). The latest Severe Hypertension in Pregnancy PSB guidelines promote a postpartum visit within 3 days of hospital discharge date, including a blood pressure assessment and history (AIM, 2022). In a longitudinal study, aggressive medical treatment coincided with decreased incidence of eclampsia and improvements in infant mortality rates. Furthermore, the results showed that maternal outcomes did not worsen with the increase in diagnosed cases, suggesting improved care for maternal hypertensive disorders (Auger et al., 2016).

Future Directions

The Preeclampsia Foundation (2022) strongly advocates for the continued development of biomarkers, quantifiable biological products detectable in the body during a disease process. Biomarkers can predict pathology before symptoms; useful to screen and detect preeclampsia early in pregnancy. Testing is rapid with the potential to manage surveillance and care, prevent unnecessary preterm deliveries, and save lives. In addition, biomarkers can reduce unnecessary use of healthcare procedures, improving redundant costs. Unfortunately, the United States has been slow to adopt these screening tools as standards in clinical practice, but providers may use them to augment clinical judgment (Preeclampsia Foundation, 2022).

Study Limitations

In an article reviewing simulation-based research in obstetrics, Chaudhari (2019) expressed that simulation has the potential to positively impact patient safety by preventing errors and adverse events. Moreover, simulation impacts long-term outcomes in obstetrics care by improving competency, facilitating a culture of safety, and improving team training, which may promote a safe and rapid response during obstetric complications. However, evidence supporting simulation use in obstetric care shows conflicting results. For example, a blend of simulation and team training may improve comfort with obstetric emergencies, but there is inconsistency in showing improved clinical outcomes. Validating and standardizing protocols, as well as simulation training, may have a positive impact on long-term patient safety and direct care outcomes, but more research is needed (Chaudhari, 2019; Ennen & Satin, 2021). D’Alton et al. (2019) recommended systematic reviews of pregnancy-related deaths to improve care

outcomes. In addition, D’Alton et al. (2019) recommended studies to address the critical research gap that exists surrounding the effectiveness of current educational standards for maternal care.

Summary

Chapters One and Two illuminated the prevalence and severity of preeclampsia, collaborative resources available to improve obstetric care for rural communities in Montana, and the potential benefits of simulation education for nursing students. The current literature reveals the potential to improve education, practice standards, and collaborative commitment to providing safe, quality care for patients at risk for and/or who develop preeclampsia. QI efforts have the power to standardize use of evidence-based screening tools, prevention measures, and treatment procedures, culminating in improved outcomes. Empirical evidence shows interprofessional simulation training is beneficial to preeclampsia management; however, the simulation process adapted for this QI teaching project focused on developing skills for novice nursing students at the SON. Three separate simulation scenarios to cover prenatal, intrapartum, and postpartum care would be optimal; however, the adaptation of a scenario for intrapartum care is the narrow focus of the next chapter. Chapter Three details the methods used to educate and evaluate the SON’s Spring 2023 nursing cohort using a preeclampsia-focused simulation process.

CHAPTER THREE

QUALITY IMPROVEMENT METHODS

Overview

The methods described below aided in adapting a preeclampsia-focused simulation process, including preparation, pre-briefing, scenario, and debriefing. Collaboration with the instructor of the Nursing Care of the Childbearing Family course provided a partnership with a nurse educator skilled in obstetric care instruction. The instructor works for and monitors students at the community hospital's Women's Health and Obstetrics unit, a birthing facility dedicated to the latest evidence-based practice (EBP) standards. The diagnostic and treatment algorithms of the Severe Hypertension in Pregnancy patient safety bundle (PSB) are currently practiced on that birthing unit. During the fall 2022 semester, the performance of the microsystem assessment identified the potential to implement active learning strategies to help nursing students develop skills to care for preeclampsia. The instructor allowed for the quality improvement (QI) teaching project implementation to occur during the spring 2023 semester.

The simulation process was implemented in the School of Nursing's (SON) state-of-the-art simulation center. High-fidelity simulation (HFS) was the chosen pedagogy to help address the problem of EBP standards being underutilized. The problem deserves perseverance to inform healthcare professionals of the latest standards to recognize, intervene, and advocate for risk-appropriate care. The teaching modality allowed for use of active learning strategies to support knowledge, psychomotor, and affective skill development. It also allowed for hands-

on practice of certain elements in the PSB, including diagnostic criteria, assessment methods, and the treatment algorithms. According to Kelly and Hager (2015), healthcare simulation enhances behaviors, practical knowledge, and the affective (values) domain of learning as students develop their role as healthcare professionals. Furthermore, simulation provides vast learning opportunities related to the variation of each scenario. The variation depends on the context and how the scenario unfolds, impacted by the participants and facilitator(s). Benefits extend beyond predetermined learning objectives with the potential to facilitate collaboration and benefit peers as they observe how others manage similar scenarios (Kelly & Hager, 2015).

Design of the Quality Improvement Initiative

The design was tailored to the SON's simulation objectives (see Simulation Objectives subheading within the Microsystem Assessment section) and curriculum goals; therefore, the process focused on educating the nursing students to recognize and manage preeclampsia in conjunction with managing fetal intolerance to labor. Multiple resources were appraised to comprehensively adapt a simulation process, including tools, preeclampsia-focused scenarios, critical action's checklists, and debriefing materials. The resources were reviewed for applicability and adherence to the latest evidence-based guidelines for preeclampsia care and simulation pedagogy. Some of the scenarios had content on eclampsia; seizures triggered by unmanaged preeclampsia. Eclampsia is an emergent condition beyond the scope of the students' novice skill set. Therefore, the content retrieved from the resources was narrowly focused on manageable preeclampsia symptoms (see Appendix B to view the Adapted Scenario).

The instructor provided a Laerdol Learning Technology and CAE Healthcare scenario template designed for the high-fidelity obstetric manikin that was purchased by the SON. The template focused on fetal intolerance to labor and was modified to include preeclampsia-focused content. A critical action's checklist template was retrieved from a simulation process designed by authors Abraham and Kusheleva (2019), that followed the American College of Obstetricians and Gynecologists' (ACOG) evidence-based standards. The template was modified to include safe-care measures that fit the expectations of the scenario adapted for the nursing students at the SON (see Adapted Scenario in Appendix B). The California Maternal Quality Care Collaborative (CMQCC), an organization dedicated to standardizing obstetric care, created a toolkit to efficiently implement the PSBs (see references list for link to tools). The toolkit provided simulation materials, diagnostic criteria, and treatment algorithms for preeclampsia. The Maternal Obstetrics and Maternal Support (MOMS) Program's Simulation Learning Academy (SLA) provided tools to design, implement, and evaluate a simulation process (see references list for tools used).

Preparation and Pre-Briefing

The Nursing Care of the Childbearing Family course prioritizes preparation and pre-briefing before each simulation scenario, which promotes psychological wellbeing for students. According to Hussein et al. (2021), pre-briefing is a structured meeting between the facilitator(s) and learners. The time allows for a review of content and learning objectives. Moreover, the facilitator(s) reviews patient background information and orients the students to the manikin and medical setup to prepare for the scenario. Hussein et al. (2021) state that taking a standardized approach significantly improves psychological safety, confidence, and mitigates

trauma. Per Hussein et al.'s (2021) recommendations, the simulation incorporated plans to reduce stress, optimize knowledge review, and provide a safe learning environment by enhancing preparedness, assuring confidentiality, and reviewing the evaluation process.

A PowerPoint was created based on pertinent information from the QI teaching project's professional paper, to educate the nursing students during pre-briefing. In addition, the CMQCC toolkit offered a Hypertensive Disorders of Pregnancy PowerPoint, giving permission to use the slides for educational purposes. The nursing students' instructor also provided the PowerPoint slides from the course lecture focused on preeclampsia content. Slides from both resources were selected for use based on pertinence toward the simulation process.

The CMQCC has multiple visual aids to standardize and direct nurses in caring for preeclampsia. The Acute Treatment Algorithm is used to determine if a patient meets the criteria for a hypertensive disorder of pregnancy. If the patient meets criteria for preeclampsia, the algorithm directs the nurse(s) to send labs and follow the antihypertensive and magnesium sulfate treatment protocols (see references for link). The Acute Treatment Algorithm was provided to the students with preparation materials and handouts, which were given to use during the scenario.

Assessment of the Adapted Simulation Process

The Healthcare Simulation Standards of Best Practice, established by the International Nursing Association for Clinical Simulation and Learning (INACSL), were reviewed to ensure the adapted simulation process aligned with the guidelines. The MOMS Program's Simulation Design and Logistics Template was used to adapt a comprehensive simulation

process, including preeclampsia-focused content, simulation learning objectives, and the curriculum goals. The template was a checklist to ensure the logistics were met, such as staff roles, scheduling, materials to complete the simulation process, cues to focus the scenario progression, and scripting to guide the instructor and facilitator. The tool also encouraged determining an endpoint; therefore, the instructor and facilitator determined the scenario would stop around 20–25 minutes. The results of the nursing interventions would then be discussed in debriefing. Next, the Simulation Innovation Resource Center's (SIRC) Simulation Assessment Plan reviewed the articulation of the overall purpose, learning outcomes, prerequisite knowledge the students must possess, and the assessment plan. Ultimately, both tools objectively conveyed an adaptation suitable to educate the nursing students.

