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Every Milliliter Matters: Quantitative Blood Loss in Postpartum

Quality Improvement Project

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May 10, 2022

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Abstract

Problem: Postpartum hemorrhage remains a leading cause of maternal mortality in the United States. For decades, visual estimation has been the standard measurement for blood loss post vaginal or cesarean delivery. Postpartum hemorrhage occurs when mothers are bleeding excessively, have uterine atony, or the placenta has failed to come out completely. Research has shown that quantitative methods of blood loss estimation revealed a higher incidence of PPH than visual estimation. That is why using quantitative methods on time is essential for diagnosing PPH (ACOG, 2019).

Context: Currently, there are multiple standard parameters for measuring postpartum hemorrhage. Each hospital either adopts quantifying blood loss or estimated blood loss. Quantification of blood loss should be replaced by estimated blood loss since it is more accurate. The project's main focus was implementing quantification of blood loss and using the Triton Scale, a smart system to quantify blood loss after every delivery on all three postpartum units. By quantifying blood loss, patients will have better patient outcomes in the cases of postpartum hemorrhage.

Intervention: The QI team started the project with education for the nurses and created a user-guide video using the Triton scale. The team provided a triton scale staff demonstration for days and night shifts, had nurses complete a 'teach back' to verify learning of Triton use, and ensured nurses knew where they would have to chart QBL on EPIC. The team provided flyers distribution over three different postpartum units and conducted staff surveys before implementing the quality improvement project and at the midpoint, highlighting various topics.

The SWOT analysis and PDSA, Gantt chart, and Cause-effect diagram were conducted while this project was implemented.

Results: Pre-implementation and mid-survey questions showed an increase in nurses being comfortable with using Triton to measure QBL by 48.8%. The auditing data on postpartum hemorrhage (PPH) and PPH records from 2020, 2021, and 2022 showed that 19 postpartum hemorrhages occurred in April 2020, 51 postpartum hemorrhages occurred in April 2021, and 35 postpartum hemorrhages occurred in April 2022. It was worth knowing that the increase from 2020 to 2021 could be due to the triton scale having been introduced to the L&D in February 2021. With the earlier diagnosis of PPH through QBL, we can improve patient outcomes.

Conclusion: The collaborative effort of the Clinical Practice Quality Specialists, CNL MSN RN students, maternity educators, and postpartum unit nurses made this project a success. The QI team shared the evidence-based research supporting QBL to gain the "buy-in" of the postpartum staff for the change project. With the support from the leadership team, unit manager, clinical instructor, and nursing staff, the sustainability of this project has excellent potential. The practice changes are a standard of care based on postpartum unit policy recommendations to ensure patients have the safest and highest quality of care after delivery. The QI team implemented the project, taught new skills, and presented their findings in the final poster presentation (See Appendix R).

Keywords: Quantifying blood loss, estimated blood loss, postpartum, cesarean delivery, vaginal delivery, compliance, Triton scale.

Introduction

Postpartum hemorrhage (PPH) is an obstetric emergency that can lead to maternal morbidity and mortality. The literature consistently shows that numerous maternal deaths related to PPH are preventable. The significant contributors identified to maternal deaths from PPH include delayed recognition and miscalculations of blood loss. Postpartum hemorrhage is the fourth leading cause of maternal mortality in the United States and the top most preventable cause, with an estimated 70% of maternal mortality cases being preventable. (Blosser, 2021). PPH can happen to any woman after delivery; it is unpredictable and can occur with or without risk factors. A postpartum hemorrhage can happen quickly, and all staff need to be prepared.

In July 2010, California Maternal Quality Care Collaborative (CMQCC) released its first obstetrical hemorrhage toolkit to decrease maternal mortality rates. The focus was to help hospitals standardize care and improve readiness, recognition, response, and reporting of maternal hemorrhage (CQMCC, 2010). The hospital X adopted CMQCC toolkit and was integrated into the labor and delivery unit's policy, procedures, and practice in 2015 (See Appendix S). Accurate blood loss estimation is clinically valuable and may substantially alter the timing of interventions to control bleeding (Valadan, 2017).

Research is crucial to provide the most accurate and up-to-date care. Evidence-based care is necessary for moving forward in the obstetrical community. The goal of the project was to review the most accurate and up-to-date research to answer our PICOT question and use the patient data from EPIC, the online electronic patient record system at hospital X. The PICOT question is: in Postpartum patients, how does measuring QBL using Triton for the first 8 hours after delivery versus not measuring QBL for the first 8 hours after delivery affect the time in

notifying the provider? The population included both vaginal and cesarean postpartum patients in the postpartum units. A review of more than ten evidence-based research articles was synthesized to develop this PICOT question accurately and thoroughly. The goal of this QI project is to investigate which framework will best guide practice to provide the safest and most effective care.

Specific Aim

The quality improvement project aims to promote QBL and to use the Triton scale with each postpartum patient versus the EBL and a baby scale to measure blood loss. Quantitative measurement of postpartum blood loss has become standard practice in hospital X since February 2021 and has been associated with improved detection of PPH. The nurses must understand that the Triton scale is an accurate real-time measurement of blood loss and has the potential to facilitate the proper implementation of obstetric hemorrhage protocols to improve patient care. (Valadan, 2017) Standardization of blood loss measurement is vital for understanding trends in PPH incidence and how blood volume affects PPH-related morbidity. Also, the QI team encouraged nurses to chart their QBL findings in a specific place on EPIC, which is beneficial for all the care team to know the exact number of QBL in the postpartum period. The aim of the QI project is that for every vaginal delivery, QBL should be collected during the first two voids. For every patient with a cesarean delivery, QBL should be collected during the first four hours during ERAS (Enhanced Recovery After Surgery) and within the first eight hours during ambulation. By following all the implementation steps, the desired outcome of the QI project implementation is to show QBL measurement via the Triton scale can lead to a faster notification of MD and earlier detection of PPH.

Problem Description

The amount of blood during birth can be tracked using estimated blood loss or quantitative blood loss. The first is an estimation of blood loss EBL, which is commonly used, but this method is prone to underestimating large blood volumes and overestimating small blood volumes. Underestimation of blood loss can result in delayed intervention for women with PPH, and overestimation can result in the use of unnecessary interventions (Hire, 2020). Visual estimation of postpartum blood loss, a simple and convenient method, has been a routine practice for a long time, even though some researchers have claimed that this method is inaccurate and results in underestimating the actual volume of blood loss. (Lertbunnaphong, 2016) The Quantification of blood loss was implemented in Hospital X in February 2021 in the Labor & Delivery unit when the Triton Scale was introduced as a smart system of calculation of QBL. After one year of practicing the QBL and Triton Scale, the Clinical Nurse Specialists and Educators suggested implementing the QBL and Triton in the postpartum unit on all patients.

Primary postpartum hemorrhage occurs in the first 24 hours after delivery, while secondary postpartum hemorrhage is characterized as bleeding 24 hours to 12 weeks postpartum. Primary causes of postpartum hemorrhage include uterine atony, lacerations, retained placenta, defects of coagulation, and uterine inversion. Secondary causes include retained products of conception, infection, and inherited coagulation defects. (Wormer, 2022) According to Hospital X postpartum policies, the provider must be notified if cumulative delivery/recovery QBL is greater than 1,000 mL or if any subsequent QBL is more significant than 200 mL.

The American College of Obstetrics and Gynecology has defined postpartum hemorrhage (PPH) as more significant than 500 mL estimated blood loss in a vaginal delivery or greater than

1000 mL estimated blood loss at vaginal and cesarean delivery (ACOG, 2017). Since blood loss at the time of delivery measured by EBL is routinely underestimated, blood loss at the time of vaginal delivery greater than 500 mL should be considered abnormal with the potential need for intervention. What is often seen on the postpartum unit is that a patient bleeds 100 ml and a couple of hours later another 100 ml, and 50-75 ml every other for the next 24 hours. If all this data is added to the blood loss during labor, it can put the patient in the hemorrhage category. But if it is possible to capture every time the patient changes the pad or has bleeding and recognize the PPH sooner, there will be a chance to prevent PPH. That is why the primary purpose of this project is to enhance recognition of postpartum hemorrhage sooner by using QBL.

Review of the Literature

PPH can be defined as the leading cause of preventable maternal morbidity and mortality (Ngwenya, 2016). To prevent it, it is essential to accurately assess the risk factors and blood loss during delivery. It is also recommended to strictly follow the authorized management plan to prevent the patient from complications and death (Edhi, 2013). PPH constitutes 11% of maternal mortality in the United States, most of which occurs within 24 hours of delivery. (Saoud, 2019) QBL was found to be more sensitive in detecting postpartum hemorrhage with the need for blood transfusion and/or significant hematocrit drop. The findings show that QBL is a more accurate measurement of blood loss and can proactively identify patients who require blood transfusion or additional monitoring based on blood loss before the onset of symptoms (Blosser, 2021).

