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Quantification of Obstetric Hemorrhage

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University of St. Augustine for Health Sciences

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Quantification of Obstetric Hemorrhage

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This Manuscript Partially Fulfills the Requirements for the
Doctor of Nursing Practice Program and is Approved by:

Dr. Theresa Pape, PhD, RN, CNOR-E, CNE

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July 17, 2022

**University of St. Augustine for Health Sciences
DNP Scholarly Project
Signature Form**

Student Last Name: Garcia	First Name: Alma	Middle Initial:
E-mail: a.garcia5@usa.edu		
Title of DNP Project: Quantification of Obstetric Hemorrhage <i>My signature confirms I have reviewed and approved this final written DNP Scholarly Project. DocuSign electronic signature or wet signature required.</i>		
Type Name in Blue Box Below	Signature	Date
DNP Project Primary Faculty: Dr. Theresa Pape, PhD, RN, CNOR-E, CNE		7-29-22
DNP Project Preceptor: Dr. Zandra V. Perez, DNP		8/4/22
DNP Project Preceptor:		

Abstract

Practice Problem: The practice problem identified involved the inconsistent measurement of blood loss during the postpartum period due to the standard practice of estimating blood loss. Estimates are subjective measures that can have variable results based on interpretation and thus provide minimal meaningful data.

PICOT: The question that guided this project was structured in the following PICOT format. In postpartum women (P), how does the implementation of quantitative blood loss measurements (I), compared to estimated blood loss measurement (C), affect the early identification of severe hemorrhage (O), during the recovery period (T)?

Evidence: Obstetric hemorrhage is a preventable event that accounts for 11% of maternal deaths in the United States and 27% worldwide. The Centers for Disease Control and Prevention (CDC) have reported a significant increase in the incidence of postpartum hemorrhage from data available from 1993 to 2014. Based on the date range reported, the rate of postpartum hemorrhage that required intervention increased from 4.3 to 21.2 per 10,000 cases.

Intervention: The intervention involved the implementation of a standardized methodology for the quantification of blood loss during the postpartum period and was supported by providing continuous education to staff, monitoring blood transfusions, and transfers to higher acuity of care.

Outcome: There was an increase in the number of blood transfusions which can be attributed to the positive effect of implementing QBL measurements and the effective implementation of mitigation strategies. A decrease in transfers to higher acuity of care also demonstrated that early identification of clinical decline positively affected patient outcomes.

Conclusion: The implementation of a standardized protocol for the quantification of blood loss versus the current practice that involves estimating blood loss can aid in the early identification of obstetric hemorrhage.

Quantification of Obstetric Hemorrhage

Every twelve hours, a woman dies due to pregnancy or childbirth complications (CDC, 2019). Obstetric hemorrhage is one of the primary complications associated with postpartum and is the primary cause of maternal morbidity and mortality worldwide (Pacheco et al., 2019). According to the National Institutes of Health (NIH), two-thirds of maternal mortalities may be preventable, but the incidence of maternal morbidity and mortality has been steadily increasing (2021). The prevention and effective management of blood loss during the postpartum period starts with the early identification of this complication. The goal of this project was to implement a standardized protocol for quantifying blood loss versus the current practice that involves estimating blood loss to aid in the early identification of obstetric hemorrhage. Estimates are subjective measures with variable results based on individual interpretations, thus providing minimal meaningful data (Baird, 2017). Objective measurements generate consistent results that can be used to formulate a treatment plan to avert maternal morbidity and mortality (Hire et al., 2020).

Significance of the Practice Problem

The rates of postpartum hemorrhage that require obstetric interventions have increased exponentially over the last 20 years (CDC, 2019). An obstetric hemorrhage is a preventable event that accounts for 11% of maternal deaths in the United States and 27% worldwide (Gavian et al., 2021). The Centers for Disease Control and Prevention (CDC) have reported a significant increase in the incidence of postpartum hemorrhage from data available from 1993 to 2014 (2019). Based on this date range, the postpartum hemorrhage rate that required intervention increased from 4.3 to 21.2 per 10,000 cases (CDC, 2019). In Texas, the maternal mortality rate is 32.5 %, compared to 20.9 % at the national level (Hollier et al., 2017). The primary cause of maternal death during pregnancy or postpartum was hemorrhage, with an incidence of 19% during the 2012 to 2015 period (Hollier et al., 2017). In Bexar County, the rate of obstetric hemorrhage per 10,000 deliveries is between 118 and 202 cases, with minorities

and rural communities disproportionately affected (Hollier et al., 2017). During the four years between 2010 and 2014, over 3,000 obstetric hemorrhage cases required blood transfusion (Hollier et al., 2017).

Health disparities and risk factors that increase maternal morbidity and mortality rates have been identified. The efforts to improve maternal health and outcomes require a multifaceted approach with collaboration from all healthcare team members. Acknowledgment of the current limitations is the first step towards improving the quality of care provided by instituting standardized protocols to improve health outcomes. Preventing maternal mortality and severe morbidity by implementing standardized best-practice protocols is the primary focus of the TexasAIM program. This initiative is a joint effort from the Department of State Health Services (DSHS), the Allegiance for Innovation on Maternal Health (AIM), and the Texas Hospital Association (THA) (Texas Health and Human Services [HHS], 2021). This program provides resources and support for facilities that implement evidence-based practice protocols to reduce maternal morbidity and mortality factors. Addressing the incidence of obstetric hemorrhage is one of the issues identified and supported by this program. Implementing a standardized methodology for quantifying blood loss during the postpartum period can be an invaluable tool for the early identification and management of hemorrhage to positively impact morbidity and mortality (Gavian et al., 2021).

PICOT Question

The question developed to support an evidence-based practice-change project involved implementing a standardized blood loss quantification protocol structured in the following PICOT format. In postpartum women (P), how does the implementation of quantitative blood loss measurements (I), compared to estimated blood loss measurements (C), affect the early identification of severe hemorrhage (O) over an 8-week period (T)?

The population under consideration consisted of women who had either a vaginal delivery or surgical cesarean section during the postpartum recovery period. The early

identification of obstetric hemorrhage can help mitigate the risk of clinical consequences associated with this event (Atallah & Goffman, 2020). The region covered by this health organization includes areas of South-Central Texas in which underserved and vulnerable populations are present (HHS, 2021).

Estimating blood loss volume is variable and does not contribute to improved clinical outcomes (Hancock et al., 2015). Quantifying blood loss could potentially augment vigilance during the postpartum period and result in the timely identification of hemorrhage to activate appropriate patient management protocols (Katz et al., 2020). Estimated blood loss measurement is a common practice in obstetrics that yields inaccurate and inconsistent results due to subjectivity. Currently, blood loss is only quantified during the labor and delivery period for the project site, and an estimate is generated during the postpartum period. The early identification of obstetric blood loss will be implemented as a standardized method for quantifying the amount of blood present.

The intervention for this project involved establishing and implementing a standardized protocol for quantifying blood loss to facilitate the early identification of obstetric hemorrhage. Measuring blood loss comprises an objective method, and results would be consistent and accurate. The intervention has been demonstrated to diminish the incidence of maternal morbidity and mortality by addressing complications before they become severe. Improving the accuracy and reliability of volume measurement is crucial in preventing adverse events.