Implementation Procedures

All materials described above, including the PowerPoint, visual aids, adapted simulation scenario, critical action's checklist, modified evaluation tool (see Evaluation Tools and Outcome Measures section below), and take-home references (see details below) were sent to the instructor for review. Next, the facilitator and instructor worked together in the SON's simulation center on March 2, 2023, to review the preparation materials before the instructor dispersed them to students. Preeclampsia-related lab values were agreed upon and additional items were added to the critical action's checklist. Based on recommendations provided by the instructor, the teaching approach was revised by creating two PowerPoint presentations. The pre-briefing presentation focused on preeclampsia recognition and

management. Another presentation was designed for after debriefing and focused on the resources available in Montana to improve outcomes for high-risk pregnancies and summarized the simulation process goals.

Simulation Process

Prior to each scheduled simulation lab, the facilitator aided the instructor and technician during preparation of the medical setup. The instructor and facilitator spent approximately 1 hour on each group's pre-briefing. The pre-briefing lecture reviewed the expectations for students to perform the elements of the PSB while simultaneously assessing the EFM and intervening if category II or III tracings indicated fetal intolerance to labor. Hypertensive disorders of pregnancy increase risk for vasoconstriction, contributing to uteroplacental insufficiency. During labor contractions, the combination of hypertension and contractions can exacerbate uteroplacental insufficiency, displayed as category II and III tracings on the EFM, indicative of hypoxia (lack of oxygen). Without intervention, the fetus can develop acidosis/acidemia. The students were taught eight possible interventions to maximize oxygen and uterine blood flow to prevent acidosis for the fetus. The first intervention is to change maternal position, alternating to the left and right side to achieve improvement. The head of the bed should be lowered flat to maximize cardiac output and relieve cord compression. Secondly, treat the cause; in this scenario, relieve vasoconstriction caused by hypertension. The third intervention is to administer a 500 ml bolus to improve placental blood flow. This decision requires clinical judgment due to the combination of severe preeclampsia and magnesium sulfate that places the patient at risk for pulmonary edema. Other interventions may include discontinuation of Pitocin (relieve contractions), sterile vaginal exam to determine stage of labor,

medication (Terbutaline) to slow uterine contractions, and amnioinfusion, injection of lactated ringers to replace uterine cushion. If interventions do not improve fetal intolerance to labor, the nurse(s) must notify the provider of the emergency (AWHONN, 2017; Instructor A, personal communication, March 22, 2023; Instructor A, personal communication, March 30, 2023; Instructor A, personal communication, April 6, 2023).

After the PowerPoint lecture and the scenario and medical setup were reviewed, the students were given time to ask questions and express concerns, and agreed on feeling prepared to begin the scenario. Each scenario cycle lasted an average of 20–30 minutes, allowing the students time to accomplish the evidence-based standards expected on the critical action's checklist. The EFM was programmed to show category I tracings initially, then transitioned to category II tracings to encourage the students to demonstrate interventions to improve fetal blood flow and oxygenation. However, no category III tracings were used to allow the students to progress through the care of managing the preeclampsia diagnosis. The students relied on the evidence-based diagnostic and treatment algorithms from the PSB while performing team-based care to the simulation manikin.

During summarization, the presentation reviewed the overarching goals: to consider all pregnant and postpartum women at risk for preeclampsia, recognize signs and symptoms, intervene using the latest EBP standards, and urgently advocate for risk-appropriate care. In addition, the delay in statewide implementation of the perinatal PSBs was reviewed to strengthen awareness that rural settings, dependent on level classification, may be unprepared to manage high-risk maternal and neonatal care. Multiple take-home references were provided. First, a table was created to compile perinatal advocacy resources, including

organizations available in Montana and nationally, to improve maternal-fetal outcomes (see Appendix E). Next, two printouts from the MOMS Program, a diagram and a description, were provided. These show the resources available in Montana to standardize education and promote collaboration in caring for high-risk pregnancies (see Appendices F and G). In addition, visual aid sheets depicting signs and symptoms of preeclampsia that demand urgent intervention were purchased from the Preeclampsia Foundation and laminated for the students (see Appendix H).

Evaluation Tools and Outcome Measures

Four evaluation tools were used for this QI teaching project. The first tool, the modified critical action's checklist, served as a guide for the facilitator and instructor to collect data on student performance during the simulation scenario. The checklist objectively measured whether the students obtained a focused history and physical assessment, performed vital signs, and provided treatment based on the PSB algorithms. It also determined whether the students assessed fetal heart rate tracing and contraction patterns appropriately. Lastly, the checklist expected students to demonstrate team-based, interpersonal skills during care for the HFS patient. The data aided the discussion and provided constructive feedback during each debriefing.

The second tool, Tanner's Clinical Judgment Model, was used to evaluate the effectiveness of the students moving through the four sequential reflection processes during debriefing, "notice, interpret, respond, and reflect" (Tanner, 2006). Tanner's Model facilitated

reflection of the students' actions during the scenario, recognition of areas for improvement, and the students' emotional responses to the HFS patient outcome.

The third tool, a concise, modified version of the Kirkpatrick Four Levels of Training Evaluation tool, was used to collect qualitative data from each group. The survey tool, described in detail below, was considered a research component of this QI teaching project; therefore, a human subject protocol for the Institutional Review Board (IRB) was completed. A form explaining voluntary participation in the evaluation was provided prior to subjective data collection. The form detailed the QI nature of the data, assured protection of anonymity, explained that the survey did not affect the students' grade, and detailed that the results are generalized for the purposes of this paper. The goal of the data was to improve the simulation training. In addition, the form described the possible harm associated with the context of this QI teaching project, from preparation to debriefing. This could include stress anticipated for participants who receive formative feedback and a pass/fail grade for participation and evaluation in simulation lab. In addition, there is a possibility for emotional distress related to preeclampsia-focused content (see Appendix D to view details). Returned evaluation forms were assessed to ensure anonymity and will be kept safe for 3 years per the IRB requirements.

The modified Kirkpatrick Evaluation tool, used as a survey, collected subjective data. The reaction-based questions of the tool targeted how students felt about every step of the simulation process, including preparation, pre-briefing, scenario, and debriefing. The learning-based questions targeted what was learned and what could have improved learning. The behavior change(s) question targeted the students' plan(s) to use the EBP standards as a registered nurse. Finally, the results-based question targeted how the content and training

facilitated meeting the clinical simulation objectives. Performance of a Plan-Do-Study-Act (PDSA) cycle to evaluate the outcome of each process, improve, and test again was used to refine subsequent implementations (Council on Patient Safety in Women's Health Care, 2016).

Timeline

The QI teaching project began during the fall 2022 semester with observations and performance of a microsystem assessment in conjunction with the literature review. The design of the simulation process was completed in March 2023. Implementations of all three simulation groups occurred on March 22, 30, and April 6, 2023. Dictation of the data and final revisions were completed, followed by professional submission for approval of publication in April 2023.

Stakeholders

The stakeholders who benefited from this QI teaching project are the nursing students, course instructor and faculty at the SON, and the potential obstetric patients and birthing facilities impacted by the nursing students. Moreover, the students can carry the instructions of using EBP standards into all areas of healthcare.

Expenses

The total cost of the QI teaching project implementation was \$228.44. Expenses included fuel for travel to and from the SON; a total of seven trips equaled approximately

\$65.00 for the full tank used. Printing and lamination costs for the take-home references were \$137.51. Purchase of the English/Spanish visual aids from the Preeclampsia Foundation for the nursing students to take with them as a reference during their careers was \$25.93.

CHAPTER FOUR

RESULTS

Review of the Problem

The epidemiological section of Chapter One highlighted that preeclampsia is the most common complication to severely affect pregnancies in the United States; yet the condition is often mismanaged (Druzin et al., 2021). To review, Druzin et al. (2021) reported 50% to 70% of preeclampsia-related morbidity and mortality is preventable. However, maternal-fetal care providers must overcome multiple system failures that lead to poor outcomes and deaths. Improving system failures includes measures such as screening, prevention, education, timely treatment, and coordination of providers and systems of care. Reducing the burden of poor outcomes on Montana families and the healthcare system begins with requiring universal screening for preeclampsia risk factors. This screening promotes the use of prevention measures, including aspirin and increased monitoring. Providing patients and family members with education related to reportable concerns must be ongoing, as preeclampsia signs and symptoms should not be mistaken for benign discomforts of pregnancy. Timely responses to concerning symptoms must occur, using evidence-based practices (EBP) to correctly diagnose and effectively treat preeclampsia. Moreover, coordination of providers and systems of care will be vital to improving outcomes (Druzin et al., 2021; Healthcare Practices, 2018).