The most common cause of PPH is uterine atony (accounting for at least 80% of cases of PPH), with genital trauma (lacerations, incisions, uterine rupture, and others), retained placenta,

and coagulopathy comprising other major etiologies. Predisposing risk factors for PPH include increased maternal age, parity, gestational age, induction, and augmentation of labor, cesarean delivery, race, income, hospital type, and location (Marshall, 2017). Another study points out that visual estimation of postpartum blood loss is a convenient method that has been a routine practice for a long time. Even though some researchers have claimed that this method is inaccurate and results in underestimating the actual volume of blood loss, many health facilities in the US still use it. (Lertbunnaphong, 2016) Using QBL instead of visual EBL for the women in the QI project would have potentially resulted in a lower incidence of PPH and reduced the number of interventions they received during the management of PPH. (Hire, 2020). Each healthcare setting would need to perform a cost-benefit analysis to consider the cost of the system and staff training compared with any potential savings from improved use of resources. (Hire, 2020). The literature review was supportive of QBL measurement in predicting and managing PPH as compared to EBL measurement of blood loss within hours after delivery (See Appendix B).

Available Knowledge

The quality improvement project aimed to determine if QBL and the use of the measuring device called the Triton scale would result in a higher number of activations of PPH protocols than visual EBL in both cesarean and vaginal birth and the use of related resources. The QI team consisted of three CNL students, a clinical instructor, and a clinical preceptor. The team established a postpartum hemorrhage checklist, defined the stages of postpartum hemorrhage, created the PICOT question for the project, reviewed postpartum unit policies, and received EPIC training before implementing our teaching with the staff. Initially, the goal of our project

was to reduce the rate of postpartum hemorrhage by collecting QBL during the first twelve hours and the appropriate management of each step. The PICO question was adjusted after the initial literature review because there was a shortage of information to support a 24-hour time frame for QBL measurement in the postpartum period. Overall, this question has yet to be discussed at length in the current literature.

The PICOT question that guided the search for evidence in this project is: In Postpartum patients, how does measuring QBL using Triton for the first 8 hours after delivery compare to not measuring QBL for the first 8 hours after delivery affect time in notifying the provider? Three CNL students conducted a comprehensive electronic literature search and developed a synthesis table to summarize the current literature on the topic. The databases searched included CINAHL Complete, PubMed, Cochrane Database of Systematic Reviews, AWHONN, and ACOG. The following search terms were utilized in the research: postpartum hemorrhage, quantifying blood loss, EBL vs. QBL, and maternal hemorrhage. Articles were considered based on evidence-based practice of estimation vs. quantification processes and postpartum hemorrhage for recognizing and preventing blood loss.

Methods

Microsystem Assessment

The main goal of hospital X is to provide the patients and their families with a safe family-centered environment. There are two postpartum units and one antepartum/postpartum unit in hospital X. For this QI project, the team interviewed the sample of nurses on each PP unit to ask them questions about the microsystem and the unit's culture. In the postpartum unit, the

staff works closely with obstetricians to offer patients and their babies the maternity services they need, like the care that meets parents' individual needs, answers to any questions, and support for keeping babies at parents' bedside to promote bonding. The postpartum care team members include nurses experienced in caring for new mothers and babies, social workers, spiritual care, and interpreter services (Appendix J). There are two clinical educators among all the postpartum units. Usually, there are 5-10 nurses and one manager on each postpartum unit, and the nurse-patient ratio is 1:6 or 1:3 couplet care. The total number of postpartum nurses is 175. The average daily census fluctuates wildly but averages 5-13 postpartum patients in 24 hours, with an average length of stay of 2-5 days. The noise level was different on each postpartum floor. It could be due to high-acuity maternal conditions on the first and second floors and low-acuity maternal conditions on the third floor. The three Maternity Units together have 52 beds in a mix of private rooms and semi-private rooms, based on medical necessity and availability. All the patients have 24-hour access to obstetricians, lactation specialists, social workers, spiritual care, interpreter services, and pediatric services.

Culture Assessment

The nursing staff in each postpartum unit works to encourage open communication, teamwork, and multidisciplinary collaboration. Postpartum nurses are dedicated to providing a safe, high-quality care experience to their patients and families. The team has a high level of engagement and encourages opportunities for improvement. There is some feedback from the nurses that during COVID time, they started to experience a lot of burnout which continues on the units, and sometimes they don't feel like they have enough mental support from the management team. (Appendix K) Frequent staff meetings were taking place via zoom, where the

multidisciplinary unit practice council met and discussed quality metrics, safety, care experience, and manager and educator updates. The QI team presented updates and collected suggestions (See Appendix I).

SWOT

Over the last two years, the postpartum units in hospital X have seen a significant increase in postpartum hemorrhages leading to the extended length of stay, using extra medication and observation from multidisciplinary teams, and requiring blood transfusion. There have been significant changes to nursing practice in all the three postpartum units regarding quantifying blood loss and using the Triton scale at every delivery. For this specific QI project, it was identified that lack of knowledge about QBL and the Triton scale in the postpartum environment prevents nurses from charting their findings on EPIC, leading to multiple complications. Another discovery in the preliminary discussions with staff revealed that nurses have barriers to understanding Triton scales and charting results on EPIC. For example, nurses were unaware of how to clean the Triton and put plastic bags over the bin to reduce the waste of many gray plastic basins and eliminate the potential supply shortage of gray basins. The team has many opportunities for improvement and success in QBL at every delivery. Implementing new changes can be very beneficial for the postpartum unit because it provides earlier notification to the provider and reduces delayed Postpartum hemorrhage treatment. The threat to the success of this project includes the fact that staff will need to take more time to collect QBL using the Triton Scale due to weighing all blood. Even though staff complied with this project, resistance was still noticeable among nursing staff toward new changes. Some of the nurses pointed out that they often know when a patient is hemorrhaging in maternity. The Triton would be beneficial during

an active PPH but otherwise would not be necessary for measuring a small amount of blood (See Appendix F).

Cost Benefit Analysis

Postpartum hemorrhage is associated with increased healthcare resource use, including administering additional uterotonics, medical interventions, possible surgery requirements, and increased length of stay. The number of nurses, obstetricians, and anesthesiologists involved in managing PPH increases with the occurrence and severity of PPH and the proportion of healthcare personnel providing continuous care. Patients often spend an additional 24 hours in hospital following significant PPH than uncomplicated birth (Richardson, 2021). Prevention is the most effective strategy to reduce costs associated with PPH. Women with PPH experienced significantly longer length of stay and higher inpatient mortality rates than women without PPH. The preponderance of these differences was attributable to non-atonic causes of PPH such as LOS and mortality, which is an important area of focus for clinicians and health care policy specialists. Interventions to reduce mortality and morbidity (including increased LOS) related to PPH may allow for the delivery of more cost-effective care and overall improvements in maternal and population health (Marshall, 2017). Interventions to reduce morbidity and mortality related to postpartum hemorrhage may simultaneously facilitate the delivery of more cost-effective care and improve both maternal and population health. According to the Agency for Healthcare Research and Quality, the average cost per stay of all types of delivery is \$3,800 per day. By implementing the Triton Scale in earlier diagnoses of PPH, the hospital could save \$3,800 for any additional days in the postpartum unit (Agency for Healthcare., 2011).

Another area that needs to be included in the cost-benefit analysis is using the Triton scale for QBL measurement. The supply company provided five triton scales for postpartum units in hospital X. Two scales were located on the first floor because this postpartum unit had patients with high-acuity maternal conditions. The antepartum/postpartum unit on the second floor also had two scales, and the third unit with low-acuity conditions and fewer patients had one scale. The number of patients varied on each unit, but the average was 12-15 patients per unit. The data from the GAUSS Triton scale showed \$27,500 for Triton Implementation Fee, which included training, professional services, hardware, consumables, and shipping materials (See Appendix N). This financial data can be helpful while identifying all the provided resources given to the nurses for early recognition of PPH and comparing the hospital X resources used to prevent PPH with other hospitals. Because the QI team implemented the provided training and teaching during working hours, there was no additional financial cost for training staff.

To understand the scale of the problem with PPH in Hospital X, the team tried to find the data on the economic effect of PPH on postpartum units. For example, for the 2020 fiscal year, there were 4,357 deliveries, in-hospital X, 257 deliveries with PPH, and 91 deliveries were transfused packed red blood cells. For the 2021 fiscal year in hospital X, 4,249 deliveries occurred, 571 deliveries with PPH, and 97 deliveries that had transfused PRBs. Even though the team obtained the financial data from the blood transfusion bank, this data indicates that Hospital X uses blood transfusion services almost a hundred times per year only because of the postpartum hemorrhages, which can be very costly.