An 8-week period was the allocated span in which the project took place. The data collected involved measurement of patient's blood loss within the postpartum period during inpatient recovery before hospital discharge. The 8-week period was sufficient to implement changes for positive patient outcomes.

Evidence-Based Practice Framework & Change Theory

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) model was used to facilitate the problem-solving process identified by the acronym PET, which involves the practice

question, evidence, and translation (Dang & Dearholt, 2017). This framework served as a guide during the development and subsequent implementation of the practice-change project because it uses a three-step process that begins with identifying a practice question and includes the most current research findings and best practices to incorporate them into patient care (Dang & Dearholt, 2017). The process of translating evidence into practice is cyclical, allowing for the learning and reflection necessary to make substantial practice improvements (Dang et al., 2021).

Kotter's Eight Step Change Model

Kotter's Eight Step Change Model was used as the foundation for the practice-change project because it provides clear descriptions and guidance for the entirety of the process. This model involves an eight-step process organized into three general categories. The three broad categories include creating the climate for change, engaging the organization, and implementing and sustaining change. A coalition is involved to gain the support of key stakeholders (Lynch, 2020). The model was selected based on organizational needs and the direct alignment with the purpose of the practice-change project. Utilizing this model as a guide in developing, implementing, and disseminating the practice-change project ensured that all options were considered and possible complications were addressed.

The implementation of this model in the practice-change projects began with a practice improvement strategy of measuring blood loss. Sharing information and communicating the importance and relevance of the practice-change project further solidified the organization's commitment to the change. Identifying specific goals and objectives was crucial as part of the process. Finally, outcomes were analyzed in support of the project.

Change Model and Practice Change

The model used for this project is Kotter's Eight Step Change Model, which provided concise guidance during the development and implementation of the project in its entirety. The 8-step process divided into three general categories delineated by this model facilitates

implementation and evaluation of the progress of the practice-change project (Lynch, 2020). Creating increased urgency for developing the topic under consideration leads to the guidance at the beginning of this model. Interprofessional collaboration and team building are the components that facilitate developing a vision and a strategy for successfully implementing practice-change initiatives. Midway through the 8-step process, the importance of constant and effective communication with leadership, healthcare providers, and stakeholders is applied to convey the relevance of practice change. Removing the obstacles to project implementation and identifying short-term wins by establishing attainable short-term targets and supporting long-term goals supports the practice-change model's progression (Lynch, 2020). Collecting and organizing the data for presentation to senior leadership is essential to ensure that the practice-change initiative is reinforced and supported by all members of the healthcare team and organizational leadership (Lynch, 2020). The project schedule organized into a Gantt chart in Appendix C details the practice-change project's development into the eight steps congruent with Kotter's model. The plan includes detailed descriptions that develop over a three-term period consistent with the three practicum courses.

The application of the theory to the practice-change project was as follows. During the initiation, potential threats to the clinical stability of women during the postpartum recovery period were identified so that effective and timely interventions could be applied. The implementation of the practice-change project at all levels was facilitated through the identification of change leaders and stakeholders within the organization. Understanding the organization's core values and vision for evidence-based practice change further supported implementing projects congruent with their goals to improve patient outcomes. By reviewing morbidity and mortality metrics associated with postpartum complications and the recommendations for practice change supported by accrediting agencies, implementing the improvement project was validated and supported. Employing proactive measures to identify the barriers to practice change ensured that the process was aligned with the organizational

mission and that stakeholders endorsed the initiative. Sharing information regarding the project's progress helped to acknowledge the contributions of everyone involved to support a shared vision. Continuous improvement and the recognition of the goals met were made possible through the analysis and evaluation of the project implementation status by monitoring the use of the QBL tool when it was implemented into the EHR and following the education provided to nurses. To ensure leadership support, the success stories that resulted from implementing the practice-change project were included as part of the plan.

Evidence Search Strategy

The topic of interest involved comparing a standardized methodology for measuring blood loss to facilitate the early detection of hemorrhage with the current practice of estimating the volume of blood loss for patients during the postpartum period. Researching this topic began with a general query using Google Scholar and applying specific key terms to narrow the search. The keywords used included *obstetric hemorrhage, postpartum blood loss, estimated blood loss, quantified blood loss, and postpartum complications*. The search yielded over 16,000 results and provided some insight into the necessity to narrow the search further. Inclusion and exclusion criteria were factored into the search to generate a more specific result. A vital inclusion criterion involved journal articles that specified the country of origin as the United States. The reason for this specification was that this country's healthcare system and diverse patient population are unique. Articles published before 2017 were excluded from the search to obtain the most up-to-date and relevant studies.

After the general search on Google Scholar, the number of articles retrieved was too extensive to review. Searches in ProQuest, PubMed, and CINAHL Complete databases yielded a more manageable result after the inclusion and exclusion criteria were applied, and the results were diagramed in Figure 1. The geographic location, the United States, proved to be a valuable inclusion criterion because it narrowed the search results from 2,646 to 46. The resulting 46 journal articles were screened, and 38 were excluded. The items excluded detailed

studies that focused on quantifying blood loss during labor and delivery. After evaluation, eight peer-reviewed journal articles were selected for the topic under evaluation.

Evidence Search Results

The PRISMA diagram included in Figure 1 details the literature search strategy and process for identifying a large volume of records with relevant topics and the process for exclusion. These records were further screened for eligibility and fit to the PICOT question associated with the practice-change project. The articles excluded consisted of duplicates and those that contained small sample sizes. Seven qualitative and one quantitative synthesis study were selected for inclusion in the review. The peer-reviewed journal articles listed in Appendix A and B were evaluated for specific inclusion criteria consisting of the study design, level, and quality defined by The Johns Hopkins Nursing Evidence-Based Practice model.

The Johns Hopkins Nursing Evidence-Based Practice (JHNEBP) Evidence Level and Quality Guide includes three levels- I, II, and III- based on experimental design and quality rating of A, B, or C determined by the evidence and content of the study (Dang & Dearholt, 2017). The primary research evidence in Appendix A includes prospective and retrospective cohort studies with large sample size and specific fit to the PICOT question under consideration. The cohort studies are appropriate for this practice-change project. According to Oliveira (2019) prospective and retrospective cohort studies have been determined to have higher accuracy and efficiency due to measuring risk factors before the outcome occurs. Another identified advantage of cohort study is the ability to examine multiple results from a single event, thus increasing the amount of data available for analysis. One of the main disadvantages identified in this type of study design is the cost of follow-up and the possible bias that could result if participants withdraw from the study. Because of the nature of the topic under consideration, follow-up is part of the care plan for postpartum women.

The evidence level II studies were determined to be quality A and B centered on the consistency of results, sample size, and referenced scientific evidence. One relevant systematic

review, Appendix B, was included and determined to be level II, quality B, based on the criteria of the JHNEBP model. The systematic review consisted of thirty-six studies with direct alignment to the PICOT question developed for the evidence-based practice change project under consideration.

Themes with Practice Recommendations

Postpartum hemorrhage is the leading cause of preventable morbidity and mortality in the United States and worldwide (Gavian et al., 2021). Thus, a thorough and rigorous review of the existing literature on practices for preventing postpartum hemorrhage demonstrated some themes for methods to prevent postpartum hemorrhage. These included: estimating blood loss (EBL) and quantifying blood loss (QBL).