Barriers to improving preeclampsia outcomes include the sparse availability of specialized obstetric care in Montana and the delay in rural hospitals implementing the Severe Hypertension in Pregnancy patient safety bundle (PSB) to standardize care across the state. To

help alleviate the underutilization of the EBP standards, the quality improvement (QI) teaching project utilized high-fidelity simulation (HFS) to provide senior-level nursing students with a holistic approach to preeclampsia care and hands-on practice of the diagnostic and treatment algorithms found within the PSB. Chapter Four, below, will summarize themes discovered during the literature review, objective and subjective data collected, and the next steps in improving outcomes for patients with preeclampsia in Montana.

Discussion

Significant findings uncovered in the literature review included the prevalence, severity, potential complications, and sequelae of preeclampsia; the need to prevent poor outcomes related to mismanagement; the benefits of using EBP standards; and the resources available to improve outcomes for birthing patients in Montana. In addition, simulation-based research showed HFS significantly improves preeclampsia management, while also highlighting the need for empirical evidence to demonstrate the impact on long-term knowledge retention, direct care, and patient outcomes (see tables within Chapter Two). Furthermore, there is a need for training simulation educators. Zhao et al. (2019) found that simulation facilitators felt 16 hours of training was insufficient and recommended increased preparation time prior to competence and confidence in the provision of preeclampsia-based simulation pedagogy.

Project Alignment with Theoretical Framework

The QI teaching project and evaluation methods aligned with the theoretical framework, Tanner's Clinical Judgment Model, by promoting the development of clinical judgment to care for preeclampsia. As Tanner (2006) recommended, the four evaluation methods chosen to assess the teaching modality guided the instructor and facilitator in identifying missteps and areas for needed growth. The students met nearly every item in the four categories on the critical action's checklist, including Initial Evaluation and Management of Preeclampsia, Management of the Labor Process, Nursing Skills, and Interpersonal Skills (see Critical Action's Checklist within Adapted Scenario in Appendix B), but had several areas for improvement, described below. Similarly, the literature review findings emphasized the need for repetition in training for obstetric emergencies (see Tables 2.1 and 2.2).

Student Challenges

Pre-briefing reviewed the importance of having the antidote calcium gluconate in the patient room due to the high-risk nature of magnesium sulfate causing toxicity. Each group forgot to ensure the antidote was in the room. Only two of the three groups performed assessments, such as deep tendon reflexes, prior to and after administration of magnesium sulfate, to evaluate for toxicity (see Critical Action's Checklist for more detail). Similarly, all the groups could have improved provision of seizure precautions. The first group had difficulty frequently monitoring the electronic fetal monitor (EFM) and needed prompts, such as the instructor (acting as the patient) saying phrases like, "Is my baby okay?" In the second half of the scenario, when the EFM showed category II tracings, the first group did identify the concerning

variability and decelerations; however, they were overwhelmed with tasks for managing maternal assessment, medication administration, and patient care. The difficulty in managing both maternal and fetal tasks led to delayed interventions to alleviate fetal intolerance to labor. However, the students did begin interventions prior to the scenario ending. The second and third groups were encouraged to define team roles and have a nurse focused on the EFM. The second and third groups independently recognized changes and more swiftly intervened for fetal intolerance to labor. The first and second groups promptly administered the antihypertensive; however, the third group was delayed in administration, due to attention being focused on preparation and administration of magnesium sulfate. The students identified the patient's name and date of birth at the beginning of each scenario; however, only one of the three groups performed dual identification of the patient once again prior to medication administration. The students discussed having difficulty answering patient and family member questions or providing education while trying to manage care tasks.

Student Strengths

Overall, the student's basic nursing skills aided in the goal to provide safety and quality during the high-risk maternal-fetal care scenario. The students worked as a team to perform accurate blood pressure assessments, follow the treatment algorithms, accurately calculate medication doses, and offer comfort techniques. With minor delays, the students succeeded in providing antihypertensive and seizure prevention medications in conjunction with performing interventions to alleviate fetal intolerance to labor.

Debriefing

The debriefing time provided a space to reflect on the students' performance during the scenario. The instructor began the discussion by soliciting the active participants to share emotional responses to the scenario; many stated it felt "unfamiliar" and "stressful." Next, the observers expressed feeling the active participants appeared calm and composed, doing a great job to complete tasks during labor pain moans and having to answer patient/family questions. The instructor utilized open-ended questions to promote critical thinking as the team moved through the four sequential processes, "notice, interpret, response, and reflection" (Tanner, 2006). Discussion allowed for students to develop a deeper understanding of the tasks that required improved clinical judgment. The formative feedback provided during debriefing highlighted strengths and areas for improvement. The instructor reassured the students that participation in subsequent scenarios will typically result in the ability to prioritize the EFM more effectively while simultaneously caring for the mother. The instructor also reviewed the method of having the magnesium sulfate as its own main line, hooked to the closest port on the ringers lactate, in case the medication needs to be stopped, to prevent residual medication from infusing into the patient if there is a need to treat toxicity.

The post-debriefing PowerPoint included a case scenario of a patient with preeclampsia who did not receive care using evidence-based practice standards to promote a healthy outcome for the mother and fetus. The pregnant patient's concerns of preeclampsia were dismissed at 32 weeks' gestation without further investigation and declared as benign gestational hypertension. Finally, the patient was induced at 36 weeks, 2 days' gestation due to preeclampsia with severe features, in a critical access hospital without a NICU. The providers failed to transfer the patient

to a risk-appropriate care setting and did not remain onsite to manage the high-risk maternal-fetal patient. The facility did not have central monitoring. The nurses failed to recognize and intervene for category II and III tracings, causing hypoxia and acidosis during the long labor. Post-delivery, the care team was ill-prepared to provide proper neonatal resuscitation. The neonate died despite the resuscitation team's best efforts. The mother, husband, family, and care team suffered from preventable trauma. The discussion reviewed the teaching goal for the students to advocate for level-appropriate care with personnel and resources skilled to care for high-risk pregnancies. The instructor also reviewed the use of a nonconfrontational advocacy approach, known as a Concern, Uncomfortable, Safety (CUS) statement, allowing for nurses to get the attention of the team by stating "I feel concerned, this makes me uncomfortable, I feel this is a safety issue." The PowerPoint reviewed that timely, evidence-based care reduces/prevents complications, the sparseness of level III/IV/NICU birthing facilities in Montana, and the resources available to improve care for high-risk pregnancies. To summarize, the facilitator reviewed the overarching goals: recognize preeclampsia, intervene using EBP, and advocate for risk-appropriate care. Lastly, the take-home references were given (Instructor A and nursing student group one, personal communication, March 22, 2023; Instructor A and nursing student group two, personal communication, March 30, 2023; Instructor A and nursing student group three, personal communication, April 6, 2023).

Kirkpatrick Four Levels of Training Evaluation Tool

The modified Kirkpatrick Four Levels of Training Evaluation tool helped to identify the participants' perceptions of the experience. The results can improve subsequent implementations by helping to diagnose breakdowns in the teaching approach and focus attention on improving

those areas. Themes emerged from the returned survey forms; 21 of 23 students provided feedback. Common survey results showed the students felt the pre-briefing created a safe environment to participate. The students reported that the treatment algorithms, pre-briefing, and debriefing were most helpful to facilitate learning. The students reported a desire for increased time to review the education and perform the scenario, otherwise there were no other suggestions for improving the teaching modality. The scenario was reportedly helpful related to “hands-on” practice and some observers’ surveys showed a desire for hands-on participation. The students reported understanding the risks surrounding preeclampsia, including the prevalence and severity of the condition. The simulation process reportedly increased the students’ confidence in recognition of symptoms and interventions to care for preeclampsia. The behavior of the students will reportedly change in the following ways: active listening to avoid overlooking patient concerns, strong advocacy for mother and baby, and consideration of postpartum education and monitoring. The students reported the case-scenario aided in deep learning of the urgency to intervene using EBP standards. Furthermore, the students learned the importance of transferring the maternal-fetal patient to a risk-appropriate care setting. One quote to show the generalized satisfaction of the learning experience: “The real-life story and interactive learning environment really helped to bring the information to memory.”

Plan-Do-Study-Act Cycle

After each simulation lab, a Plan-Do-Study-Act (PDSA) cycle was used to refine the teaching approach, then test again with each implementation. Observation of the first group identified specific areas requiring additional emphasis, such as prioritization of the EFM and fetal intolerance to labor. After the first simulation lab, the pre-briefing PowerPoint was

modified to improve flow and highlight the identified areas. The second implementation identified further areas to emphasize during pre-briefing and debriefing to improve instruction for the third group. The instructor, facilitator, and students had a satisfactory learning experience; therefore, the facilitator has been invited to continue collaborating on this QI teaching project in subsequent semesters. The next steps include implementation of the revised teaching approach next semester, fall 2023, with potential to continuously improve the active learning strategies for developing preeclampsia care skills with future nursing cohorts.

