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Quantitative Blood Loss Implementation in Cesarean Births

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Postpartum hemorrhage (PPH) is a leading cause of maternal morbidity and mortality in the United States;[1,2] it was responsible for 10.7% of pregnancy-related deaths between 2014 and 2017.[1] Historically, obstetric (OB) professionals visually estimated blood loss in cesarean births, despite its lack of reliability.[3,4] Research recommends quantitative blood loss (QBL) measurement during all births to improve the early recognition of PPH. The QBL process involves the direct measurement of blood loss postdelivery using calibrated drapes or suction canisters and weighing blood-soaked items. Strategies to reduce PPH incidence and adverse outcomes include the utilization of risk assessment tools and implementing massive transfusion hemorrhage protocols that are relevant in birthing suites as well as in the perioperative environment.[5] Current trends in obstetrical practice are focused on measurement versus estimation of blood loss after vaginal birth, yet adoption of this evidence-based practice is far from universal in cesarean births. To optimize patient safety, a multidisciplinary task force at a women's specialty hospital explored the logistical and practical implications of QBL application in the surgical environment.

DRIVER FOR CHANGE

Before the project, OB and anesthesia professionals subjectively estimated blood loss using visual assessment and clinical experience. The inaccuracy of provider-based blood loss estimation during cesarean births is known as a primary cause of delayed recognition and response to PPH, contributing to maternal morbidity and mortality.[6] The American College of Obstetricians and Gynecologists and the Association of Women's Health, Obstetric and Neonatal Nurses promote the replacement of estimated blood loss (EBL) with QBL during every birth to promote improved patient outcomes.[3,7] Although adopting QBL strategies in the birthing suite has received national focus, implementation within the perioperative environment is much less common. This quality improvement (QI) project aimed to replace visual EBL with a standardized QBL process during cesarean births.

THE CHANGE

In August of 2020, a multidisciplinary task force of key stakeholders from Penn Medicine Women & Babies Hospital in Lancaster, Pennsylvania, formed to explore and pilot QBL measurement during cesarean births. Using the Advancing Research and Clinical Practice Through Close Collaboration model,[8] the perioperative clinical nurse specialist (CNS) and the maternal-child health CNS led the task force, serving as evidence-based practice mentors. Additional stakeholders included clinical staff champions, OB and anesthesia professionals, information technology (IT) analysts, perioperative leaders, and perioperative clinical educators.

After conducting a gap analysis and reviewing QBL practice recommendations from the American College of Obstetricians and Gynecologists[3] and the Association of Women's Health, Obstetric and Neonatal Nurses,[7] the task force created a project plan for implementing QBL for cesarean births. Quantifying blood loss for cesarean births involves totaling blood loss from the calibrated suction canister and blood-soaked laparotomy sponges and subtracting the estimated amount of amniotic fluid and saline irrigation and dry weights of items (eg, laparotomy