Estimating Blood Loss

Efforts have been made to implement sustainable measures to aid in the early identification of blood loss to activate protocols designed to curtail possible complications. Estimating blood loss (EBL) is a routine part of care and assessment during the postpartum period (Bell et al., 2020; Blosser et al., 2021; Conly et al., 2017; Hire et al., 2020; and Rubenstein et al., 2021). A review of 36 studies on methods to improve the procedures associated with adequate means of determining the degree of blood loss during the postpartum period resulted in the supportive use of QBL to identify and manage possible complications during this period effectively. Generally, the consensus was that the early identification of blood loss utilizing QBL measurement techniques improves maternal outcomes due to objectivity and accuracy (Hancock et al., 2015). Seven studies in the systematic review were found to support the prevailing consensus that visual estimation of blood loss is inaccurate, and the information generated is limited (Hancock et al., 2015).

Quantitative Blood Loss Measurement

The implementation of quantitative blood loss measurement techniques has significant implications for early hemorrhage detection (Bell et al., 2020; Blosser et al., 2021; Conly et al.,

2017; Hire et al., 2020; and Rubenstein et al., 2021). Establishing a standardized methodology for measuring blood loss during the postpartum period using QBL techniques results in improved assessment and early identification of potential complications due to the sensitivity and objectivity of this method (Blosser et al., 2021; Conly et al., 2017; and Rubenstein et al., 2021). The implementation of QBL measurement significantly reduces the incidence of maternal morbidity and mortality by providing a means of early identification that facilitates the implementation of postpartum hemorrhage protocols (Ajemian et al., 2020; Bell et al., 2020; Hire et al., 2020; Kahr et al., 2018; and Rubenstein et al., 2021).

Recommendations

Postpartum hemorrhage may not be preventable, but implementing strategies that support early identification of medically significant blood loss can significantly impact maternal morbidity and mortality. The themes identified during the literature review offered supportive evidence about the importance of implementing a standardized methodology for the early identification of blood loss and the significance of QBL measurements versus EBL. The literature support for QBL rather than EBL also answers the PICOT question: “In postpartum women (P), how does the implementation of quantitative blood loss measurements (I), compared to estimated blood loss measurements (C), affect the early identification of severe hemorrhage (O) over an 8-week period (T)?” Care of postpartum hemorrhage starts with early identification and interventions to decrease the severity of associated complications.

Setting, Stakeholders, and Systems Change

The setting in which this practice-change problem was developed involved a maternal and neonate center that serves both a central Texas city and surrounding rural communities. The mission and values of this organization support all initiatives to improve care by focusing on providing compassionate services inspired by faith and reinforced by the principles of safety, excellence, and accountability. The inpatient setting includes operating rooms, labor and delivery suites, and an obstetrics emergency room to address emerging problems and

complications. The leadership and staff at this women's center are deeply committed to providing the safest and best care possible to expectant mothers, their babies, and their families. A unique characteristic of this center that was a significant factor in the development of this project involved the patient population served. Many surrounding rural communities have limited access to obstetric care, including prenatal care, which places women at higher risk during labor, delivery, and postpartum.

The identification and active involvement of stakeholders within the organization were critical in developing and implementing the proposed practice-change project (Agency for Healthcare Research and Quality [AHRQ], 2021). Engaging stakeholders throughout the development of the practice-change project increases the initiatives' relevancy, utilization, implementation, and dissemination (AHRQ, 2021). The senior leadership for the organization, including the executive leadership team, women's center director, nurses and staff, quality management clinicians, and the patient population served, are all important in the implementation and dissemination of organizational change efforts. Organizational support was facilitated by recognizing a need for change regarding the current practice implemented during the care of postpartum patients. The sustainability of the proposed practice change required the involvement and collaboration of all healthcare team members, which was facilitated by tangible positive outcomes.

A SWOT analysis facilitates the assessment of organizational strengths, weaknesses, opportunities, and threats to the implementation of the practice-change project under consideration (Community ToolBox, 2021). The organizational analysis was performed (Table 2) and included identified strengths and weaknesses and opportunities available to curtail possible threats. Some of the most salient strengths noted included the active involvement of staff and the support from all leadership team members. Being a newly established women's center can be considered a weakness due to the gaps in care and deficiencies in education for new staff, but this creates an opportunity for learning and improvement that can only be used to improve

the program. One perceived threat was the possible resistance to change when implementing new procedures and processes, which was mitigated by maintaining an open line of communication and continuous collaboration between all healthcare team members. A significant threat to implementing this practice-change project involved the patient population being served because social determinants of health can significantly impact patient outcomes.

Healthcare organizations can be stratified into levels to illustrate how complex systems interact and affect outcomes. Micro-, meso-, and macro-levels are part of a framework that pertain to patient interactions, the organization and community, and the policy level, respectively (World Health Organization, 2002). This practice-change project's impact has been appreciated at all levels- micro, meso, and macro. At the micro-level, changes to postpartum care can have a substantial effect on patient outcomes. Implementing a standardized methodology for quantifying PPH can lead to the early identification and prompt implementation of interventions that will affect maternal morbidity and mortality. Support from all members of the healthcare team and units not explicitly designated to care for obstetric cases can potentially jeopardize the meso-level of systems change. Recognizing the limitations of social determinants of health affecting the patient population being cared for can substantially affect the macro-level of systems change and can potentiate actions to address deficiencies.

Implementation Plan with Timeline and Budget

The quantification of blood loss during the postpartum period promotes an objective and reliable clinical assessment of patient status, which leads to earlier detection of clinical deterioration. The goals that guided the implementation and evaluation of this change project were essential components to success. Interprofessional collaboration and support were imperative to achieve the determined objectives.

Objectives

1. A protocol for quantifying blood loss by nurses and staff during the postpartum period will be developed by week 1.

2. Approximately 95% of the nurses will be trained to use the QBL protocol by the end of week 1.
3. The QBL measurement tool will be 100% integrated into the electronic health record for postpartum documentation by week 8.

Project Timeline

The project timeline is detailed in Appendix C and includes information from project initiation to implementation and conclusion. Implementation of the practice-change project took place over 8-weeks. The first steps included initiating contact with the preceptor at the clinical site to discuss the topic under consideration. During the initial phase, gathering relevant evidence supported the project's urgency and importance in developing the vision that guided the implementation. The practice-change project continued to be supported by developing appropriate education for nurses and staff. Communicating the findings and importance of evidence-based practice change was facilitated by presentations and meetings with organization leaders and other stakeholders. Finally, data were collected and evaluated to generate project results.

Interprofessional Collaboration

The implementation of a practice-change project would not be possible without interprofessional collaboration. The experience and expertise of all healthcare team members augment the success of any efforts to promote positive patient outcomes (Bridges et al., 2011). It is through such collaboration that the practice change was supported and sustained. Open communication between all healthcare team members facilitated the development of this change to benefit patients.