One tool used to determine blood loss is the hold clot and activation of massive transfusion guidelines. Blood products can be readily available at the patient's bedside but will be

transfused as indicated by the patient's condition and if the patient's condition warrants the procedure. The universal hold clot strategy yielded a cost of \$2,878 per emergency-release transfusion prevented compared with a plan of no routine admission testing. Assume that the average cost of a postpartum hemorrhage with a blood transfusion has been estimated at \$2,878 (Einerson, 2017). By recognizing and responding quickly to a hemorrhage situation, additional costs can be avoided and further harm to the patient.

Intervention

The intervention stage of the QI project consisted of multiple elements. The practice change began with distributing the pre-implementation surveys among the postpartum units to see the nurses' knowledge about the Triton scale and QBL. (See Appendix D) The Triton system (Gauss Surgical, Inc., Los Altos, CA) is a novel U.S. Food and Drug Administration-cleared mobile application on a tablet computer (iPad) that uses the enabled tablet camera to capture images of surgical sponges. (Valadan, 2017) After collecting the nurses' responses and considering the survey responses, the QI team developed the materials for teaching the proper use of the Triton scale and EPIC documentation. The team created the video using the Triton scale, downloaded it on YouTube, and sent it out to all postpartum nurses via Voalte and email. In addition, the team created flyers with all the information about our project and actual dates and hung these flyers on each postpartum unit. (See Appendix K) The flyers emphasized that maternal hemorrhage is a significant cause of maternal comorbidity and mortality and the need for early detection and management of such a severe condition.

The QI team members also remembered that several studies support Triton's accuracy, and this device was easy to use, intuitive, safe, and did not malfunction (Lertbunnaphong, 2016). Another feature that the Triton scale provides is accuracy in predicting a hemoglobin drop. Its ability to provide real-time blood loss highlights the potential usefulness of the Triton device, and possibly, further down on the road, the postpartum nurses can use it too while identifying PPH risk factors. This feature of the Triton scale will potentially allow earlier intervention instead of waiting for postoperative lab or Complete Blood Count results or blood loss estimates at the end of the case. (Saoud, 2019). Also, the QI team indicated on the flyers that this is not a permanent intervention but a three-month trial. After this, we started the teaching process. Every day for one week, one CNL student came to the postpartum unit during the pm and pm shift to educate nurses on Triton Scale use and show them where to chart QBL results on EPIC.

The proposed implementation of this QI project will require the postpartum nurses to complete the entire QBL process, including weighing all items with blood for the first eight hours after the delivery, and dry weights of items will be subtracted. This will give the entire healthcare team, including the providers, an accurate blood loss calculation and help them recognize a postpartum hemorrhage as early as possible. The project goal was to decrease the response time to the interventions necessary to help reduce the bleeding and decrease the need for the patient to receive a blood transfusion. All staff involved in measuring postpartum blood loss were trained to use the equipment properly.

Following the initial action plan, the project went live on March 28 (See Appendix G). Daily chart audits will continue till the end of the trial on June 28. The team presented the data and findings to one local improvement team (LIT) meeting and two staff meetings (See

Appendix D). In addition, every Monday, the CNL students presented the weekly updates to the clinical instructor and preceptor and discussed the progress and future outcomes. From the first day of implementation of the QI project, the team weekly updated nurses with new findings to share the project results in real-time and incorporate staff suggestions. Sharing the weekly data with the team helped to ensure the culture change. Seeing the practice change working and knowing that the changes improve quality and safety for their patients will motivate the staff until it becomes the accepted practice.

Study of Intervention

The study of the intervention for the QBL project was done weekly by implementing new knowledge, practicing new skills, using new technologies and seeing progress and improvement in collecting, and charting QBL. Creating the project plan was an essential step; it provided a guide throughout the process, keeping the project measures and outcomes in focus (Appendix G). To determine the cause of PPH and the cause of escalation of PPH, the team utilized a fishbone diagram (cause-effect) (See Appendix M). The QI team used a fishbone diagram to demonstrate the various aspects that could delay earlier notification to MD or OB rapid responses due to using EBL instead of QBL. Before February 11, 2022, when Triton scales were introduced to all maternity units, the nurses did not have the specific training skills for QBL. Also, there were an inadequate number of scales and no weighted measurements in EPIC.

The change process (PDSA Cycle) for this project includes: assessing hemorrhage risk and implementing measures to prevent bleeding, providing education and testing the changes, and identifying if the cycle was carried out as planned. The team did the project, studied it through the results and survey feedback, and acted on it by implementing additional feedback

that the staff gave to the team better to see the project for the remaining two months and completed a Gantt Chart where the team highlighted the timeline of the project overall. 100% of the staff completed the educational training sessions, and 98% of nurses complied with using the Triton scale and charting QBL on EPIC (Appendix C).

Measures

To collect data, the team used multiple criteria and information from our patients' health care records to attempt to integrate all the potential elements that could influence the outcomes of the patient with PPH. Specifically, the team used the following components: the date and time of delivery, the patient's MRN, type of delivery, any risk factors, vital signs, QBL during the labor, an initial recovery period of 90 minutes, laboratory tests (if any ordered), the number of blood products (if any transfused), uterotonics administered, other vascular access obtained, the incidence of induction of general anesthesia, and provider notifications if any. Postpartum Hemorrhage policies from the maternity unit were used for guidelines in the research process, teaching strategies, and implementation of the project. After reviewing the policies, different vital topics were discussed within the team about hemorrhage risk screening, management of PPH, nursing intervention, and documentation.

The QI team conducted two surveys. Before the teaching process, the pre-implementation survey was distributed throughout all the postpartum units. This survey aimed to collect data from the postpartum nurses about their feelings towards new implementation and gain information and insights into the potential barriers that the team can face. The midpoint surveys were distributed 30 days after implementing the quality improvement project, and the purpose was to collect information and ideas and measure staff engagement. Pre-implementation and

mid-survey questions showed an increase in nurses being comfortable with using Triton to measure QBL by 48.8%.

Ethical Considerations

Our study has been approved as a quality improvement project by our maternity clinical instructor and maternity clinical practice quality specialist. The project involves implementing care practices and interventions that are evidence-based. The project does NOT seek to test an intervention beyond current science and experience. (Appendix A). There are no ethical concerns or implications for the quantification process. Increasing the recognition and decreasing the response time to heavy bleeding after delivery will improve the quality of care received at hospital X. Since visual estimation frequently either over or underestimates the blood loss and requires continual retraining, national organizations such as California Maternal Quality Care Collaborative (CMQCC), the Association of Women's Health, Obstetric and Neonatal Nurses (AWHONN), and the American College of Obstetrics and Gynecologist (ACOG) have deemed the QBL process as best practice (Valadan, 2017). The staff and providers serving in the postpartum units agree that this project will be implemented to improve the function or delivery of care.

Results

Early recognition of PPH is a critical step in the improvement process. The implementation of the QI project started on March 28,2022. When QBL and Triton scales were introduced to postpartum units, nurses had barriers to understanding Triton scales and charting findings on EPIC. There were barriers like what to do with the Triton regardless of finding

proper location next to outlets, cleaning and putting plastic bags over the bin. There are only a few postpartum patients who meet the criteria for PPH after initiating the QI project. The initial chart audits show no QBL was done regularly during postpartum. In the case of clots or saturated pads in one hour, nurses were triggered to implement QBL measurements.

The pre-implementation surveys were conducted two weeks before implementing the QI project. A pre-implementation study showed that 77.6% of nurses agreed that after using the Triton scale, they felt comfortable using it for measuring QBL. After a mid-point implementation survey, 90.3% of nurses were comfortable using Triton, which significantly increased positive feedback and compliance from postpartum nurses. It can be because when the midpoint surveys were distributed, the postpartum nurses were already more familiar with the QI project, and they had appropriate knowledge about how to use the Triton scale and where to chart QBL. Mid-point survey results indicated that 73.8% of nurses agreed that QBL is more accurate than EBL, and it was found that QBL improved notification time to the provider.

In 2020-2021 the data showed that there were 4,357 deliveries. Among them there were 257 deliveries with PPH, and 91 deliveries were transfused PRBs. For the 2021 fiscal year in hospital X, 4,249 deliveries, 571 deliveries with PPH, and 97 deliveries transfused PRBs. To compare the data, the month of April was used. The results showed that 19 postpartum hemorrhages accrued in April 2020, 51 postpartum hemorrhages occurred in April 2021, and 35 postpartum hemorrhages occurred in April 2022. The significant increase in postpartum hemorrhage cases from 2020 to 2021 could be due to implementing the Triton Scale in the Labor & Delivery department in February 2021. Unfortunately, the provided data from the previous years did not show in which unit (L&D or postpartum) exactly postpartum hemorrhage occurred.

While implementing the project, the QI team made sure that nurses reported the amount of QBL and if the patient did bleeding in L&D or postpartum. Also, the goal was to check the time of notification of the provider or rapid response team. The chart's audits from April 2022 indicated a total of 272 deliveries and 35 postpartum hemorrhages. Twenty-nine hemorrhages occurred in the labor & delivery unit and six in the postpartum unit (See Appendix Q).