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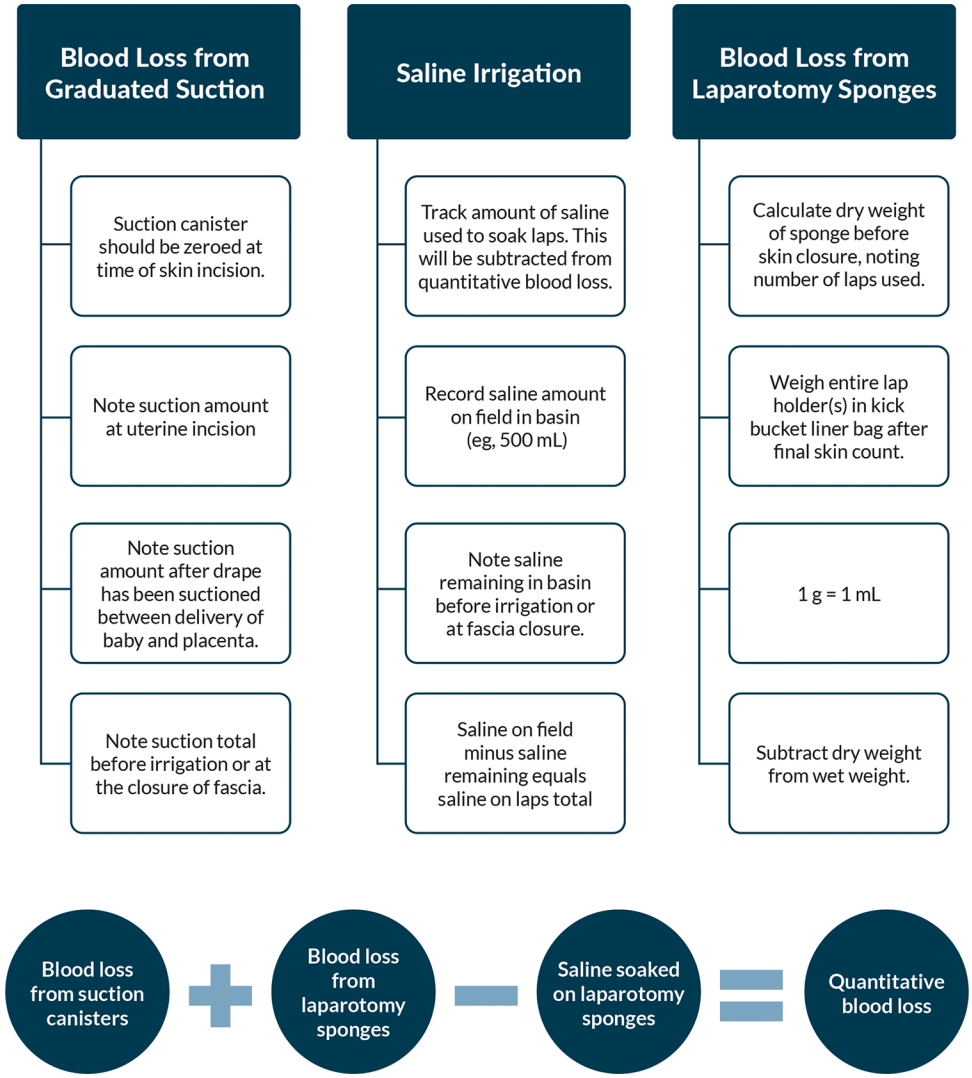


Figure 1. Quantitative blood loss process map used during cesarean births.

sponges, blue towels, laparotomy counter bags). The task force voiced concerns about the implementation (eg, the amount of time necessary to perform QBL, potential effect on OR turnover time, overall accuracy of the QBL calculation process). The necessary supplies and equipment for QBL calculation were already present in the department's designated cesarean birth ORs, including a calibrated suction system and a pediatric scale for weighing blood-soaked materials.

The initial phase of the project included a 30-day preimplementation pilot spanning from October to November 2020. At this time, the clinical staff champions (ie, an RN circulator and a surgical technologist) trialed the strategies for calculating QBL. During this preimplementation phase, the task force met once every two weeks to review staff member feedback, collect data, and modify the QBL process to address identified barriers and issues. The task force created a QBL process map (Figure 1) and an RN circulator worksheet (Figure 2) to guide QBL calculation. The QBL worksheet permitted the RN circulator to incorporate the calculated QBL value into the surgical team's end-of-procedure debriefing, which did not extend surgical procedure or room turnover times. In December 2020, before expanding the pilot into a department-wide adoption, clinical staff champions began training RN circulators and surgical technologists on the QBL process.