Resources and Budget

The resources available for this project included the DNP student as project manager (PM), the women's center coordinator, the informaticist, staff educators, the inpatient clinical director, and front-line registered nurses. Since the practice-change project was an identified

need for the organization, the cost involved is minimal. Since registered nurses received training as part of their professional development and informaticists involved in embedding the tool into the electronic health record performed this as part of their duties, it did not require a separate budget. A detailed budget was included in Table 1, and the values included are representative of standards salaries.

Role of PM

The role of the PM as project leader was to provide information and guidance during the development and implementation of the practice-change project. The focus afforded by collaborating with organizational leaders allowed the PM to solidify the plan so that a positive impact on health outcomes and lasting change within the organization could occur.

Results

Selection of Participants

The evaluation of the data collected during the pre-and post-implementation of the EBP change project was an essential component of assessing the functionality of the interventions. Participants of the DNP practice-change project included 109 women in the postpartum unit following vaginal or caesarian delivery during the 8-weeks of the implementation phase. Exclusion criteria included postpartum women admitted to intensive care or COVID unit, requiring emergency department evaluation and treatment, or classified under the high-risk postpartum evaluation.

Data Collection

Comparison baseline data was gathered and evaluated before the practice-change project implementation phase and included data that spanned 8-weeks during January and February. The data collected during the implementation phase took place for 8-weeks immediately following the pre-implementation stage. Project implementation began with an immediate postpartum hemorrhage risk assessment incorporated into the electronic health record (EHR) during March and April. The risk assessment categories included in Appendix D

were used to verify postpartum clinical status and suitability for inclusion. Participants under the high-risk category were excluded due to the probability of transfer to an intensive care unit for closer monitoring. The Quantitative Analysis Tool for Blood Loss (Appendix E) was used to quantify blood loss for the early identification of postpartum hemorrhage. The aggregate data collected was recorded in a data collection sheet (Appendix G) that was used throughout the implementation phase of the practice change project.

Protection of Human Rights and Privacy

Data collected, stored, and analyzed during the progress of the practice-change project was based on de-identified health information. The data gathered during the course of the project was also stored within a password-protected computer with limited accessibility. The aggregate data collected did not contain identifying patient information, thus reducing the risk of loss of confidentiality.

Data Analysis

Data were analyzed using the Microsoft Excel office program to compare the results. The data is represented using a bar graph (Appendix H) that was created using Excel to compare the rate and frequency of required blood transfusions or transfers to higher acuity of care due to identified deterioration in clinical status based on assessment and blood loss volumes recorded. The four months illustrated on the graph cover the pre-and post-implementation periods that span two months each. Blue bars represent the total number of postpartum cases each month (n= 41, 56, 53, and 56), followed by red bars representing the total number of blood transfusions (n= 3, 2, 4, and 2). Green bars represent the number of cases (n= 4, 0, 0, and 2) that required transfer to higher acuity of care.

Outcome Measures

Outcome measures involved frequency and rate calculations for postpartum patients that required interventions, including blood transfusions and transfers to a higher acuity of care, due to the early identification of blood loss facilitated by quantification methods. During the 8-weeks

that comprised the pre-implementation period during January and February, there were 97 cases, five (5.2%) required blood transfusions, and four (4.1%) were transferred to higher acuity of care. During the implementation phase covering the same length of time during March and April, 109 cases included six (5.5%) blood transfusions and two (1.8%) transfers to higher acuity of care. A comparison of the pre-and post-implementation rate of required interventions generated data supporting the change project's purpose. An increased number of blood transfusions resulted from the early identification of clinical decline from using QBL measurements, and the interventions enacted prevented possible morbidity and mortality.

Clinical significance is of greater importance for evidence-based practice-change projects because that is the basis for their implementation (Dhawan et al., 2017). The significance of clinical outcomes for this project was demonstrated by a reduction in patient upgrades to higher acuity units and an increase in the use of blood products that were required. Evaluation of the percent change showed a 0.3% (n= 6) increase in blood transfusions and a 2.3% (n= 2) decrease in the number of transfers to higher acuity of care. Implementing these mitigation strategies, including blood transfusions, ultimately led to improved patient outcomes.

Process Measures

The process measure for this practice-change project involved using the postpartum risk assessment tool and the quantification blood loss tool, both embedded into the EHR. Shift charge nurses ensured that the specified tools were being utilized. The objective for this process measure was 100% achievement, which was met during the implementation based on chart audits performed by the shift charge nurse.

Balance Measures

Balance measures considered included decreasing the number of patients that required interventions such as blood transfusions and transfers to higher acuity units due to postpartum hemorrhage. The goal was to reduce the number of patients transferred or requiring interventions due to complications or worsening clinical status. This measure aimed to reduce

the number of transfers to higher acuity care by 50%, with a goal of reducing the incidence by 95%. A significant balance measure would be the reduction of blood transfusions or transfers due to postpartum hemorrhage by 95% during the implementation phase, with a goal of 95% after sustained implementation. Based on data comparison of patients in the pre-and post-implementation groups, there was an 8% (n= 2) increase in the rate of blood transfusions and a decrease of 78% (n= 2) in transfers to higher acuity. These results demonstrate an increase in blood transfusions, which can be attributed to the positive effect of implementing QBL measurements and effective mitigation strategies. A decrease in transfers to higher acuity of care also demonstrates that early identification of clinical decline positively affected patient outcomes.

Sustainability Measures

Sustainability measures included the continued education of current and new nurses and staff to use the Postpartum Hemorrhage Risk Assessment Tool and the Quantitative Analysis Tool for Blood Loss instead of estimating blood loss (Appendix D and E). Their current implementation supported the validity of both tools to assess risk and measure blood loss during labor and delivery. The objective for this measure of 95% and the education goal of 95% for new nurses and staff were met. The women's center coordinator continues to monitor the continuous application of the process, compliance, and effectiveness.

Impact

The impact of the practice improvement project can be demonstrated by including the clinical significance of preventing adverse clinical outcomes associated with postpartum hemorrhage. The practice problem addressed involved the implementation of a standardized and objective protocol for measuring blood loss that facilitated the identification of worsening clinical status and the prompt implementation of strategies to minimize negative outcomes.

The positive clinical outcomes that reduce maternal morbidity and mortality reinforce the importance of the continued implementation of evidence-based strategies. The organization has

seen increased team dynamics that can further expand the current practice. The limitations included continuous changes in staffing that required a reevaluation of the education requirements based on experience and baseline knowledge. The factors that facilitated the sustainability of the practice-change project included leadership support, substantial training resources, and the necessary equipment to ensure the provision of a higher level of care is continuous.

Dissemination

The dissemination of this practice-change project results was incorporated into various modalities. Sharing the information within the practicum setting culminated all efforts to bring the practice-change project to completion. All healthcare team members were invited to attend the presentation disseminated using TEAMS. This virtual platform facilitated attendance and conformed to the current social distancing restrictions dictated by pandemic protocols. Additionally, educational materials were created, organized, and disseminated to areas indirectly involved with postpartum patients, such as the emergency department. The results generated by the practice-change project are planned as a poster presentation at the Alpha Alpha Chapter of Sigma Theta Tau. A manuscript for publication in SOAR @USA will be submitted to facilitate disseminating information to individuals directly involved in the field.