Discussion

Patient safety is an essential aspect of quantifying blood loss techniques in the postpartum unit. QBL is an objective measurement recommended for the early identification of bleeding in all births. QBL is recommended to reduce inaccuracies that can cause potential delays in decision-making and response to postpartum hemorrhage. Using the Triton scale while measuring QBL is a valuable tool for the appropriate surveillance and rescue of women who experience postpartum hemorrhage. Implementing QBL can significantly decrease the mortality rates of PPH. The nursing staff continues to improve by completing the QB after each delivery for the first eight hours postpartum, which initiates the quantifying process. The team was up for ongoing success by using the new and learned skills, drills, evidenced-based practice education, and new equipment (Triton Scale). The CNL students and clinical preceptors created weekly huddle messages and provided a detailed guide to start the quantifying process for all deliveries for postpartum nurses. Once the nursing staff clearly defined the QBL process and Triton scale, followed and completed, the QI team could see 98% of nurses' compliance with charting QBL on EPIC. Implementing the QBL and using the Triton scale was a team effort and would not be successful without the entire team working together to complete it. The new team will continue

the following quality improvement project for the next two months until it becomes a standard of practice to affect the morbidity and mortality of our postpartum population positively.

Lessons Learned

Since poor outcomes can result from delayed recognition and denial of significant bleeding and changes in maternal condition, effective measurement of ongoing blood loss is critical to early recognition. There were many lessons learned from this QI project. The QI team learned how to research, collect, and understand the data needed to support the implementation and effective teaching processes. It was the first step in seeing the improving outcomes and realizing that the team was following the right direction. Through effective teamwork and communication with postpartum unit educators, the QI team obtained the policies for postpartum units and financial data on Triton scales. The team was also able to get the data for the years 2020 and 2021 of all deliveries and all the cases with postpartum hemorrhage cases and postpartum hemorrhage with blood transfusion cases. The CNL students continued doing the chart audits from the first day of going live, and at the end of the 30 days, the obtained data were compared with the report from the previous two years. Another important lesson the QI team learned while going through the project's implementation process is that even though the results indicated 98% compliance from the nurses on doing QBL when the team received the nurses' feedback from mid-point surveys, there were many negative responses. For example, 55 % of the midpoint survey nurses reported that Triton QBL added significant time to their patient care. In retrospect, more time should have been spent on nurses' education and explanation of the

importance of starting using Triton for collecting QBL. Also, because the new teaching and skills were implemented in the postpartum unit, perhaps the nurses would need more time to adapt to new processes and new skills and further surveys would show more positive feedback. Some nurses did not understand the differences in implementing the Triton scale and expressed that this takes from the nurse's critical thinking competency. A few nurses claimed that they already know when a pad looks like it should be weighed, and using the Triton scale is often unnecessary. Adjusting to new unit policies, guidelines, and skills takes time. That is why the proper timeline and time management are crucial while implementing the quality improvement project. While the QI project did not identify a trend in earlier identification of PPH by nurses, the training involved in the QI project better prepared the staff for accurate QBL measurement and Triton device use during a real emergency.

Conclusion

For the last three weeks, since the QI project went live, there have been only a few patients who have met the criteria for PPH. Because of using the QBL Triton scale, the team members now recognize more PPH than just estimating blood loss. The team can predict that if nurses continue to do a three-month trial, an increase in numbers can be seen. This project has already been effective in recognizing hemorrhages. It will be necessary to continue to focus on the quantification practices, ensuring the team follows the practice changes. This project has a high potential for sustainability, and as a quality and safety measure, it is best practice; therefore, it is an expectation of the team. The collaborative efforts of the nursing staff in each postpartum

unit made this project a success. The team will continue the quality improvement work until it becomes a standard of practice and a part of the daily culture to affect the morbidity and mortality of our perinatal population positively. Reducing barriers and increasing facilitators through institutional support, staff education, and feedback loops will improve the adoption of new equipment, policies, and protocols.

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Appendix A

Statement of Determination and Non-Research Determination Form

Student: Iana Vatsenko

✓ This project meets the guidelines for an Evidence-based Change in Practice Project as outlined in the Project Checklist (attached). Student may proceed with implementation.

Title of Project: Every Milliliter Matters: Quantitative Blood Loss in Postpartum

Brief Description of Project: This quality improvement project aims to reduce the incidence of postpartum hemorrhage in Hospital X.

- **Data that Shows the Need for the Project:** The provided data shows that there were 389 deliveries with postpartum hemorrhage in the last three years and 200 cases had blood transfusion which brings the hospital's PPH average above the national average according to the National Database of Nursing Quality Indicators.
- **Aim Statement:** The quality improvement project aims to promote QBL and use the Triton scale with each postpartum patient versus the EBL and baby scale to measure blood loss. Quantitative measurement of postpartum blood loss has become standard practice in hospital X since February 2021 and has been associated with improved detection of PPH. The nurses must understand that the Triton scale is an accurate real-time measurement of blood loss and has the potential to facilitate the proper implementation of obstetric hemorrhage protocols to improve patient care. The aim of the QI project is that for every vaginal delivery, QBL should be collected during the first two voids. For every patient with a c-section, QBL should be collected during the first four hours during PRAAS (Enhanced Recovery After Surgery) and within the first eight hours during ambulation. By following all the implementation steps, the desired outcome of the QI project implementation is to show how collecting of QBL and using Triton scale can lead to a faster notification of MD and earlier detection of PPH.
- **Description of Intervention(s):** The QI project started with the detailed literature research, and education to the nurses. The team created a user-guide video on using the triton scale and provided a triton scale staff demonstration for days and nights shifts, had nurses complete teaching back to us, and ensured nurses knew where they would have to chart QBL on Epic. The team provided flyers distribution over three different postpartum units and conducted staff surveys before implementing our project and at the midpoint, highlighting various topics. The SWOT analysis, as well as PDSA, Gantt chart and cause-effect diagram were conducted.
- **Desired Change in Practice:** With the support from the leadership team, unit manager, clinical instructor, and nursing staff, the sustainability of this project has excellent potential. The practice changes are a standard of care based on postpartum unit policy recommendations to ensure patients have the safest and highest quality of care after delivery. The QI team implemented the project, taught new skills, and presented their findings in the final poster presentation (See Appendix C). The new team will continue the following quality improvement project for the next two months until it becomes a standard of practice to affect the morbidity and mortality of our postpartum population positively.
- **Outcome Measurements:** Pre-implementation and mid-survey questions showed an increase in nurses being comfortable with using Triton to measure QBL by 48.8%.

EVIDENCE-BASED CHANGE OF PRACTICE PROJECT

CHECKLIST *


STUDENT NAME: Iana Vatsenko

DATE: 3/1/2022

SUPERVISING FACULTY: Lisa Brozda.

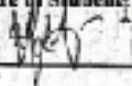
Instructions: Answer YES or NO to each of the following statements:

| Project Title: | YES | NO |
|--|-----|----|
| The aim of the project is to improve the process or delivery of care with established/ accepted standards, or to implement evidence-based change. There is no intention of using the data for research purposes. | Y | |
| The specific aim is to improve performance on a specific service or program and is a part of usual care. ALL participants will receive standard of care. | Y | |
| The project is NOT designed to follow a research design, e.g., hypothesis testing or group comparison, randomization, control groups, prospective comparison groups, cross-sectional, case control). The project does NOT follow a protocol that overrides clinical decision-making. | Y | |
| The project involves implementation of established and tested quality standards and/or systematic monitoring, assessment or evaluation of the organization to ensure that existing quality standards are being met. The project does NOT develop paradigms or untested methods or new untested standards. | Y | |
| The project involves implementation of care practices and interventions that are consensus-based or evidence-based. The project does NOT seek to test an intervention that is beyond current science and experience. | Y | |
| The project is conducted by staff where the project will take place and involves staff who are working at an agency that has an agreement with USD SONHP. | Y | |
| The project has NO funding from federal agencies or research-focused organizations and is not receiving funding for implementation. | Y | |
| The agency or clinical practice unit agrees that this is a project that will be implemented to improve the process or delivery of care, i.e., not a personal research project that is dependent upon the voluntary participation of colleagues, students and/ or patients. | Y | |
| If there is an intent to, or possibility of publishing your work, you and supervising faculty and the agency oversight committee are comfortable with the following statement in your methods section: <i>"This project was undertaken as an Evidence-based change of practice project at X hospital or agency and as such was not formally supervised by the Institutional Review Board."</i> | Y | |

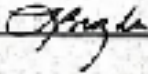
 **UNIVERSITY OF SAN FRANCISCO** | School of Nursing and Health Professions

*Adapted with permission of Elizabeth L. Holmann, MD, Director and Chair, Partners Human Research Committee, Partners Health System, Boston, MA.