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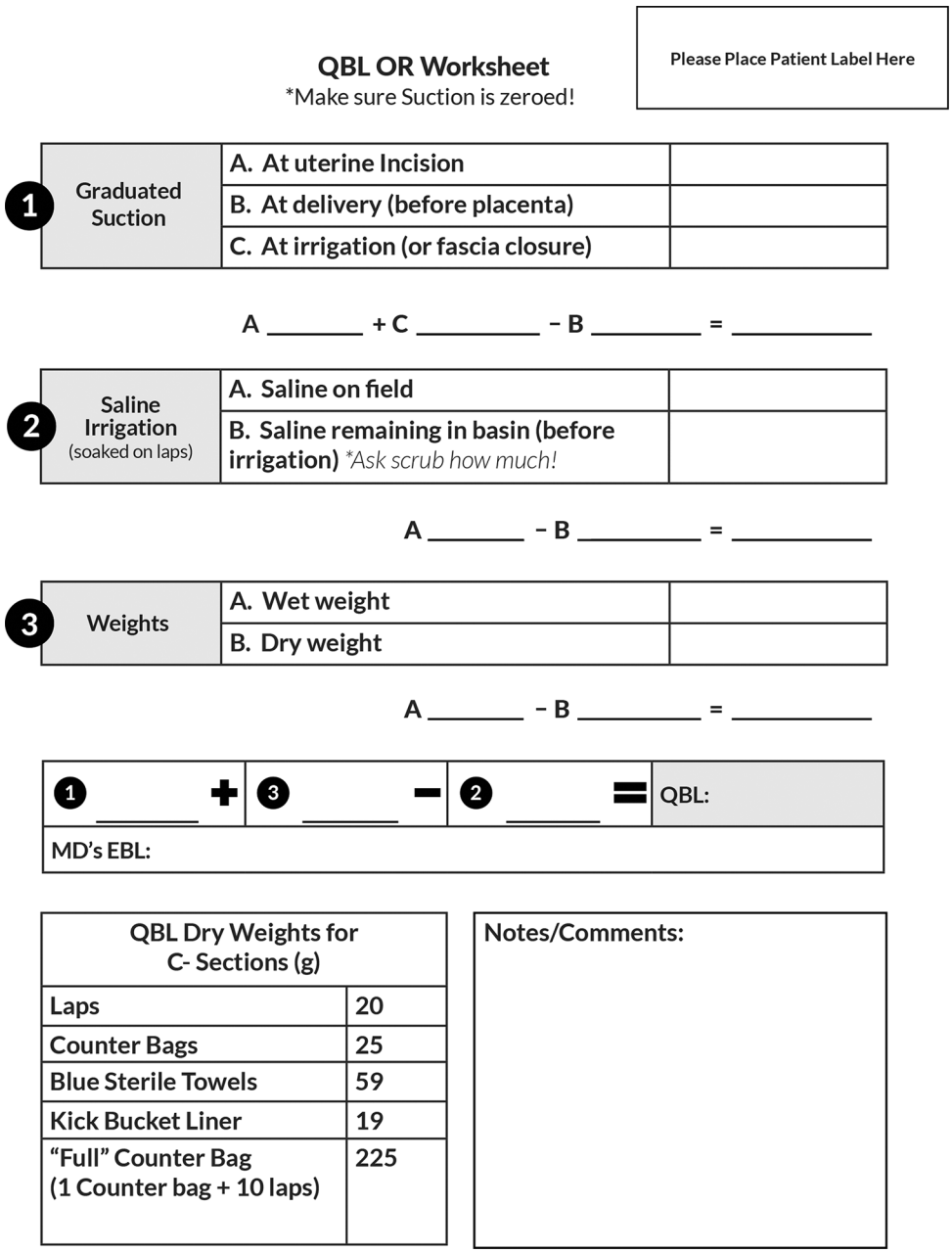


Figure 2. Operating room worksheet used by RN circulators to calculate quantitative blood loss. QBL = quantitative blood loss; MD = doctor; EBL = estimated blood loss.

The clinical nurse champion reviewed completed QBL worksheets weekly, entered the data into a secure database, and inspected worksheets for accuracy and staff member comments to identify additional education needs. If staff members did not complete a QBL worksheet, the clinical nurse champion followed up with the RN circulator of that procedure via e-mail or in-person to assess barriers to compliance. The champions' observations and staff members' feedback guided the need for additional educational offerings, including holding formal staff meetings and providing opportunities for hands-on application.