Conclusion

The purpose of the practice-change project was to positively affect maternal morbidity and mortality rates by recognizing a deteriorating clinical status during the postpartum recovery period. Using the tools supported by the JHNEBP model, evidence was translated into practice to make improvements. Furthermore, utilizing Kotter's Eight Step Change Theory Model provided structured guidance during developing and applying the practice change strategies. A review of current literature supported the postulated question that aims at improving outcomes by establishing a standardized protocol for quantifying blood loss. The literature evaluated consists of level II, quality A and B studies designated by the JHNEBP model. Based on the

review of the available evidence, the practice recommendations that involved implementing a standardized protocol for quantifying blood loss during the postpartum recovery period were made. The alternative practice of estimating blood loss was identified in the literature review as yielding limited beneficial information due to its subjectivity. Implementing this evidence-based practice-change project reduced the incidence of maternal morbidity and mortality due to postpartum hemorrhage through the early identification of deteriorating clinical status and the enactment of mitigating protocols. By identifying the deficiencies and limitations involved in the current practice of estimating blood loss and the possible adverse events associated with postpartum hemorrhage, urgency for practice change was generated, and the acquisition of support for organizational change and system improvement was made possible. Implementing evidence-based practice change protocols can positively impact maternal morbidity and mortality rates and substantially affect the quality of life of an underserved community. Implementing a standardized protocol for the early identification of postpartum hemorrhage through the quantification of blood loss was used to enact mitigation strategies and procedures to reduce the incidence of adverse patient outcomes.

References

- Agency for Healthcare Research and Quality (AHRQ). (2021, November 5). Section 2: Engaging stakeholders in a care management program. *Designing and Implementing Medicaid Disease and Care Management Programs*.
<https://www.ahrq.gov/patientsafety/settings/long-termcare/resource/hcbs/medicaidmgmt/mm2.html>
- Ajemian, B., Handal-Orefice, R., Alnafisee, S., Gavara, R., & Wapner, R. J. (2020). 993: Quantitative blood loss: A potential screening tool to prevent unnecessary postpartum blood draws. *American Journal of Obstetrics and Gynecology*, 222(1), S617.
<https://doi.org/10.1016/j.ajog.2019.11.1004>
- Atallah, F., & Goffman, D. (2020). Improving healthcare responses to obstetric hemorrhage: Strategies to mitigate risk. *Risk Management and Healthcare Policy*, 13, 35-42.
Doi:10.2147/RMHP.S179632
- Baird E. J. (2017). Identification and management of obstetric hemorrhage. *Anesthesiology Clinics*, 35(1), 15–34. <https://doi.org/10.1016/j.anclin.2016.09.004>
- Bell, S. F., Watkins, A., John, M., Macgillivray, E., Kitchen, T. L., James, D., Scarr, C., Bailey, C. M., Kelly, K. P., James, K., Stevens, J. L., Edey, T., Collis, R. E., & Collins, P. W. (2020). Incidence of postpartum hemorrhage defined by quantitative blood loss measurement: A national cohort. *BMC Pregnancy and Childbirth*, 20(1), 1–9.
<https://doi.org/10.1186/s12884-020-02971-3>
- Blosser, C., Smith, A., & Poole, A. T. (2021). Quantification of blood loss improves detection of postpartum hemorrhage and accuracy of postpartum hemorrhage rates: A retrospective cohort study. *Cureus*, 13(2), e13591. <https://www.cureus.com/articles/50976-quantification-of-blood-loss-improves-detection-of-postpartum-hemorrhage-and-accuracy-of-postpartum-hemorrhage-rates-a-retrospective-cohort-study>

- Bridges, D. R., Davidson, R. A., Odegard, P. S., Maki, I. V., & Tomkowiak, J. (2011). Interprofessional collaboration: Three best practice models of interprofessional education. *Medical Education Online*, 16, 6035. Doi: 10.3402/meo.v16i10.6035
- Centers for Disease Control and Prevention (CDC). (2019). Data on selected pregnancy complications in the United States. *Reproductive Health*.
<https://www.cdc.gov/reproductivehealth/maternalinfanthealth/pregnancy-complications-data.html>
- Community Tool Box. (2021, November 5). SWOT analysis: Strengths, weaknesses, opportunities, and threats. *Center for Community Health and Development at the University of Kansas*. <https://ctb.ku.edu/en/table-of-contents/assessment/assessing-community-needs-and-resources/swot-analysis/main>
- Conly, B., Sylla, R., Lee, K., & Wei, J. (2017). Improved estimation of blood loss at time of cesarean section using a quantitative approach [28M]. *Obstetrics & Gynecology*, 129(5), S140. Doi: 10.1097/01.AOG.0000514699.18738.76
- Dang, D., Dearholt, S., Bissett, K., Ascenzi, J., & Whalen, M. (2022). *Johns Hopkins evidence-based practice for nurses and healthcare professionals: Model and guidelines*. 4th ed. Indianapolis, IN: Sigma Theta Tau International
- Dang, D., & Dearholt, S. (2017). Appendix D: Evidence level and quality guide. In *Johns Hopkins Nursing Evidence-Based Practice: Model and Guidelines*. 3rd ed. Sigma Theta Tau International
- Diaz, V., Abalos, E. & Carroli, G. (2018). Methods for blood loss estimation after vaginal birth. *The Cochrane Database of Systematic Reviews*, 9(9), CD010980.
<https://www.cochranelibrary.com/cdsr/doi/10.1002/14651858.CD010980.pub2/full>
- Dhawan, A., Brand, J. C., Provencher, M. T., Rossi, M. J., & Lubowitz, J. H. (2017). Research pearls: The significance of statistics and perils of pooling. Part 1: Clinical versus statistical significance. *Arthroscopy: The Journal of Arthroscopic & Related Surgery*,

33(6), 1099- 1101. [https://www.arthroscopyjournal.org/article/S0749-8063\(17\)30181-0/fulltext](https://www.arthroscopyjournal.org/article/S0749-8063(17)30181-0/fulltext)

Evensen, A., Anderson, J. M., & Fontaine, P. (2017). Postpartum hemorrhage: Prevention and treatment. *American Family Physician*, 95(7), 442- 449.

<https://www.aafp.org/pubs/afp/issues/2017/0401/p442.html>

Gavian, S., Rosenberg, N., & Hulbert, J. (2021, September 18). Proactively preventing maternal hemorrhage- related deaths. *The Joint Commission*.

[https://www.jointcommission.org/resources/news-and-multimedia/blogs/leading-hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-deaths/#:~:text=While%20only%203-](https://www.jointcommission.org/resources/news-and-multimedia/blogs/leading-hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-deaths/#:~:text=While%20only%203-5%25%20of%20obstetric%20patients%20will%20experience,deaths%20worldwide%20and%2011%25%20of%20U.S.%20maternal%20deaths.)

[hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-](https://www.jointcommission.org/resources/news-and-multimedia/blogs/leading-hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-deaths/#:~:text=While%20only%203-5%25%20of%20obstetric%20patients%20will%20experience,deaths%20worldwide%20and%2011%25%20of%20U.S.%20maternal%20deaths.)

[deaths/#:~:text=While%20only%203-](https://www.jointcommission.org/resources/news-and-multimedia/blogs/leading-hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-deaths/#:~:text=While%20only%203-5%25%20of%20obstetric%20patients%20will%20experience,deaths%20worldwide%20and%2011%25%20of%20U.S.%20maternal%20deaths.)