Quality Improvement Project Summary

Prior to the QI teaching project implementation, the Microsystem Assessment found that the nursing students were gleaning preeclampsia-focused content via passive learning strategies (lecture/PowerPoint). The curriculum did not include education about the status of Montana's use of EBP standards in obstetrics, nor information regarding the advocacy resources available in the state and nationally to improve outcomes. Therefore, the QI teaching project succeeded in utilizing active learning strategies (simulation process) known to be superior in developing knowledge, psychomotor, affective, and collaborative skills as students engage in the healthcare role (Abraham & Kusheleva, 2019; Akalin & Sahin, 2020; Chaudhari, 2019; Ennen & Satin, 2021; Kelly & Hager, 2015; Raney et al., 2019; Silva et al., 2021; Tabatabaeian et al., 2018; Walker et al., 2014). Objective and subjective data determined that the students achieved the simulation learning objectives by working as a team to assess both mother and fetus while performing, analyzing, and prioritizing patient management.

The challenges inherent to the implementation of this QI teaching project included the complexity of preeclampsia care, the students' novice experience in performing obstetric simulation scenarios, and the inability to allow the students to practice the scenario after the one-time lab focused on the QI content. However, the pre-briefing approach set the stage for the teaching modality to provide a safe learning environment within the simulation center, reinforcing student-centered education. The students benefited from a controlled environment that simulated a high-risk intrapartum clinical experience. Communication and teamwork occurred to aid in the performance of the elements of the PSB. The students were able to make mistakes without causing harm and discuss those mistakes in debriefing. Reflection also highlighted the safe care measures accomplished, boosting the students' confidence in the ability to work as a team to perform interventions. In addition, the simulation experience improved the students' knowledge of the PSB prior to potential exposure to the algorithms during clinical rotations at the level II hospital, when working alongside a preceptor.

Implications and Recommendations

The implications of the QI teaching project on education included improving knowledge and skills in using the EBP guidelines found within the Severe Hypertension in Pregnancy PSB. Delays in statewide implementation of the PSBs may create barriers for new nurses to utilize evidence-based supports, especially in rural settings that deliver fewer patients per year. Implications on practice included encouraging the future advocates, nursing students, to help change and commit to a healthcare culture that supports implementation of and adherence to EBP, including use of perinatal PSBs and a risk-appropriate care system. Education and practice

changes can increase the likelihood of early recognition and intervention in a level-appropriate facility, with potential to promote optimal outcomes for mother and baby.

The literature review supported use of simulation pedagogy to improve obstetric care management. A recommendation for the School of Nursing (SON) is to increase time allotted for simulation into the curriculum standards. For the Nursing Care of the Childbearing Family course, one method is to increase the allotted one credit (45 hours for lab, simulation, and clinical; simulation uses nine of 45 hours). This could be accomplished by donating time allotted for lecture, which utilizes three credits, each worth 15 hours, totaling 45 hours. One credit, 15 hours could be donated toward simulation. This would allow for the simulation curriculum to adopt a flipped classroom approach, which would expect more independent student preparation prior to scheduled lab times. El-Banna et al. (2017) studied nursing-student satisfaction and achievement related to a flipped classroom approach and recommended judicious use of a flipped classroom approach when content is dense/difficult, which is the case for developing preeclampsia care skills. Pre-briefing should remain standardized to promote adequate time for review. The increased simulation time would benefit the students' abilities to actively engage in the healthcare role in a safe, controlled environment. The additional lab time, if logistics could allow, has potential to ensure each student participates as a nurse for every simulation scenario, to allow for hands-on-learning. Furthermore, students would benefit from multiple observations/performances when the scenario is repeated, allowing for catching previous oversights and learning from performing actions correctly. In addition, it would be optimal to offer open skills-labs for the students to repeat skills and scenarios to increase competence and confidence in performance of the safe-care measures.

To expand this QI teaching project, the simulation process could be officially validated (see Validation of a Preeclampsia-Based Simulation Scenario subheading within Chapter Two) to ensure reliability and reproducibility. Then, PDSA cycles could aid in refining the teaching process to include interdisciplinary education. Moreover, modifications to the simulation approach would be necessary based on the low, moderate, or high-fidelity resources available in the teaching environment. Utilization of the Montana Obstetrics and Maternal Support (MOMS) Program's Simulation Learning Academy (SLA) harnesses the power to train nurse educators to design, implement, and evaluate simulation. The facilitator plans to participate in the six-session course offered starting in April 2023 related to the Severe Hypertension in Pregnancy PSB scenario. The facilitator will encourage nurse educators throughout Montana to become skilled in simulation pedagogy to improve education and training in care settings preparing to commit to the EBP standards found within the perinatal PSBs. Walker et al. (2014) reported that simulation training to improve high-risk obstetric care has the power to save lives in low-resource settings. In agreement with the literature review, this professional paper recommends more research to determine long-term maintenance of skills and patient outcomes when using preeclampsia-focused simulation pedagogy.

Clinical Nurse Leader Competencies

All nine of the Clinical Nurse Leader (CNL) competencies, as defined by the American Association of Colleges of Nursing (AACN) (2013), were achieved through this QI teaching project. The first three competencies, Clinician, Outcomes Manager, and Advocate were achieved by taking accountability for improving preeclampsia outcomes, through promotion of

EBP education to nursing students who will potentially care for high-risk patients within micro and mesosystems of care. The project encouraged use of the standardized care practices, shown to improve safety and quality, while urging interdisciplinary collaboration/communication to positively impact patient outcomes. The fourth competency, Educator, was achieved as the facilitator developed simulation pedagogy skills via research and observation, relied on EBP simulation training tools, and collaborated with a skilled simulation instructor; culminating in the adaptation and implementation of an effective simulation scenario for the cohort of nursing students. Through PDSA cycles, improvement of the scenario and continual refinements can be made to present the education to subsequent nursing cohorts. The fifth competency, Information Manager, was achieved through the facilitator creating reference materials to help the nursing students utilize the tools available to communicate with the care team, including the patient, and advocate for perinatologist consultation when mothers meet criteria for preeclampsia. The sixth and seventh competencies, Systems Analyst/Risk Anticipator and Team Manager, were achieved as the facilitator analyzed the course curriculum and determined the lecture content taught evidence-based diagnostic and treatment methods; however, there was no simulation to allow for active participation in caring for preeclampsia. There was an opportunity to provide a preeclampsia-based simulation to improve outcomes for one of the most common obstetric emergencies that causes significant morbidity and mortality. The eighth competency, Member of a Profession, was achieved as the facilitator aided the educational process for nursing students before entry into the healthcare profession. The teaching modality disseminated the latest EBP standards to improve care and collaboration for improved maternal-fetal outcomes. Lastly, the facilitator is committed to lifelong learning, with hopes to share passion for improved

preeclampsia outcomes with all those who will benefit from this QI teaching project. Plans to improve preeclampsia outcomes in Montana include joining forces with the states perinatal advocates to become a liaison for the southwestern communities. In addition, the facilitator became certified through the Maternal Mortality and Morbidity Advocates (MoMMA's) Voices coalition in conjunction with the Montana Perinatal Quality Collaborative (MPQC) and Yarrow to become a lived expert and contribute to QI improvements during statewide implementation of the PSB to improve care for hypertensive disorders of pregnancy.

Conclusion

The QI teaching project, using HFS, addressed a relevant healthcare issue that can result in a meaningful and substantive contribution to nursing practice. The holistic care approach created awareness of the need for pregnant patients to receive early screening for preeclampsia to promote prevention measures and diligent monitoring during antepartum, intrapartum, and postpartum care. Nursing students were taught to advocate for timely treatment of patients with preeclampsia, using the EBP algorithms to improve quality and safety. Students expressed understanding the importance of advocating for transfer to a level-appropriate facility to help alleviate the burden of high-risk maternal-fetal patients being managed in unprepared settings. QI efforts must coincide with continual education, including use of simulation, for trainers and learners, to develop and maintain skills to care for preeclampsia in a safe, learner-centered environment. Improved education for professionals can impact education for patients, members of the team with valuable input during care, and QI efforts. Until implementation of EBP is achieved in all birthing facilities throughout the

state, families face barriers to safe care. One in 12 pregnant families may face preeclampsia complications (Akalın & Sahin, 2020; Preeclampsia Foundation, 2022); therefore, perinatal collaborators must steadfastly lead mitigation efforts to standardize education and care practices. Montanans deserve safe and equitable care for mothers and babies, in a streamlined system, dedicated to promoting healthy outcomes for growing families.