STUDENT NAME (Please print):
Iana Vatsenko

Signature of Student:
 **DATE** 5/10/2022

SUPERVISING FACILITY MEMBER NAME (Please print):
Lisa Brozda

Signature of Supervising Faculty Member
 Lisa Brozda RN, MSN, CNS **DATE** 5/14/2022

Appendix B
Review of the Literature

| Study | Design | Sample | Outcome/ Feasibility | Evidenc e rating |
|---|--|--|--|-----------------------------|
| 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). <i>Incidence of postpartum hemorrhage defined by quantitative blood loss measurement: a national cohort. BMC pregnancy and childbirth</i> , 2020(1), 271. | Cohort Study | Sample Size: 31,341 women were used in this study. | QBL is feasible in all hospitals providing maternity care and is associated with detection of higher rates of postpartum hemorrhage. | |
| Blosser, C., Smith, A., & Poole, A. T. (2021). <i>Quantification of Blood Loss Improves Detection of Postpartum Hemorrhage and Accuracy of Postpartum Hemorrhage Rates.</i> | A Retrospective Cohort Study | 5,454 deliveries were included in this study | QBL is a more accurate measurement of blood loss, helps to identify patients who require blood transfusion or additional monitoring based on blood loss, prior to the onset of symptoms. | |
| Marshall, A. L., Durani, U., Bartley, A., Hagen, C. E., Ashrani, A., Rose, C., Pruthi, R. K. (2017, September). <i>The impact of postpartum hemorrhage on hospital length of stay and inpatient mortality: a National Inpatient Sample-based analysis.</i> | Retrospective analysis was conducted from the National Inpatient Sample database during the 2012 through 2013 time period. | 1,352,691 hospitalizations | Postpartum hemorrhage is a major cause of maternal morbidity and mortality, and it's also associated with increased hospital length of stay. | |
| Matthew G. Hire, Elizabeth M.S. Lange, Mahesh Vaidyanathan, Kim L. Armour, Paloma Toledo, <i>Effect of Quantification of Blood Loss on Activation of a Postpartum Hemorrhage Protocol and Use of Resources</i> , Journal of Obstetric, Gynecologic & Neonatal Nursing, Volume 49, Issue 2, 2020 | Prospective observational trial. | 42 cases of cesarean birth | Use of QBL during c-section reduces the number of identified PPHs by more than 50% over visual EBL and may have reduced the resources used as part of care. | |

| | | | | |
|--|--|---|--|--|
| <p>Lertbunnaphong, T., Lapthanapat, N., Leetheeragul, J., Hakularb, P., & Ownon, A. (2016). <i>Postpartum blood loss: Visual estimation versus objective quantification with a novel birthing drape. Singapore Medical Journal</i> , 57, 325-328.</p> | <p>Cross sectional study</p> | <p>286 patients with term pregnancies</p> | <p>EBL is not optimal for measurement of postpartum blood loss in PPH. This method should be withdrawn from standard obstetric practice and replaced with objective measurement using QBL and TRiton Scale</p> | |
| <p>Edhi, M. M., Aslam, H. M., Naqvi, Z., & Hashmi, H. (2013). "Postpartum hemorrhage: causes and management." <i>BMC Research Notes</i>, 6, 236.</p> | <p>Cross sectional study</p> | <p>1493 deliveries</p> | <p>This study highlights the existing variable practices for the management of PPH.</p> | |
| <p>Main EK, Cabe V, Abreo A, et al. (2017). Reduction of severe maternal morbidity from hemorrhage using a state perinatal quality collaborative. <i>American Journal of Obstetrics</i>.</p> | <p>Quality Improvement Design</p> | <p>99 collaborative hospitals with 48 non-collaborative hospitals</p> | <p>The results indicated the reduction of severe maternal morbidity after implementing QBL.</p> | |
| <p>Doctorvaladan, S., Jelks, A., Hsieh, E., Thurer, R., Zakowski, M., & Lagrew, D. (2017). Accuracy of blood loss measurement during cesarean delivery. <i>American Journal of Perinatology Reports</i>, 07(02). https://doi.org/10.1055/s-0037-1601382</p> | <p>Prospective cohort study</p> | <p>50 patients</p> | <p>Implementation of QBL improves clinical outcomes and provides early recognition of PPH</p> | |
| <p>Saoud, F., Stone, A., Nutter, A., Hankins, G. D., Saade, G. R., & Saad, A. F. (2019). Validation of a new method to assess estimated blood loss in the obstetric population undergoing cesarean delivery. <i>American Journal of Obstetrics and Gynecology</i>, 221(3). https://doi.org/10.1016/j.ajog.2019.06.022</p> | <p>A single-center prospective cohort clinical trial</p> | <p>242 patients</p> | <p>The Triton system provides a better estimate of blood loss than the visual estimate. Clinical trials to evaluate its benefit are warranted.</p> | |

Appendix C

PDSA Cycle



PLAN:

- Distribute pre-implementation survey through all postpartum nursing staff
- Provide education video of how to use the triton scale before actual teaching
- Organize a one week teaching session with staff.
- Educate nurses of the importance of charting QBL on EPIC.
- Potential goal is decreased number of PPH hemorrhage.
- Assess hemorrhage risk and implement measures to prevent hemorrhage.

DO:

- Test the changes.
- Identify if the cycle was carried out as planned.
- By doing daily chart audits, record data and observations.

STUDY:

- Did the results match your predictions? Yes No
- Comparing the results with the prediction can help us with continuing education and practice. It will improve recognition, response, and readiness when responding to PPH.

ACT:

- Abandon: Discard this change idea and try a different one.
- Adapt: Improve the change and continue testing plan. Describe what we will change in our next PDSA
- Adopt: Select changes to implement on a larger scale

Appendix D

QBL Survey PPH

Do you currently implement QBL for Postpartum patients?

- Yes
- No

What is a "trigger" that makes you implement QBL for a patient?

- Large clots
- Greater than 1pad/hr saturation
- Change in vital signs
- Trickling of blood
- Boggy Uterus
- OB Rapid
- Gush of blood
- Other

Do you think implementing QBL with Triton scale for patients will disrupt current workflow?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Do you believe you will encounter barriers if you implement QBL for Postpartum patients?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree
-

After receiving Triton training, I feel comfortable using Triton to measure QBL

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Appendix E

QBL Mid Point Survey

Did collecting QBL change your perception of hemorrhage occurrence?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

What is a "trigger" that makes you implement QBL for a patient?

- Large clots
- Greater than 1pad/hr saturation
- Change in vital signs
- Trickling of blood
- Boggy Uterus
- OB Rapid
- Gush of blood
- Other

QBL improved notification time to the provider

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

After receiving Triton training, I feel comfortable using Triton to measure QBL

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Has the quantified number of blood loss in your postpartum patient's surprised you?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

Do you believe QBL is more accurate than EBL?

- Strongly Agree
- Agree
- Neutral
- Disagree
- Strongly Disagree

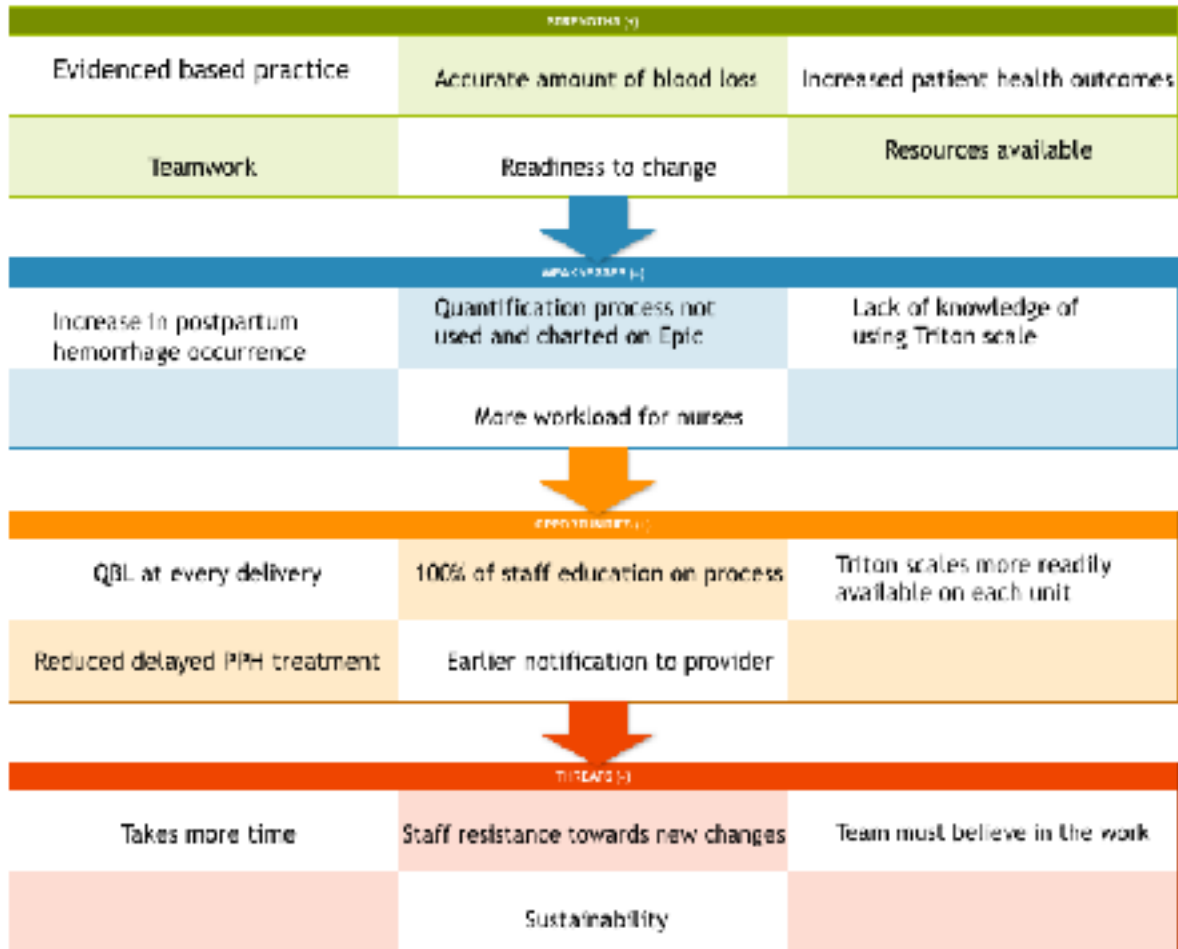
What changes, if any, would you make to the process