[5%25%20of%20obstetric%20patients%20will%20experience,deaths%20worldwide%20a](https://www.jointcommission.org/resources/news-and-multimedia/blogs/leading-hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-deaths/#:~:text=While%20only%203-5%25%20of%20obstetric%20patients%20will%20experience,deaths%20worldwide%20and%2011%25%20of%20U.S.%20maternal%20deaths.)

[nd%2011%25%20of%20U.S.%20maternal%20deaths.](https://www.jointcommission.org/resources/news-and-multimedia/blogs/leading-hospitalimprovement/2019/11/proactively-preventing-maternal-hemorrhagerelated-deaths/#:~:text=While%20only%203-5%25%20of%20obstetric%20patients%20will%20experience,deaths%20worldwide%20and%2011%25%20of%20U.S.%20maternal%20deaths.)

Hancock, A., Weeks, A. D., & Lavender, D. T. (2015). Is accurate and reliable blood loss estimation the “crucial step” in early detection of postpartum haemorrhage: An integrative review of the literature. *BMC Pregnancy and Childbirth*, 15(1).

<https://bmcpregnancychildbirth.biomedcentral.com/articles/10.1186/s12884-015-0653-6>

Hire, M. G., Lange, E. M. S., Vaidyanathan, M., Armour, K. L., & Toledo, P. (2020). Effect of quantification of blood loss on activation of a postpartum hemorrhage protocol and use of resources. *Neonatal Nursing*, 49(2), 137- 143. [https://www.jognn.org/article/S0884-](https://www.jognn.org/article/S0884-2175(20)30005-8/fulltext)

[2175\(20\)30005-8/fulltext](https://www.jognn.org/article/S0884-2175(20)30005-8/fulltext)

Hollier, L., Levy, B., & O'Brien, B. (2017). Preventing maternal mortality and morbidity. *Texas Health and Human Services*. <https://www.dshs.texas.gov/mch/pdf/Preventing-Maternal-Mortality-and-Morbidity-in-Texas---October-12,-2017.pdf>

Intellectus Statistics [Computer software. (2022). Retrieved from

<https://analyze.intellectusstatistics.com/#>

Kahr, M. K., Brun, R., Zimmermann, R., Franke, D., & Haslinger, C. (2018). Validation of a quantitative system for real-time measurement of postpartum blood loss. *Archives of Gynecology & Obstetrics*, 298(6), 1071–1077.

<https://link.springer.com/article/10.1007/s00404-018-4896-0>

Katz, D., Wang, R., O'Neil, L., Gerber, C., Lankford, A., Rogers, T., Gal, J., Sandler, R., & Beilin, Y. (2020). The association between the introduction of quantitative assessment of postpartum blood loss and institutional changes in clinical practice: An observational study. *International Journal of Obstetric Anesthesia*, 42, 4–10.

[https://www.obstetanaesthesia.com/article/S0959-289X\(19\)30070-6/fulltext](https://www.obstetanaesthesia.com/article/S0959-289X(19)30070-6/fulltext)

Lynch, W. (2020). *A comprehensive guide to Kotter's 8 step model of change*.

<https://warren2lynch.medium.com/a-comprehensive-guide-to-kotters-8-step-model-of-change-43d4eb86f1ea>

Mortimer, F., Isherwood, J., Pearce, M., Kenward, C., & Vaux, E. (2018). Sustainability in quality improvement: measuring impact. *Future Healthcare Journal*, 5(2), 94–97.

<https://doi.org/10.7861/futurehosp.5-2-94>

National Institutes of Health (NIH). (2021, September 25). *Maternal morbidity and mortality*.

<https://www.nichd.nih.gov/health/topics/factsheets/maternal-morbidity-mortality>

Oliveira, I. (2019). Cohort studies: Prospective and retrospective designs. *Cochrane Tutorials and Fundamentals*. <https://s4be.cochrane.org/blog/2019/03/06/cohort-studies->

[prospective-retrospective-](https://s4be.cochrane.org/blog/2019/03/06/cohort-studies-)

[designs/#:~:text=As%20previously%20described%2C%20retrospective%20cohort%20studies%20are%20typically,between%20one%20or%20more%20risk%20factors%20and%20outcome.](https://s4be.cochrane.org/blog/2019/03/06/cohort-studies-)

Pacheco, L. D., Saade, G. R., & Hankins, G. (2019). Medical management of postpartum hemorrhage: An update. *Seminars in Perinatology*, 43(1), 22–26.

<https://www.sciencedirect.com/science/article/abs/pii/S0146000518301253?via%3Dihub>

Rubenstein, A. F., Zamudio, S., Douglas, C., Sledge, S., & Thurer, R. L. (2021). Automated quantification of blood loss versus visual estimation in 274 vaginal deliveries. *American Journal of Perinatology*, 38(10), 1031–1035. <https://www.thieme-connect.de/products/ejournals/abstract/10.1055/s-0040-1701507>

Texas Health and Human Services. (2021, September 25). TexasAIM. *Maternal and Child Health*. <https://dshs.texas.gov/mch/TexasAIM.aspx>

World Health Organization (WHO). (2002). *Innovative care for chronic conditions*. https://www.who.int/chp/knowledge/publications/iccc_ch2.pdf#:~:text=Micro-%20Meso-%20and%20Macro-Levels%20One%20strategy%20to%20organize,and%20community%20level%20and%20the%20policy%20level%20respectively.