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APPENDICES

APPENDIX A

GLOSSARY

Appendix A: Glossary

Term	Definition
Acidosis	“A pathologic state characterized by an increase in the concentration of hydrogen ions in the arterial blood, with pH below the normal range of 7.35 to 7.45; the condition may be caused by an accumulation of carbon dioxide or acidic products of metabolism (respiratory acidosis), or by a decrease in the concentration of alkaline compounds (metabolic acidosis).” (Farlex Partner Medical Dictionary, 2012).
Amniotic fluid embolism	“The entry of amniotic fluid through a tear in the placental membranes into the maternal circulation. This rare event may occur at any gestational age, <u>but</u> most commonly during labor, delivery or in the immediate post-partum period. The contents of the fluid (e.g., shed fetal cells, meconium, lanugo, vernix) may produce pulmonary or cerebral emboli. Cardiac arrest and disseminated intravascular coagulation (DIC) commonly occur. Maternal death is a frequent complication.” (Medical Dictionary, 2009).
Antiphospholipid syndrome	“condition in which the immune system mistakenly creates antibodies that attack tissues in the body. These antibodies can cause blood clots to form in arteries and veins. During pregnancy, antiphospholipid syndrome can result in miscarriage and stillbirth” (Mayo Clinic, 2022).
APGAR Score	“a method for determining an infant's condition at birth by scoring the heart rate, respiratory effort, muscle tone, reflex irritability, and color. The infant is rated from 0 to 2 on each of the five items, the highest possible score being 10. Each of the factors is rated 60 seconds after birth and again five minutes later. The Apgar score is an objective way of assessing and describing an infant's adaptation to extrauterine life.” (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition, 2003).
Bronchopulmonary dysplasia	“chronic pulmonary insufficiency seen primarily in infants born prematurely; defined clinically as a persistent supplemental oxygen requirement at 1 month of age and typically seen in infants who required positive pressure ventilation” (Farlex Partner Medical Dictionary, 2012).
Critical access hospital	“limited-service hospitals designed to provide essential services to rural communities.” (Montana Hospital Association, 2022).
Disseminated intravascular coagulation (DIC)	“a bleeding disorder characterized by abnormal reduction in the elements involved in blood clotting due to their use in widespread intravascular clotting. It may be a secondary complication of any of numerous obstetrical, surgical, infectious, hemolytic, and neoplastic disorders, all of which activate in some way the intrinsic coagulation sequence. Paradoxically, the intravascular clotting ultimately produces hemorrhage because of rapid consumption of fibrinogen, platelets, prothrombin” (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition, 2003).
Eclampsia	“in pregnant women, the convulsive stage of preeclampsia; the convulsions are not attributable to other cerebral

	conditions such as epilepsy. It is a potentially life-threatening disorder characterized by hypertension, generalized edema, and proteinuria.” (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, Seventh Edition, 2003).
High-fidelity simulation (HFS)	“High Fidelity Simulation is a healthcare education methodology that involves the use of sophisticated life-like manikins in realistic patient environments.” (Healthy Simulation, 2020, para. 1) “In Healthcare Simulation, the degree to which a particular manikin can reproduce or mimic human physiology is known as fidelity.” (para. 2).
Hypoxia	“Decrease below normal levels of oxygen in inspired gases, arterial blood, or tissue, without reaching anoxia. [hypo- + oxygen]” (Farlex Partner Medical Dictionary, 2012).
Intrauterine Growth Restriction (IUGR)	“blood supply is reduced to the placenta, a risk associated with preeclampsia, nourishment is restricted and may cause fetus to be small for gestational age” (Preeclampsia Foundation, 2021a, “How does preeclampsia affect the baby?” section).
Necrotizing enterocolitis	“necrotizing enterocolitis is a serious bacterial infection in the intestine, primarily of sick or premature newborn infants. It can cause the death (necrosis) of intestinal tissue and progress to blood poisoning (septicemia).” (Gale Encyclopedia of Medicine, 2008).
Oligohydramnios	“deficiency in the amount of amniotic fluid, defined as 500 mL or less at term and smaller amounts at earlier gestational ages.” (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, 2003).
Perinatal	“Relating to the period shortly before and after birth; from the twentieth to twenty-ninth week of gestation to 1 to 4 weeks after birth.” (Miller-Keane Encyclopedia and Dictionary of Medicine, Nursing, and Allied Health, 2003).
Perinatologist	“A Maternal Fetal Medicine specialist - trained obstetrician/gynecologist who has 3 years of additional formal training and specialized interest and experience taking care of women with complicated pregnancies and their unborn babies.” (Origin Health, 2022, para. 1).
Placental abruption	“occurs when the placenta separates from the wall of the uterus prior to the birth of the baby. This can result in severe, uncontrollable bleeding (hemorrhage); associated with malformation of the placenta and high blood pressure, as is common in preeclampsia. (Gale Encyclopedia of Medicine, 2008).
Postpartum	“the fragile time after birth, and up to six weeks post-delivery” (Preeclampsia Foundation, 2022).
Precipitous delivery	“An unexpected birth caused by swift progression through the second stage of labor with rapid fetal descent and expulsion.” (Medical Dictionary, 2009).
Preeclampsia	“persistent high blood pressure that develops during pregnancy or the postpartum period. It is often associated with high levels of protein in the

	urine or the new development of decreased blood platelets, trouble with the kidneys or liver, fluid in the lungs, or signs of brain trouble such as seizures and/or visual disturbances.” (Preeclampsia Foundation, 2021d, para. 1).
Pulmonary embolism	“caused by emboli (clot[s]) that travel through the blood stream to the lungs and block a pulmonary artery. When this occurs, circulation and oxygenation of blood is compromised. The emboli are usually formed from blood clots but are occasionally comprised of air, fat, or tumor tissue.” (Gale Encyclopedia of Medicine, 2008).
Respiratory distress syndrome	“Acute respiratory distress syndrome (ARDS) is a serious lung condition that causes low blood oxygen due to fluid build-up inside the tiny air sacs of the lungs, causing surfactant to break down. Surfactant is a foamy substance made by your body that keeps your lungs fully expanded so you can breathe. The lung tissue may scar and become stiff.” (National Heart, Lung, and Blood (NIH) Institute, 2022).
Rural	“A whole state like Montana could be considered as rural based on the large land mass, sparse population, low over all population density,” possibility of “great distances to travel to a town large enough to have even marginally adequate retail, health, and other necessary services.” (Weinert & Boik, 1995, para. 3).
Uteroplacental insufficiency	“Inadequate blood flow through the placental intervillous spaces to enable sufficient transmission of nutrients, oxygen, and fetal wastes. It may be caused by diminished maternal cardiac output due to anemia, heart disease, regional anesthesia, or supine hypotension; vasoconstriction due to chronic or pregnancy-related hypertension or uterine overstimulation; vasospasm due to pregnancy-induced hypertension; vascular sclerosis due to maternal diabetes or collagen disease; or intrauterine infection. It increases the risk for intrauterine growth retardation” (Farlex Partner Medical Dictionary, 2009).

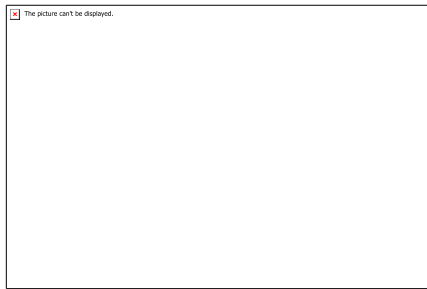
APPENDIX B

ADAPTED SIMULATION SCENARIO

Preeclampsia Induction of Labor Category II FHR Tracing

Adapted from Laerdal Learning Technology & CAE Healthcare

Angela Davis (hypothetical patient)



Synopsis & Handoff Report

Angela Davis is a Caucasian female, G1T0P0A0L0, at 36.2 weeks gestation. She was admitted to the Labor and Delivery Unit one hour ago for induction of labor due to worsening signs and symptoms of preeclampsia with hypertensive emergency. Goal was induction of labor at 37.0 weeks gestation, but blood pressures have increased to severe ranges. Blood pressure on admission was 162/110. Fifteen minutes later, the repeat blood pressure was 166/112. 20 mg of Labetalol was administered IV 5 minutes ago. Blood pressure monitoring is ordered every 10-20 while managing the hypertensive emergency. Pharmacy is preparing Magnesium Sulfate for administration. Preeclampsia labs were drawn with IV placement and sent to lab upon admission, see results. Saline lock present in left forearm.

Initial cervical examination revealed 2 cm dilation, 20% effacement, -2 station. Membranes intact. 25 mcg misoprostol (Cytotec) was inserted vaginally by the perinatologist one hour ago. Angela reports uterine contractions are beginning to increase, reports a pain scale of 3/10. Unsure of comfort measure techniques and pain relief, requesting more information on her options.