Appendix F

Performance Improvement Tools

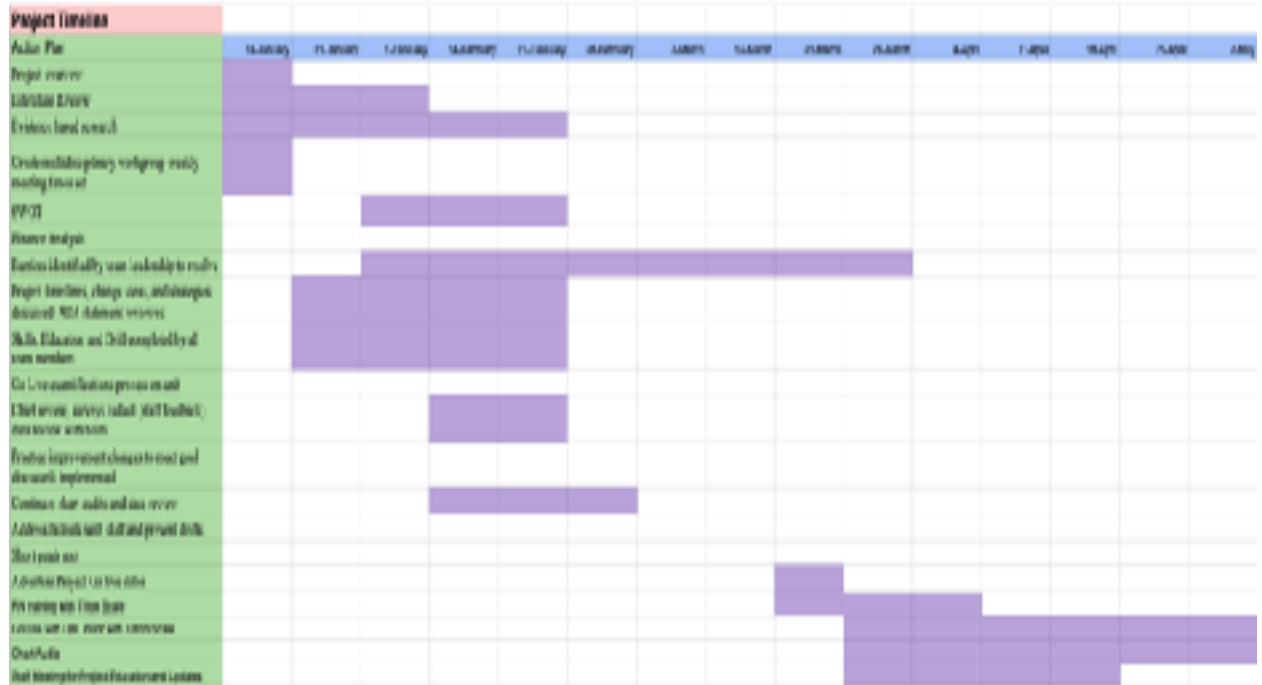
SWOT Analysis

SWOT ANALYSIS ARROWS



Appendix G


Project Timeline



Appendix H LIT presentation

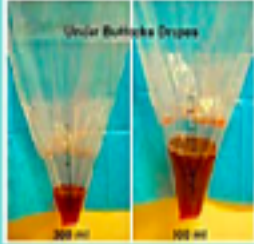
Background

Primary PPH occurs in 1-5% of women within the first 24 hours



Project Aim:

Quantify blood loss in PP for the first 24 hours



Pico question

In postpartum patients, how does cumulative Quantitative Blood Loss (QBL) collection for 90 minutes postpartum compared to 24 hrs cumulative QBL collection postpartum for non moderate to high risk patients affect early detection of postpartum haemorrhage during hospital stay?

Pre-Implementation Survey Questions

QBL Screening PD

Do you currently implement QBL for postpartum patients?

When a "trigger" that asks you implement QBL for a patient?

Do you currently implement QBL for postpartum patients?

Pre-Implementation Survey

- 81.7% implement QBL for Postpartum patients
- Top 3 suggestions:
 - 100% blood clot
 - 41.7 change in vital signs
- Staff barriers:
 - 50% disrupt current workflow
- Staff support:
 - 83.7% comfortable using Triggers to measure QBL
 - 84.5% adequate resources available
- 66.7% feel QBL is necessary to implement QBL using Triggers scale to identify postpartum at an earlier stage.

PPH Data 2020-2021

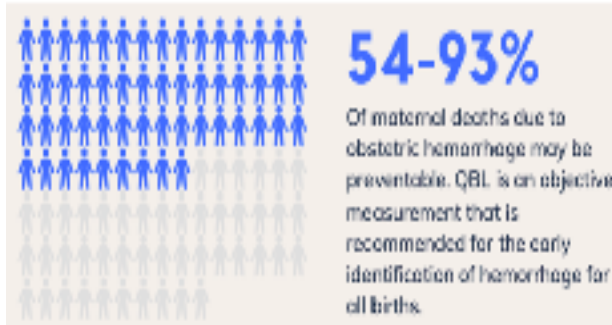
- Total Deliveries with PPH
 - 2020: Average of 23/ month
 - 2021: Average of 48/ month
 - Increase in 27 deliveries/ month with PPH from 2020 to 2021
- Average Blood loss with PPH
 - 2020: 1471 ml
 - 2021: 1359 ml
- C-section deliveries with PPH
 - 2020: Average of 16/ month
 - 2021: Average of 35/ month
 - Increase in 19 c/s with PPH from 2020 to 2021
- Vaginal deliveries with PPH
 - 2020: Average of 6/ month
 - 2021: Average of 13/ month
 - Increase in 7/ vaginal deliveries/ month

Upcoming goals:

- More nurse participation in survey
- Audits
- Determine financial impact
- Prepare for staff presentation

Appendix I
April 11 Staff Meeting

Background and Our Why



Background and Our Why Cont.



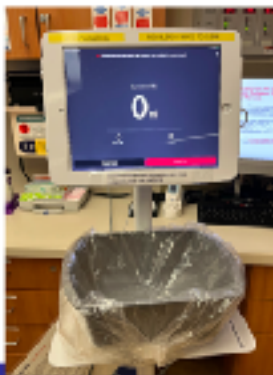
Pre-implementation Survey Results



PICO Question

In Postpartum patients how does measuring QBL using Triton for the first 8 hours after delivery compare to not measuring QBL for the first 8 hours after delivery affect time in notifying provider?