Table 1

Budget

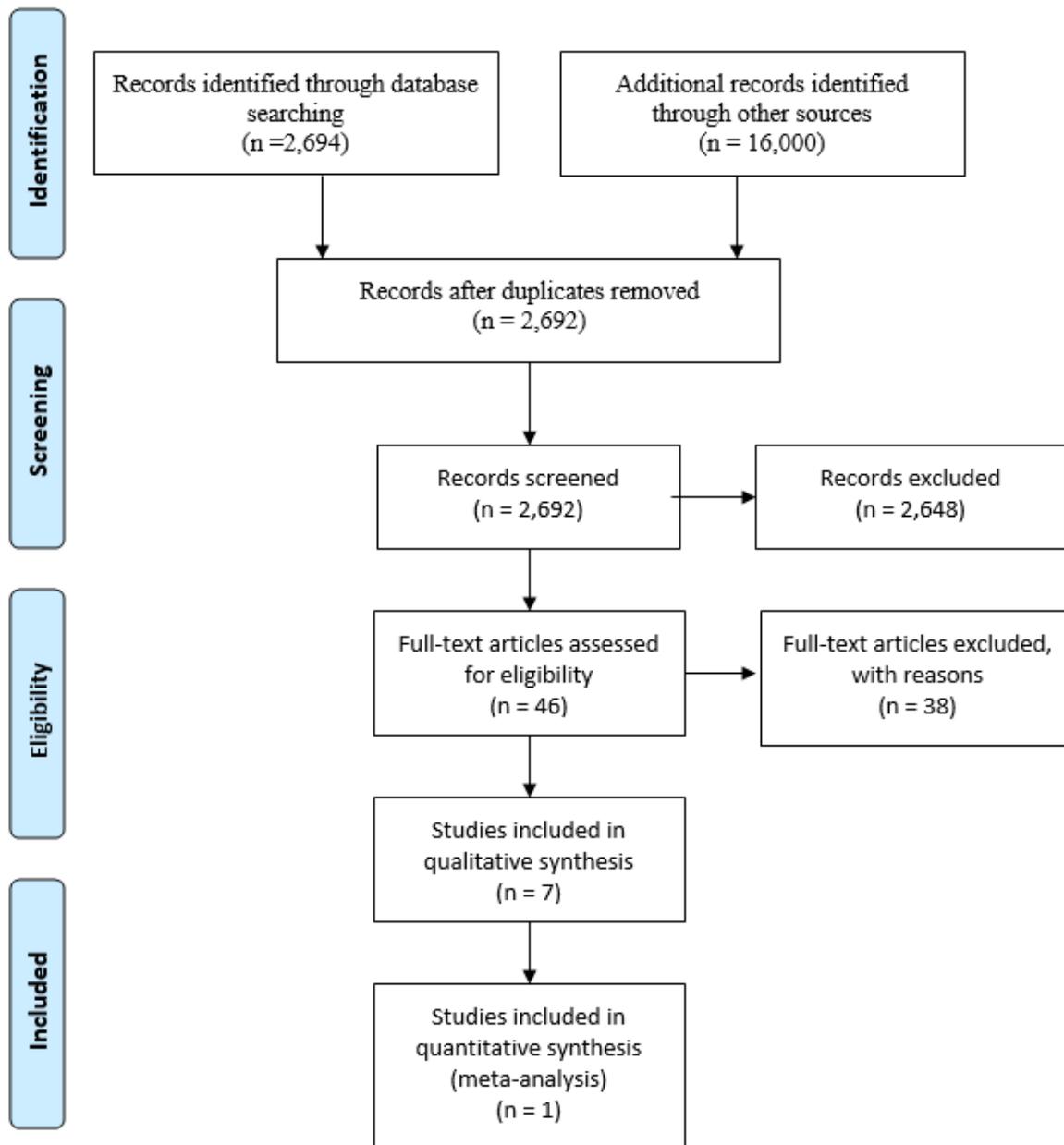
EXPENSES		REVENUE	
Direct		Billing	
Salary and benefits <ul style="list-style-type: none"> • RN education x2 hours x 100 RNs @ \$30.00 	\$6,000	Grants	\$0
Supplies: scales x 30 @ \$150.00	\$4,500	Institutional budget support	\$200,500
Services			
<ul style="list-style-type: none"> • Informaticist @ \$70,000 salary • Clinical Director @ \$120,000 salary 	\$70,000 \$120,000		
Total Expenses	\$200,500	Total Revenue	\$200,500
Net Balance			\$0

Table 2*SWOT Analysis*

S strengths	W weaknesses	O opportunities	T threats
<ul style="list-style-type: none"> • Actively involved staff with diverse background • Support from the leadership team to develop an effective and efficient women's center 	<ul style="list-style-type: none"> • Newly established women's center • Education needed at all levels of the organization 	<ul style="list-style-type: none"> • Process improvement • Growth • Learning 	<ul style="list-style-type: none"> • Many patients treated at the center have limited prenatal care • Language barriers

Figure 1

PRISMA Literature Search Strategy Diagram



Note. Adapted from Moher, D., Liberati, A., Tetzlaff, J., & Altman, D. G. The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLOS Medicine*, 6(7), e1000097. <https://doi.org/10.1371/journal.pmed.1000097>

Appendix A

Summary of Primary Research Evidence

Citation	Design, Level Quality Grade	Sample Sample size	Intervention Comparison	Theoretical Foundation	Outcome Definition	Usefulness Results Key Findings
Ajemian et al., 2020	Prospective pilot cohort study Level II Quality B	n=100	CBC was obtained on admission, PPd1 and PPd2	none	QBL is a strong predictor of P.P. hct	A QBL of 600mL can serve as a screening tool to determine if obtaining P.P. hct is necessary
Bell et al., 2020	Prospective, consecutive cohort Level II Quality A	n=31,341 women in 12 hospitals in Wales	Visual estimation of P.P. blood loss often under-reports actual bleed volume. QBL was introduced to improve accuracy of blood loss measurement.	None	QBL is associated with higher rates of PPH	QBL has implications for the early detection and management of PPH
Blosser et al., 2021	Retrospective observational study Level II Quality A	EBL n=2,743, 848 cesarean births QBL n=2,712, 828 cesarean births	Evaluate the ability of EBL and QBL to predict the need for blood transfusion in P.P. patients P.P. hemorrhage was defined as blood loss greater than or equal to 1000mL regardless of route of delivery	none	QBL is a more sensitive test for detecting clinically significant blood loss, which could lead to earlier recognition of hemorrhage and interventions.	In vaginal births, QBL demonstrated a trend for increased sensitivity when compared to EBL in predicting PPH. In cesarean births, QBL was more than twice as sensitive for the prediction of PPH with blood transfusion compared to EBL. QBL is a more sensitive test for detecting clinically significant blood loss, which could lead to earlier recognition of hemorrhage and more timely intervention.

<p>Conly et al., 2017</p>	<p>Retrospective cohort study Level II Quality A</p>	<p>n= 564 scheduled cesarean sections QBL=295, EBL=269</p>	<p>Determine if QBL is better able to measure blood loss compared to EBL. QBL and EBL are compared to pre and postoperative hct</p>	<p>none</p>	<p>QBL was weakly to moderately correlated while EBL was very weakly correlated with the calculated blood loss</p>	<p>Implementation of a standardized, quantitative approach to measuring blood loss may improve the immediate postoperative assessment.</p>
<p>Hire et al., 2020</p>	<p>Prospective observational study Level II Quality B</p>	<p>n=42 cases of cesarean birth</p>	<p>To determine if quantification of blood loss (QBL) would result in fewer activations of postpartum hemorrhage (PPH) protocols than visual estimation of blood loss (EBL) after cesarean birth and to track the use of related resources.</p>	<p>None</p>	<p>Use of QBL during cesarean births would have reduced the number of identified PPHs by more than 50% over visual EBL and may have reduced the resources used as part of care.</p>	<p>Quantification of blood loss may significantly reduce the activation of postpartum hemorrhage protocols and may prevent the use of procedures and medications that could contribute to maternal morbidity.</p>
<p>Kahr et al., 2018</p>	<p>Prospective observational study Level II Quality A</p>	<p>n= 921; 461 vaginal delivery, 460 cesarean section</p>	<p>Validating the applicability QBL by comparing with a hemoglobin-based formula for blood loss as an objective control.</p>	<p>None</p>	<p>QBL highly correlated to calculated blood loss for both vaginal and cesarean births.</p>	<p>QBL during both vaginal deliveries as well as cesarean sections showed a strong correlation with the calculated blood loss.</p>
<p>Rubenstein et al., 2021</p>	<p>Prospective observational study Level II Quality A</p>	<p>n=274 vaginal deliveries</p>	<p>To compare quantified blood loss measurement (QBL) using an automated system (Triton QBL, Menlo Park, CA) with visual</p>	<p>None</p>	<p>Automated QBL recognizes more patients with excessive blood loss than visual estimation. To realize the</p>	<p>QBL detects hemorrhage more frequently than visual estimation Median QBL is significantly greater than median EBL.</p>

			blood loss estimation (EBL) during vaginal delivery.		value of QBL, clinicians must accept the inadequacy of visual estimation and implement protocols based on QBL values	
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Legend: QBL – Quantitative Blood Loss, EBL – estimated blood loss, P.P. – postpartum, PPH – postpartum hemorrhage, hct – hematocrit, CBC – complete blood count, PPd1 – postpartum day 1, PPd2 – postpartum day 2