Medical History: Angela has a history of hypertension while on birth control. Angela presented with preeclampsia symptoms at 32 weeks gestation with elevated blood pressures -140's/90's and swelling of hands. Patient was referred to the perinatologist at the regional perinatal care facility and transferred care from her rural critical access hospital. Angela has stayed at the

Ronald McDonald house to achieve close monitoring of pregnancy and remain close to level-appropriate care. Angela has been on bedrest with close monitoring of her preeclampsia labs, blood pressures, and weekly non-stress tests. Continuation of pregnancy was safe until today. Preeclampsia labs have been positive for elevated proteinuria. Group B strep negative at 36 weeks gestation. This is a lesbian couple; Kara Jones is her partner and is at the bedside.

Learning Objectives

General

- Identifies relevant patient history information
- Identifies the primary nursing problem
- Implements clinician orders appropriately
- Demonstrates correct medication administration
- Demonstrates appropriate communication with interprofessional team members
- Demonstrates effective team-work
- Implements patient safety measures
- Explains physical findings and diagnostics related to patient condition
- Demonstrates therapeutic communication

Scenario-Focused

- Interprets Electronic Fetal Monitoring and recognizes a Category I-III fetal heart rate tracing
- Initiates and prioritizes appropriate interventions for Category II and III fetal heart rate tracing
- Initiates and prioritizes appropriate interventions for Severe Preeclampsia
- Provides appropriate education to the client and family

Equipment and Supplies

ID Band-Angela Davis (DOB: 11/17/1997)

Cervical Assessment: 2cm/20%/-2

Saline Lock (LFA)

IV Pump with 2 chambers

BP cuff

Gravid abdomen

Exam Gloves-S, M, L

Supplies

Clipboards

BP Cuff

Emesis Bag

22 G 1 inch Needles (3)

Gel

Thermometer

Pump Tubing (2)

3 cc Syringes (3)

Alcohol wipes

Saline Flush (3)

Suction

O2 Mask

Pillows (Hip Wedge/Padding) (3)

Sterile Gloves

Medications

LR

Terbutaline 1 mg/ml

Stadol 2 mg/ml

Fentanyl 200 mcg/ml

Zofran (Ondansetron) 8 mg/ml

Penicillin G 5 million units

Labetolol 20 mg/ml

Hydralazine 5 mg/ml

Nifedipine 20 mg PO

Magnesium Sulfate 4 grams in 100 ml NS

Magnesium Sulfate 1 gram/25 ml

Forms-Print

Interventions Worksheet

Report to Student Scenario

Orders

Labs

Student Expectations

Simulator Settings & Facilitator Notes

Initial Simulator Settings

BP 170/118

Contraction frequency 4 minutes

Category I Tracing (Active Sleep)

Baseline: 150

Moderate Variability

Absent Accelerations

Absent Decelerations

Pain Scale 3

Breathing with contractions

Mid-Scenario Simulator Settings

BP 168/122

Deliver Lab Results

Contraction frequency 3 minutes

Category II Tracing (Calm Sleep)

Baseline: 130

Minimal Variability

Absent Accelerations

Late Decelerations

Pain Scale 8

Vocal with contractions

Nauseated

Requests nausea medication

Call: Ondansetron (Zofran) 4 mg IVP every 6 hrs PRN Nausea/vomiting

Critical Action's Checklist (Based on Learning Objectives)

Evaluated during Simulation, Discussed during Debriefing

1. Initial Evaluation and Management of Preeclampsia and Emergent Hypertension

- ☐ Obtain focused history of present illness (inquire about headaches, blurry vision, chest pain, SOB, N/V, RUQ/epigastric pain), pertinent past medical and obstetric/gynecologic history
- ☐ Assess vital signs
- ☐ Perform physical examination including evaluation of cardiovascular and respiratory systems
- ☐ Review laboratory tests
- ☐ Follow algorithm for treatment of hypertensive emergencies, including appropriate reassessment of blood pressure and administration of antihypertensive medications.
- ☐ Administer magnesium sulfate bolus for seizure prophylaxis
- ☐ Assess and educate about side effects of Magnesium Sulfate (Hot flushes, Nausea, Weakness, Drowsiness, Burning at IV site)
- ☐ Assess for Magnesium Sulfate toxicity (Hypotension, Loss DTR, Bradypnea, SOB, Oliguria, Chest Pain)
- ☐ Identify that Calcium Gluconate is readily available
- ☐ Initiate seizure precautions (Raised and padded side rails, Suction and oxygen available)
- ☐ Identify additional factors: Bedrest, Calm & Quiet Environment, DVT Prophylaxis)

2. Management of the Labor Process

- ☐ Support maternal coping
 - ☐ Position change
 - ☐ Avoidance of supine positioning
 - ☐ Support/Reassurance
 - ☐ Hydrotherapy
 - ☐ Fan/Cool washcloth
 - ☐ Relaxation-Music, Breathing Techniques
 - ☐ Administration of analgesia
 - ☐ Moderate pain versus severe pain
 - ☐ Administration of antinausea medication
 - ☐ Provider notification with SBAR and verbal order read back
- ☐ Provide education related to the labor process

3. Management of Fetal Intolerance to Labor

- Monitor for category I-III fetal heart rate tracings
- Monitor for frequency and intensity of uterine contractions
- Perform interventions to restore oxygenation and prevent hypoxia to fetus
 - Maternal Position Change
 - Treatment of the Cause (Preeclampsia)
 - IV Fluid Bolus
 - Provider notification with use of SBAR

4. Nursing Skills

- ☐ Perform hand hygiene
- ☐ Perform dual identification of patient
- ☐ Perform dual identification prior to medication administration
- ☐ Utilizes six rights of medication administration

5. Interpersonal Skills

- ☐ Perform Self-introduction, including identification of support system
- ☐ Explain clinical findings and plan to patient and addresses patient concerns
- ☐ Demonstrates professionalism and appropriate communication

Report to Students

The picture can't be displayed.

Name	Angela Davis	Height	68 inches (5 ft. 8 in.)
DOB	November 17, 1997	Religion	Catholic
Gender	Female	Occupation	IT Consultant
Perinatologist	Dr. Audrey Phillips – MFM Specialist	Marital Status	Married
Allergies	Nifedipine	Language	English
Weight	194 lbs.	Emergency Contact	Kara Jones

Angela Davis is a Caucasian female, G1T0P0A0L0, at 36.2 weeks gestation. She was admitted to the Labor and Delivery Unit one hour ago for induction of labor due to worsening signs and symptoms of preeclampsia with hypertensive emergency. Goal was induction of labor at 37.0 weeks gestation, but blood pressures have increased to severe ranges. Blood pressure on admission was 162/110. Fifteen minutes later, the repeat blood pressure was 166/112. 20 mg of Labetalol was administered IV 5 minutes ago. Blood pressure monitoring is ordered every 10-20 while managing the hypertensive emergency. Pharmacy is preparing Magnesium Sulfate for administration. Preeclampsia labs were drawn with IV placement and sent to lab upon admission, see results. Saline lock present in left forearm.

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Medical History: Angela has a history of hypertension while on birth control. Angela presented with preeclampsia symptoms at 32 weeks gestation with elevated blood pressures - 140's/90's and swelling of hands. Patient was referred to the perinatologist at the regional perinatal care facility and transferred care from her rural critical access hospital. Angela has stayed at the Ronald McDonald house to achieve close monitoring of pregnancy and remain

close to level-appropriate care. Angela has been on bedrest with close monitoring of her preeclampsia labs, blood pressures, and weekly non-stress tests. Continuation of pregnancy was safe until today. Preeclampsia labs have been positive for elevated proteinuria. Group B strep negative at 36 weeks gestation. This is a lesbian couple; Kara Jones is her partner and is at the bedside.