- Notifying MD includes calling MD to bedside or calling OB Rapid Response



- Add plastic liner in order to reduce grey basin waste.
- Make sure to add liner before zeroing the scale
- Plastic liner disposed into Biohazard

Quick Reminders

- Always clean Tritons after each use with purple wipes to disinfect (even with isolation pts)
- Always remember to plug in Triton to charge

Go Live: Week of 3/26- Daily Audits

- Ensure nurses are recording and charting QBL
 - o Vaginal- QBL at the first 2 voids
 - o C-Section- QBL within the first 4 hours during Dangle (ERAS) and within the first 8 hours during Ambulation (ERAS)



Appendix J

Unit Communication Assessment Tool

Unit: Postpartum 192

Organization/setting: LPCH

| Unit Characteristic: | Assessment: |
|---|---|
| Noise level on unit | Noise level is minimal. Quiet environment. 3 nursing stations. |
| Manager: Visibility of manager, staff Communication patterns from manager to staff (giving/receiving feedback etc.) Receptiveness of manager to staff and patient/family concerns | Current manager is a resource nurse. Manager is on the unit, visible to nurses. During the weekends manager is on call Nurses receive feedback from manager. |
| Report/handoff Method of delivery (face-to-face; recorded? patient rounds?) Systematic? Variation between shifts? | Report/handoff delivered face-to-face. |
| Nurse-patient communication Gossip/evidence of bullying behavior; disrespect, incivility | Nurse-patient communication significantly changed because of COVID. Per nurses' words, "there is a lot of gossiping between nurses." |
| Social support for nurses, staff | Per nurses' words, "there is not enough social and mental support for nurses. Many nurses experience burnout." |
| Conflict resolution Interdisciplinary communication which includes physician-nurse communication | The charge nurse resolves all disagreements on the unit and escalates to the manager. Good communication. |
| General observations about work environment/ culture; team communication | Nurses work together, but they feel burned out. Manager turnover. |

Appendix K

Quantifying Blood Loss (QBL) Education Simulation

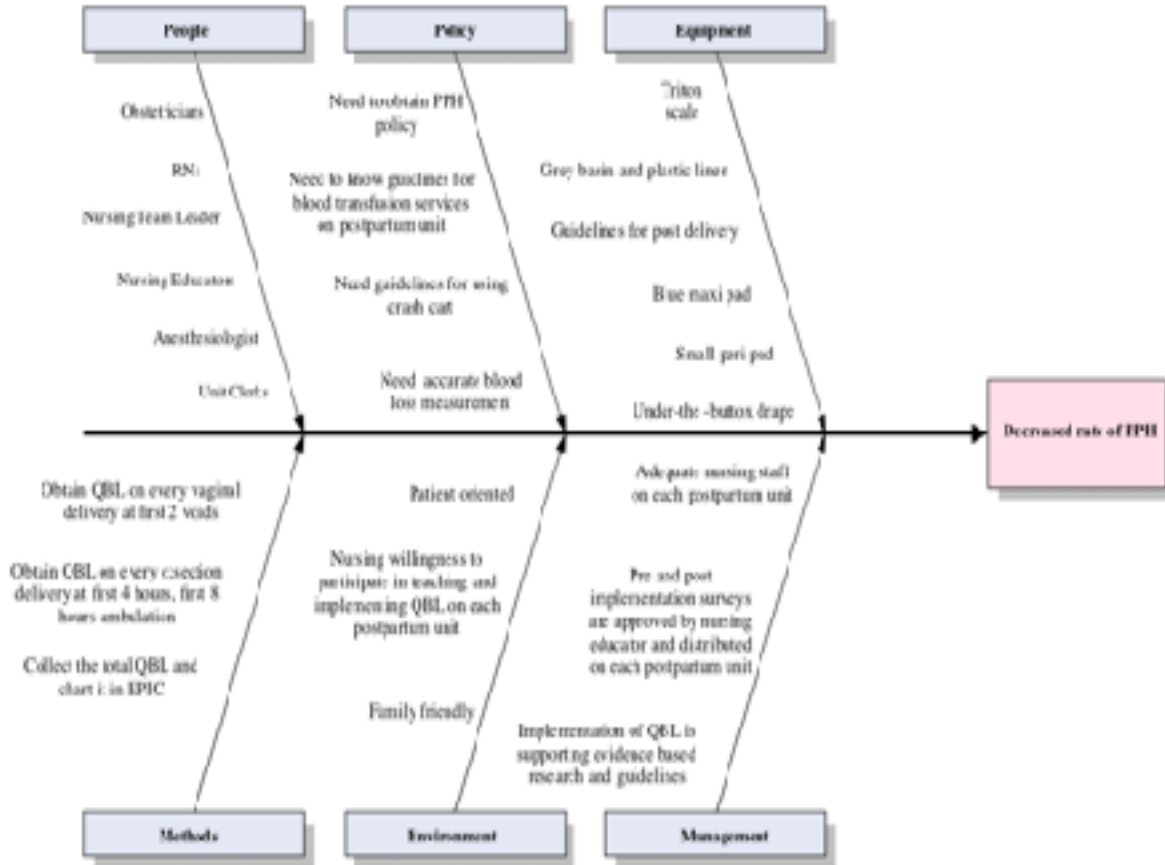


Appendix L

5 Ps

| | |
|-----------------------------|--|
| <p>Purpose</p> | <ul style="list-style-type: none"> ● High quality care ● Safe quality care ● Care that meets individual needs ● Answer any concerns to help mothers and babies ● Support mothers and babies at bedside to promote bonding ● Prevent and look out for postpartum hemorrhage |
| <p>Patients</p> | <ul style="list-style-type: none"> ● Postpartum ● New mothers ● Newborns |
| <p>Professionals</p> | <ul style="list-style-type: none"> ● Obstetricians ● Lab techs ● Unit Secretary ● Nursing Team Leader ● Nursing Educators ● Social workers ● Spiritual care ● Interpreter services |
| <p>Processes</p> | <ul style="list-style-type: none"> ● Assessments (QBL, VS etc.) of New mothers upon arrival to the floor within 30 minutes, after first void, and after second void for both vaginal and c-section. |
| <p>Patterns</p> | <ul style="list-style-type: none"> ● Huddles at 7:00 am and 7:00 pm ● Patient Hand Off Report: 7:00 am- 7:30 am and 7:00 pm- 7:30 pm |

Appendix M Cause-effect Diagram



**Appendix N
Cost Analysis**

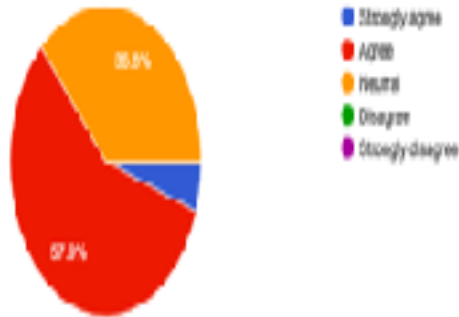
| Software License | | | |
|-----------------------------|--|---------------|----------------|
| Yearly Delivery Volume | Description | UOM | Price per Case |
| 4329 | Triton - Blood Loss (Obstetrics) Includes licenses for Triton AI, Triton Carister and Triton QBL | Per Delivery | \$22.50 |
| | | Per Month | \$8,116.88 |
| One-Time Implementation Fee | | | |
| Number of Systems | Description | One-Time Cost | |
| 11 | Triton Implementation Fee Includes: - Training and case support - Professional services - Hardware (Apple device(s), Bluetooth scale) - Consumables (scanning label, inserts, calibration placard) - Materials shipping | \$27,500.00 | |

| | |
|---|---------------------------------|
| One-Time Implementation Fee | \$27,500.00 |
| PILOT DISCOUNT (Implementation) | (\$27,500.00) |
| 6-Month Pilot Subscription Total | \$48,701.25 |
| PILOT DISCOUNT (Subscription) | (\$48,701.25) |
| TOTAL | \$0.00 |

Appendix O Pre-implementation Survey Results

Do you feel like it's necessary to implement QBL using Titrator scale in identify postpartum at an earlier stage?

18 responses



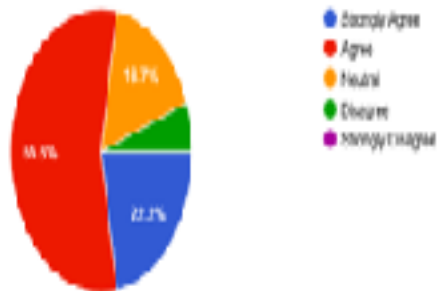
Do you believe you have adequate resources to implement QBL for patients using the Titrator scale?

18 responses



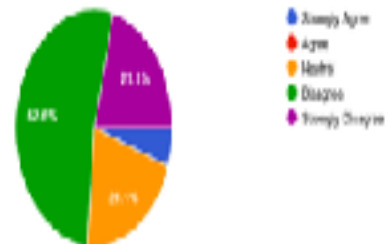
After receiving Titrator training, I feel comfortable using Titrator to measure QBL.

18 responses



Do you think implementing QBL with Titrator scale for patients will disrupt current workflow?