Appendix B

Summary of Systematic Reviews

Citation	Quality Grade	Question	Search Strategy	Inclusion/ Exclusion Criteria	Data Extraction and Analysis	Key Findings	Usefulness/Recommendation/ Implications
Hancock et al., 2015	Systematic, integrative review Level II Quality B	Can a review of the various methods available for the determination of maternal blood loss during childbirth improve the accuracy and reliability of blood loss estimation?	36 studies were included that evaluated the accuracy of visual estimation; tested methods to improve skills in measurement; examined their effect on PPH diagnosis and treatment, and / or explored additional factors associated with blood loss evaluation.	Studies were excluded if they focused on secondary PPH; definition of risk factors for PPH; and treatment regimens for PPH.	The papers were manually organized into subgroups based on interventions and research design	7 of 8 studies found that visual estimation was inaccurate. A small number of qualitative studies suggested that factors other than volume were taken into consideration when making decisions about blood loss. Delays in the diagnosis of PPH were also apparent in the low-income settings where maternal collapse, loss of consciousness, pallor and cyanosis were used as signs that blood loss was serious	Early diagnosis of PPH can improve maternal outcomes Early diagnosis of PPH should improve maternal outcomes, but there is little evidence that this can be achieved through improving the accuracy of blood loss volume measurements. The diagnosis may rely on factors other than volume, such as speed of blood flow and nature of loss

Legend: PPH – postpartum hemorrhage

Appendix C

Project Schedule

Activities/ Tasks	NUR 7801								NUR 7802								NUR 7803					
	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11	Week 13	Week 15	Week 1	Week 3	Week 5	Week 7	Week 9	Week 11
Meet with preceptor	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Review literature	X	X																				
STEP 1: CREATING AN URGENCY																						
Prepare project proposal	X	X	X	X	X	X	X	X														
Submit project to USA Evidence-Based Practice Project Review Council (EPRC)								X														
STEP 2: FORMING GUIDING COALITIONS																						
Identify champions and team members				X	X																	
Identify and train data collectors						X																
STEP 3: DEVELOPING A VISION AND STRATEGY																						
Flow map and current process						X	X	X	X													
Obtain and analyze baseline data										X												
Develop patient education											X											
STEP 4: COMMUNICATING THE VISION																						
Present 15 min PowerPoint to leadership												X										
Present 30 min PowerPoint to clinicians												X										
STEP 5: REMOVING OBSTACLES																						
Meet with clinical leadership													X									
Educate key stakeholders- providers & nurses														X			X					
STEP 6: CREATING SHORT-TERM WINS																						
Update documentation templates															X							
Meet with clinic leaders																X						
Implement process																	X	X	X	X		
STEP 7: CONSOLIDATING GAINS																						
Collect data and evaluate																	X	X	X	X		
Report out to senior leadership																	X	X	X	X		
STEP 8: ANCHORING CHANGE																						
Discuss success stories																					X	X
Ensure there is visible culture change																					X	X
Ensure there is continued support from leadership																					X	X

Appendix D

Immediate Postpartum Hemorrhage Risk Assessment

<p>Low Risk Circle all that apply:</p>	<p>Medium Risk Circle all that apply:</p>	<p>High Risk Circle all that apply:</p>
<p>a) Singleton pregnancy b) Less than 5 total vaginal births c) No known bleeding disorders d) No history of PPH e) Uncomplicated vaginal delivery f) No genital tract trauma</p>	<p>a) C-section uterine surgery b) Multiple Gestations c) Polyhydramnios d) > 5 total vaginal deliveries e) Chorioamnionitis f) History of previous PPH g) Large uterine fibroid or uterine anomaly h) Prolonged active > 12 hours i) Prolonged Oxytocin use j) Rapid labor k) Application of forceps or vacuum l) Genital tract trauma m) Shoulder Dystocia n) Magnesium Sulfate treatment o) Hematocrit < 30 p) Infant over 4 kg</p>	<p>a) Hematocrit < 25 and other medium or high-risk factors b) Platelets < 100,000 c) Anticoagulant therapy d) Active bleeding e) Known coagulopathy f) Abruptio</p> <p>Request order from OB/CNM to maintain IV Saline Lock for 6 hours post-delivery on all medium and high-risk vaginal deliveries.</p>

Appendix E

Quantitative Analysis Tool for Blood Loss

Quantitative Analysis Tool for Blood Loss

After umbilical cord is clamped and cut, note amount of fluid in drape/canister as your baseline. Measure blood loss prior to cleaning patient and irrigation. Weigh all soiled laps/towels/chux etc after delivery. (1gm=1ml)

Item	Approximate Dry Weight (grams)		Soiled Weight (grams)	(Soiled Weight- dry weight)=ML's of blood	Total per Category
	# of Items	Total			
Blue Chux	36				
White Chux	127				
Raytex	3				
Delivery Lap	21				
Green Towel	78				
Vaginal Packing	12				
White Peri Pad	14				
Peach Peri Pad	32				
OR Lap (18 x18)	21				
Small OR Lap (4 x18)	8				
White Ice Pack	220				
Green Ice Pack	209				
Sponge Counter	22				
Suction Canister	(amount after delivery of baby)		—————→		
Under Buttocks Drape	(amount after delivery of baby)		—————→		
Weigh all soiled items to obtain total soiled weight, and then subtract total dry weight				Total Quantified Blood Loss (ML) —→	
For Cesarean Sections only- subtract amount of irrigation used during case. (ask scrub tech amount of irrigation left on OR table at the end of the case and subtract from 1000ml for this calculation)					
Total Quantified Blood Loss (ml) for Cesarean Sections —→					

Nurse Completing Form: _____ Date: _____ Time: _____

Appendix F

Analysis of Evaluation Data

Measures	Benchmark	Goal	Current Statistics	Statistical Test
Outcome Measure Early identification of PPH		95%		t-test or Mann Whitney U test, frequency, percentage
Process Measure Percent of staff completing tool Q shift	95%	100%		Frequency, percentage
Balance Measure Length of stay (LOS)	3 days	≤ 3 days		Frequency
Balance Measure Number of transfers to higher level of care		0		Frequency
Balance Measure Transfusion of blood products		0		Frequency
Sustainability Measure Percent of education of current and new staff	95%	95%		Frequency, percentage

Appendix G*Data Collection Table*

Month	Number of postpartum cases	Number of cases that required additional interventions- Blood Transfusions	Number of cases that required transfer to higher acuity care
Pre-Implementation			
January 2022	41	3	4
February 2022	56	2	0
Implementation			
March 2022	53	4	0
April 2022	56	2	2

Appendix H

Postpartum Hemorrhage Monitoring