Obstetric Admission

Indication for Admission	Induction of labor related to preeclampsia and hypertensive emergency
Admission Status	Inpatient
Admit to	Labor and Delivery

Orders
Call Orders:
Systolic BP greater than 160 mmHg or less than 90 mmHg
Diastolic BP greater than 110 mmHg or less than 50 mmHg
Temperature greater than 38 degrees Celsius (100.4 F)
SpO2 less than 92%
Category II or III fetal heart rate
Maternal Assessments:
Blood pressure, respirations, pulse, SpO2 and pain assessment every 1 hour and PRN
Temperature every 4 hours; After ROM every 1 hour
System assessment every 2 hours
Fetal Assessments:
Continuous external fetal and contraction monitoring (Continuous EFM)
Labor:
Sterile vaginal exams by Physician or RN PRN
Intake and Output:
Regular diet as tolerated
IV and IVF
Insert and maintain saline lock
Ringers Lactate: 125 ml/hr IV PRN vomiting or decreased fluid intake
Ringers Lactate: 500 ml bolus (500 ml/hr) PRN Category II or III fetal heart rate pattern
Medications:
Butorphanol (Stadol) 1-2 mg IVP every 2 hr PRN severe pain
Fentanyl citrate PF (Sublimaze) 50-100 mcg IVP every 60 min PRN mild to moderate pain
Misoprostal (Cytotec) tablet 25 mcg vaginal every 4 hrs PRN induction of labor
Penicillin G Potassium (Pfizerpen) 5 million units one time followed by 2.5 million units every 4 hours until delivery PRN
Antihypertensive Treatment Algorithm for Hypertensive Emergencies
Blood pressure every 10-20 minutes; Follow antihypertensive algorithm
Labetolol (Trandate) 20-80 mg IVP every 10 minutes PRN: Follow antihypertensive algorithm
Hydralazine (Apresoline) 5-10 mg IV every 20 minutes PRN: Follow antihypertensive algorithm
Nifedipine (Procardia) 10 mg PO PRN: Follow antihypertensive algorithm

Ringers Lactate 75 ml/hr, mainline for Magnesium Sulfate
Magnesium Sulfate loading dose 4 grams in 100 ml NS over 20 minutes
Magnesium Sulfate maintenance dose 2 grams/hr
Calcium Gluconate 1 gram IV PRN magnesium toxicity

Admission Labs

Hematology	Patient	Reference Range
WBC	11.0	3.8 – 11.0
RBC	4.2	4.0 – 5.2 grams (Female- 18+)
HGB	11.2	11.5-15.5 (Female- 18+)
HCT	37	35 – 47 (Female- 18+)
PLT	148,000 L	150 - 407
Total Protein (24 hour urine collection)	>300 mg/dl H	<100 mg/dl
AST/ALT	74 H	<1
Creatinine	1.5 H	0.6-1.1 (Female)

Support Person Script

Cues for use during simulation:

If the students fail to introduce themselves	Who are you?
If the students fail to discuss the plan of care	What is going to happen now?
If the students fail to identify Preeclampsia	Is her blood pressure too high?
If the students fail to educate about Preeclampsia	Can you tell us about Preeclampsia
If the students fail to discuss administered medications, including the side effects	What is that for? Are there any side effects?
If the students fail to provide updates about fetal status	Does the baby look ok on the monitor?
If the students fail to discuss pain relief options	What are Angela's options for this pain?
If the students fail to communicate the communication with the provider	Has anyone talked to a doctor about Angela yet?
Use any other appropriate questions	Think about this scenario from the family perspective

Debrief

- Identifies complete and incomplete actions from the Critical Action's Checklist
- Identifies priority nursing problem/s
- Explains physical findings and diagnostics related to patient condition
- States possible causes of uteroplacental insufficiency and Category II or III heart rate tracing

APPENDIX C

TANNER'S CLINICAL JUDGMENT MODEL TEMPLATE

Appendix C: Tanner's Clinical Judgment Model Template

Clinical Judgement Model for Debriefing				
Emotional Response One Word	Noticing What did you notice about the situation?	Interpreting What was your understanding of the situation?	Responding Deciding on a course of action or what the course of action should have been	Reflecting Reflection of actions and beyond actions
What was the scenario about?				Take aways-What did you learn?

APPENDIX D

MODIFIED KIRKPATRICK FOUR LEVELS
OF TRAINING EVALUATION

Appendix D: Modified Kirkpatrick Four Levels Of Training Evaluation

I, Katlin Tonkin, am facilitating the preeclampsia-focused simulation lab alongside the instructor of the Nursing Care of the Childbearing Family course. I am a Master of Science in Nursing student, soon to graduate as a Clinical Nurse Leader and become certified as a nurse educator. I am a student at Montana State University (MSU). I am considered a principal investigator in charge of conducting research to support my professional senior project. My contact information is: phone 406-560-0598 and email katlin.vanmeel@gmail.com, please feel free to contact me with any questions/concerns. The contact information for the Institutional Review Board (IRB) for MSU is irb@montana.edu.

My senior project is a quality improvement teaching project. The purpose of the evaluation survey attached below is to collect subjective data to determine whether the preeclampsia-focused simulation process (preparation, pre-briefing, scenario, debriefing) effectively aided in preparing nursing students to develop knowledge, psychomotor (technical), and affective (values) skills to care for preeclampsia. Simulation content was based on the evidence-based guidelines and resources found within the Severe Hypertension in Pregnancy patient safety bundle. Preparation and pre-briefing materials aided in psychological safety for the students. The stress students naturally experience in preparation for a high-fidelity simulation involves application of knowledge while being evaluated. Formative feedback was provided in conjunction with the pass/fail grade based on the course's simulation credit requirements. The students who observed first and performed the scenario second had additional preparation. There was a risk for emotional distress related to the content of preeclampsia.

Participation in the survey is voluntary and will not affect the student's grade.

Confidentiality will be protected for the students and institution. The institution will not be identified in my written project. Responses will remain anonymous and generalized. No protected health information will be gathered for the purposes of this quality improvement project. Proceeding with the evaluation indicates your consent to participate. Thank you for allowing me to learn from teaching and observing the preeclampsia-focused simulation process. I appreciate all responses and plan to improve subsequent implementations based on the constructive feedback.

Kirkpatrick Four Levels of Training Evaluation

The Kirkpatrick Evaluation is a research-based tool to evaluate the value of a training modality

This survey is OPTIONAL

Please DO NOT include your name

Reaction

1. Please describe your reaction to the simulation process for this preeclampsia-based simulation (preparation, pre-briefing, simulation scenario, debriefing).

Learning

2. Please describe two things that were most helpful to your learning.
3. My learning could have been improved by...

Behavior

4. Please describe two ways you will apply what you learned as a practicing nurse.

Recall

The clinical objectives set forth for this course:

“Simulation clinical objectives:

- a. Demonstrate appropriate fetal and maternal assessments during simulation scenarios.
- b. Perform, analyze, and prioritize patient management for clinical situations involving the obstetric patient and family.”

Results

5. How did the preeclampsia-focused simulation process help you meet the learning objectives set forth by this course?

References:

- DeMelo, B. et al. (2017). The use of instructional design guidelines to increase effectiveness of postpartum hemorrhage simulation training. *International Journal of Gynecology and Obstetrics*, 137 (1), 99-105.
- Kirkpatrick, D, and Kirkpatrick W.K. (2016). *Four levels of training evaluation*. ATD press. Alexandria VA.
- Wright, D. 2005. *The Ultimate Guide to Competency Assessment in Health Care*. 4th Ed. Creative Health Care Management. St. Paul. MN.

APPENDIX E

PERINATAL CARE ADVOCATES

Appendix E: Perinatal Care Advocates

<u>Organization</u>	<u>Advocacy Actions</u>
Preeclampsia Foundation Website: https://www.preeclampsia.org	“Our purpose is to improve the outcomes of hypertensive disorders of pregnancy by educating, supporting and engaging the community, improving healthcare practices, and finding a cure” (Preeclampsia Foundation, 2022, Purpose section, para. 2).
Montana Obstetrics & Maternal Support (MOMS) Program Website: https://www.mtmoms.org	“The MOMS Program was created to connect rural providers to obstetrical/gynecological, perinatal, mental health and substance abuse specialists to build competency and consistency across perinatal providers.” (MOMS, 2022).
Alliance for Innovation on Maternal Health (AIM) Website: https://saferbirth.org/patient-safety-bundles/#core-aim-psbs	A quality improvement initiative - designed and revises perinatal patient safety bundles (PSBs) to reduce variation, improve outcomes, and combat leading causes of maternal morbidity/mortality. Goal - evidence-based practice, patient-centered and trauma-informed care for every patient (AIM, 2023).
Montana Perinatal Quality Collaborative (MPQC) Website: Montana Perinatal Quality Collaborative (umt.edu)	A quality improvement initiative focused on perinatal health. Partners with advocate groups in Montana: Montana’s State Health Agency, Montana Dept. of Public Health and Human Services, The Montana Hospital Association, The Montana Maternal Mortality Review Committee, Enhancing Reviews and Surveillance to Eliminate Maternal Mortality (ERASE-MM), Montana’s Maternal Health Innovation grant, AIM, others. Addresses health disparities by increasing support to facilities caring for Montana’s seven Indian Reservations and rural/remote communities (Rural Institute, 2023).
University of Montana Research Website: https://www.mtmoms.org/university-of-montana-research/	Performs research related to social/behavioral determinants of maternal and child health, rural healthcare delivery systems, early childhood systems, severe maternal morbidity, and more. Partners with and evaluates the MOMS Program. See research efforts within the Maternal Health in Montana report and the Levels of Care Assessment Tool (LOCATe) which helps create a risk-appropriate care system in Montana for mothers and neonates.
Origin Health Website: https://originhealth.com	Comprehensive OB/GYN and maternal-fetal care. Screening and advanced perinatal and gynecologic ultrasound services. Partners with Family Physicians, Midwives, Women’s Health Nurse Practitioners and OB/GYN’s who provide the primary obstetric and gynecologic care. Maternal Fetal Medicine (MFM) physicians have advanced training to provide care to complicated pregnancies and other reproductive issues (Origin Health, 2022, para. 1).
Community Medical Center (CMC) – CPG Maternal and Fetal Medicine	MFM specialists collaborate with obstetricians to care for high-risk pregnancies to provide best care possible.