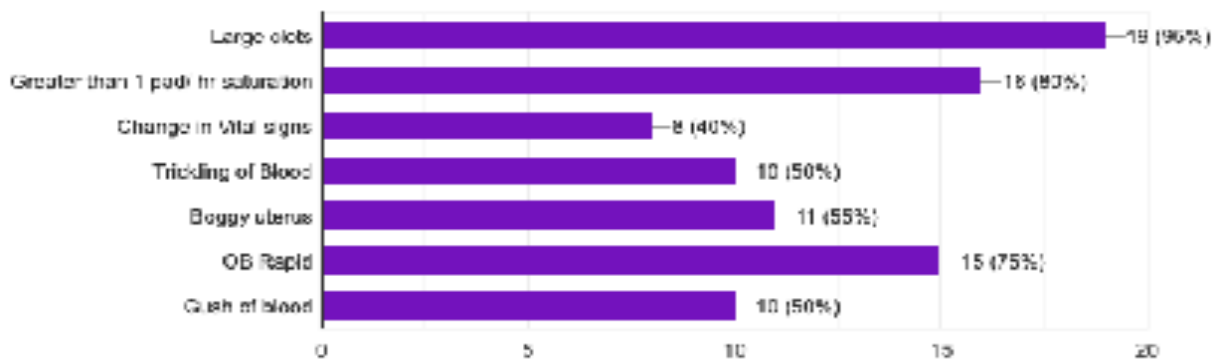
11 responses



What is a "trigger" that makes you implement QBL for a patient?



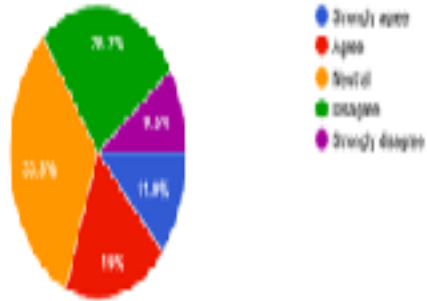
20 responses



Appendix P Mid-point Survey Results

Did collecting QBL change your perception of hemorrhage occurrence?

40 responses



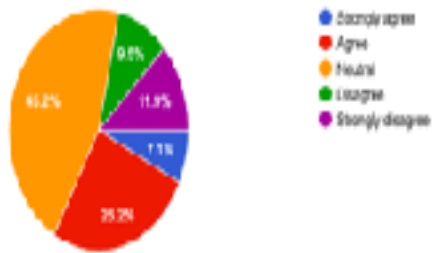
Has Triton QBL added significant time to your patient care

21 responses



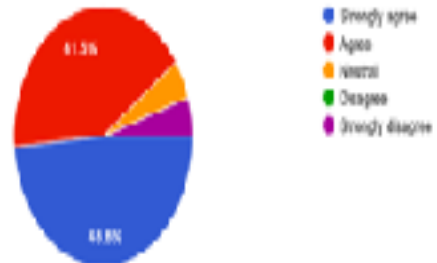
QBL improved notification time to the provider

41 responses



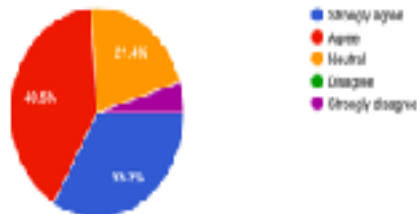
After receiving Triton training, I feel comfortable using Triton to measure QBL

21 responses

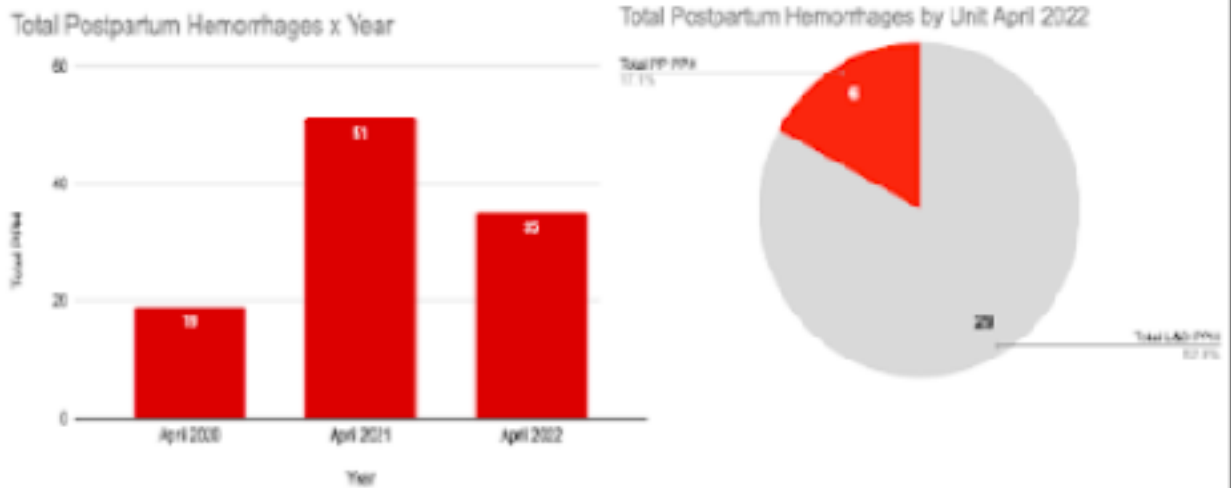


Do you believe QBL is more accurate than EBL?

42 responses

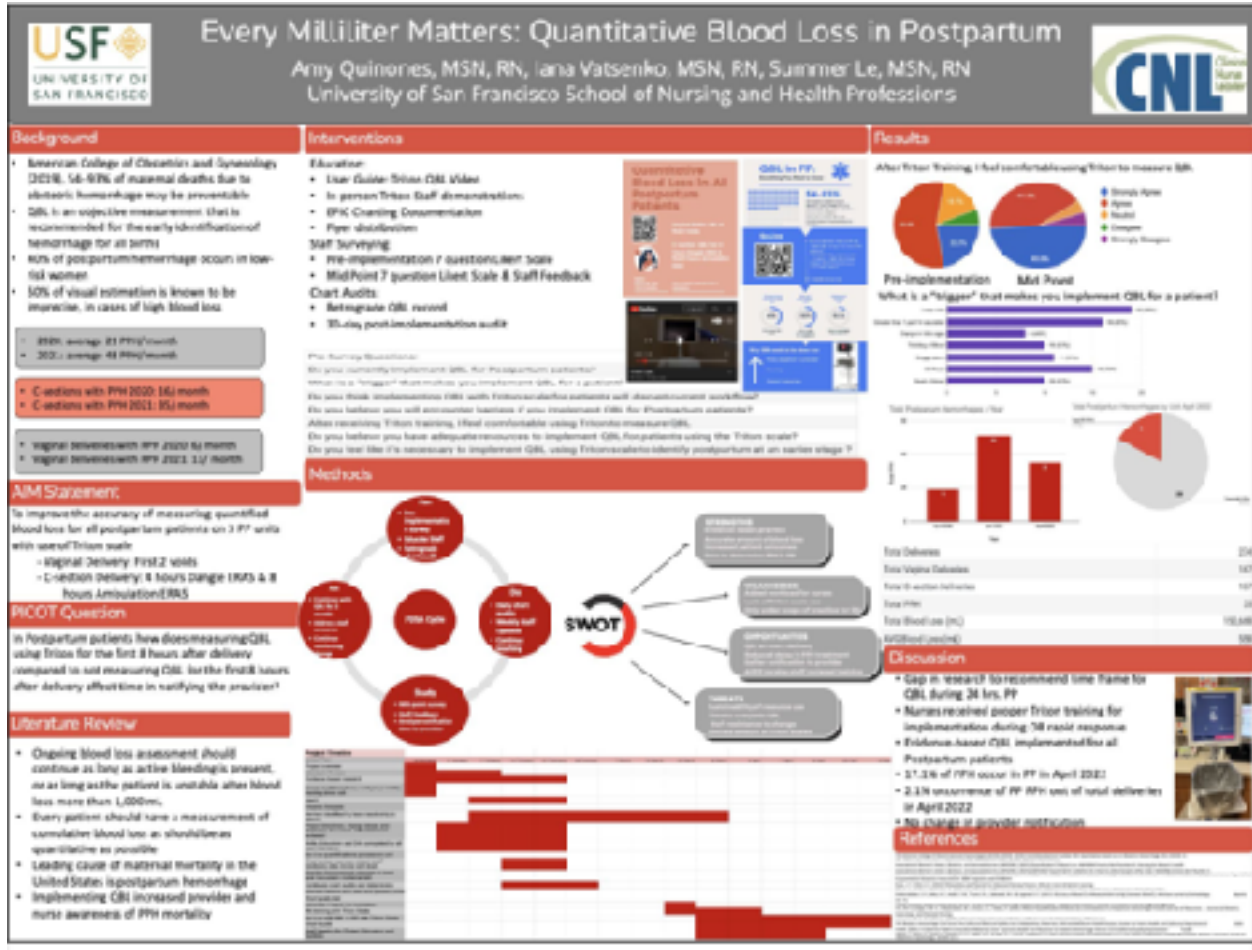


Appendix Q Chart Audits Results



| | |
|----------------------------|---------|
| Total Deliveries | 274 |
| Total Vaginal Deliveries | 167 |
| Total C-section Deliveries | 107 |
| Total PPH | 35 |
| Total Blood Loss (mL) | 150,668 |
| AVG Blood Loss (mL) | 558 |

Appendix R
Final Presentation Poster



Appendix S CMQCC OB Hemorrhage Management Plan