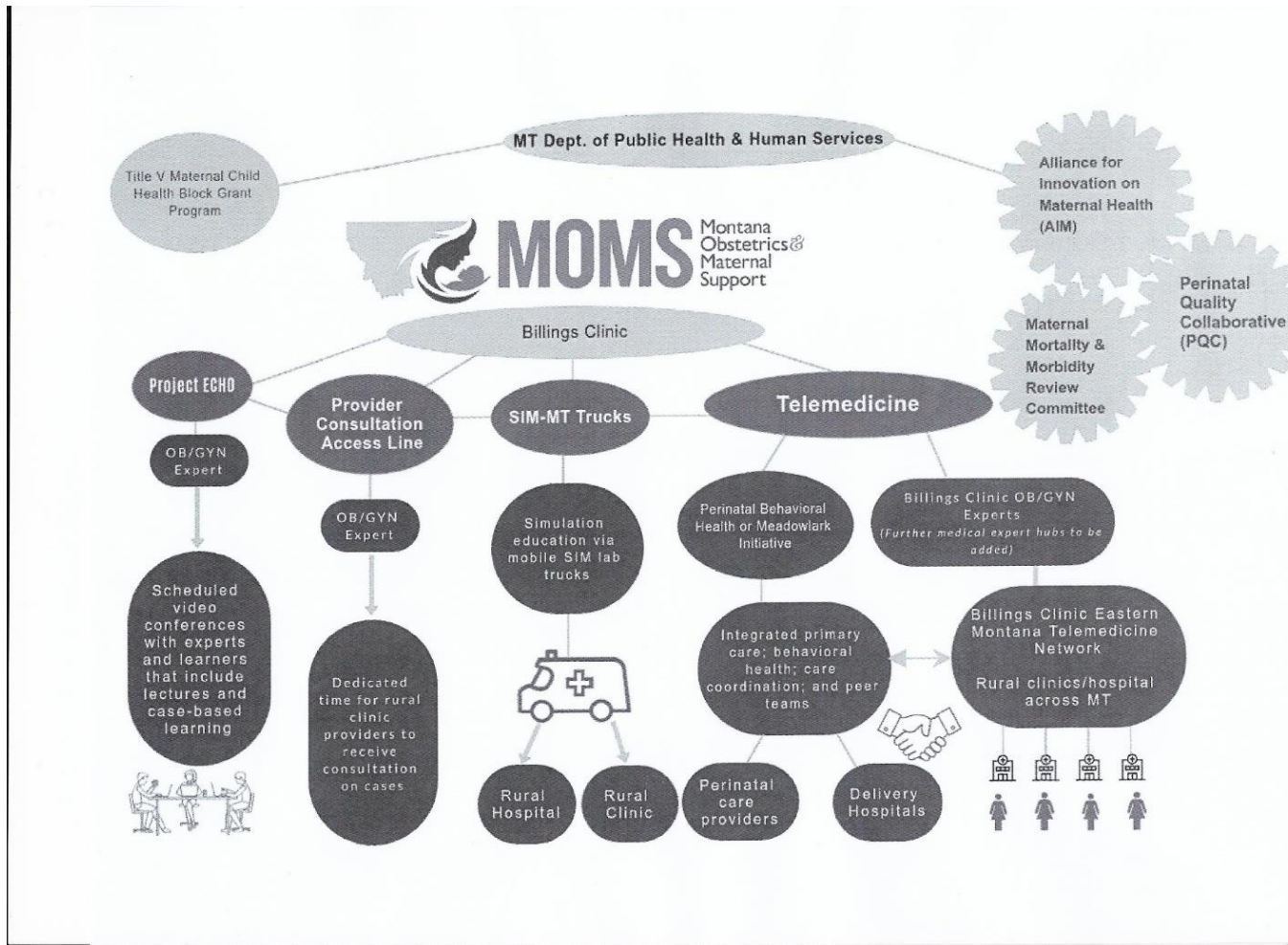
https://communitymed.org/women-and-newborns/maternal-fetal-medicine	Provides specialized services in utero and after delivery (CMC, 2023).
<p>Billings Clinic</p> <p>Website: https://www.billingsclinic.com/services-specialties/obgyn/obstetrics-pregnancy-and-birth/maternal-fetal-medicine/</p>	<p>MFMM's partner with patient's obstetrician to provide highly specialized care to diagnose and treat unique health needs (Billings Clinic, 2023, para. 1).</p> <p>2019 Women's Choice Award – One of America's best hospitals for obstetric care. Also has a clinic in Bozeman – OBGYN, infertility, female urology (Billings Clinic, 2023).</p>
<p>The American College of Obstetricians and Gynecologists (ACOG)</p> <p>Website: https://www.acog.org</p>	“Indispensable decision support resource for women's health care providers – reliable and relevant, grounded in scientific evidence, and developed through a rigorous and inclusive process.” (ACOG, 2022, Clinical Information section).
<p>Association for Women's Health, Obstetric, and Neonatal Nurses (AWHONN)</p> <p>Website: https://www.awhonn.org/about-us/</p>	Empowers and supports nurses caring for women, newborns, and families through research, education, advocacy. Offers nurse resources, such as training courses and guides for high-risk perinatal care, electronic fetal monitor (EFM) interpretations, and much more (AWHONN, 2023).
<p>The Society for Maternal-Fetal Medicine (SMFM)</p> <p>Website: https://www.smfm.org</p>	SMFM promotes education, research, and engages in advocacy to optimize equitable perinatal outcomes (SMFM, 2022).
Maternal Mental Health Resources	Actions
<p>Postpartum Support International (PSI) – Montana</p> <p>Website: https://www.postpartum.net/locations/montana/</p> <p>Call/text 1-800-944-4773</p>	The link contains a form for patients/family/providers to reach out to the PSI support system. Support Coordinators provide info, support, resource referrals to address pregnancy/postpartum mental health challenges
<p>Mind Body Soul Therapy</p> <p>https://mind-body-soul-therapy.com/what-is-perinatal-mental-health/</p> <p>1-909-492-0058</p>	Perinatal mental health and wellness before/during/after pregnancy. Fertility, stress/anxiety, depression, fears, childbirth-related traumatic experiences and PTSD, postpartum depression and OCD, pregnancy/infant loss.
<p>20/20 Mom – Visionaries for the Future of Maternal Mental Health</p> <p>https://www.2020mom.org/mmh-disorders?emci=c758e2ac-c9a1-ed11-994c-00224832eb73&emdi=ea000000-0000-0000-0000-000000000001&ceid=</p>	<p>Website provides overview and prevalence of maternal mental health conditions – baby blues, pregnancy/postpartum anxiety/depression/OCD, maternal dysthymia, birth related PTSD, birth loss and grief, postpartum mania/psychosis.</p> <p>Advocate at the federal level. Educate via events/movements to improve outcomes. Training/webinars. Screening tools and resources available.</p>
<p>National Maternal Mental Health Hotline – Health Resources & Services Administration (HRSA)</p> <p>www.MCHB.HRSA.gov/national-maternal-mental-health-hotline</p> <p>Call/text 1-833-9-HELP4MOMS (1-833-943-5746)</p>	Free, 24/7, confidential support, resources, and referrals

<p>The National 988 Suicide & Crisis Lifeline</p> <p>Immediate help call or text 988</p> <p>Chat feature – https://988lifeline.org/</p>	<p>Free, 24/7, confidential support, resources, and referrals</p>
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APPENDIX F

MONTANA OBSTETRICS MATERNAL
SUPPORT (MOMS) DIAGRAM

Appendix F: Montana Obstetrics Maternal Support (Moms) Diagram



APPENDIX G

MONTANA OBSTETRICS MATERNAL SUPPORT (MOMS)

CURRENT PROGRAMMING MARCH 2023



APPENDIX H

PREECLAMPSIA FOUNDATION VISUAL AID

Appendix H: Preeclampsia Foundation Visual Aid

Ask Your Doctor or Midwife

Preeclampsia

What Is It?

Preeclampsia is a serious disease related to high blood pressure. It can happen to any pregnant woman during the second half of her pregnancy, or up to 6 weeks after delivery.

Risks to You

- Seizures
- Stroke
- Organ damage
- Death

Risks to Your Baby

- Premature birth
- Restricted growth
- Death

Signs of Preeclampsia



Stomach pain



Headaches



Feeling nauseous; throwing up



Seeing spots



Swelling in your hands and face



Gaining more than 5 pounds (2.3 kg) in a week

What Should You Do?

Call your doctor or midwife right away. Finding preeclampsia early is important for you and your baby.



For more information go to www.preeclampsia.org

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