EVALUATION OF THE CHANGE

Clinical staff champions provided real-time support during the first two months of implementation to monitor and coach staff members in QBL performance. The RN circulator

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Table 1. OR Staff Compliance With Completing QBL Worksheets on Cesarean Births

Month	Total Cesareans Performed	Total QBL Worksheets Completed	Completion Rate, %
December 2020	85	63	74.1
January 2021	103	91	88.3
February 2021	97	91	93.8
March 2021	109	103	94.5
April 2021	119	116	97.5
May 2021	106[a]	103	97.2
June 2021	125	123	98.4
July 2021	104[a]	101	97.1
August 2021	108	105	97.2

QBL = quantitative blood loss.
[a]Total eligible case volume adjusted for one interoperative cell salvage case.

worksheet served as a data collection tool to monitor QBL values and identify barriers to the process. Information that the task force obtained from the RN circulator worksheet included demographic data, the surgeon's reported EBL, the volume of cesarean births performed per month, and the total number of worksheets completed. The perioperative CNS derived supplemental data from retrospective chart reviews and tracking OR turnover times to determine the effect that this change had on OR efficiency. The task force incorporated staff member feedback to refine the process by clarifying or removing confusing terminology.

The task force validated the success of this QI project by adopting QBL as the standard of care to replace visual EBL. The broader scope pilot ran from December 2020 through August 2021, with the first month seeing a QBL completion rate of 74.1% (Table 1). Early in the pilot, the RN circulator cited the following reasons for not completing the QBL: emergent cesarean cases, negative QBL values

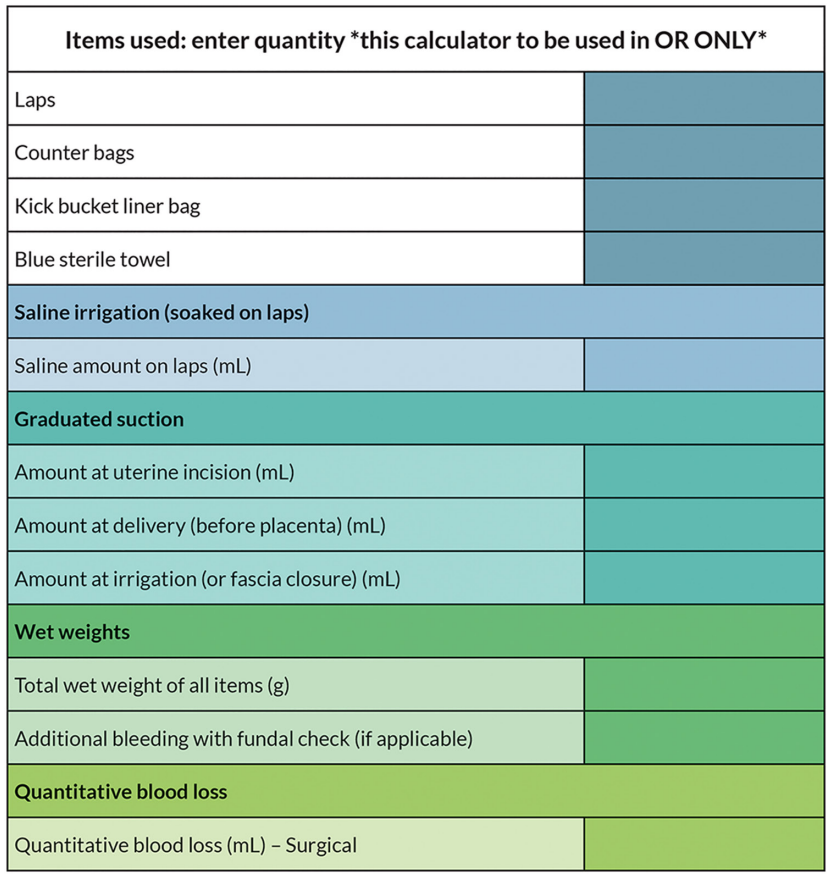


Figure 3. Sample of quantitative blood loss calculator incorporated into the electronic health record.

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because of errors in calculation, or staff member apprehension related to their unfamiliarity with the process. Additionally, QBL was not calculated on cesarean births requiring intraoperative cell salvage because suctioned blood volume is diverted from the calibrated suction system to the cell savage device.

The task force IT analysts built a QBL calculator based on the manual worksheet into the electronic health record (EHR) to streamline documentation, lessen staff member workload, and reduce human errors related to manual calculations (Figure 3). The task force planned for QBL documentation to transition from the worksheet to the EHR calculator once OB and anesthesia professionals formally adopted the QBL process as a standard of care. This would prevent duplicate documentation of QBL and EBL values within the patient's record and officially end the QI pilot. However, the task force delayed the rollout of the EHR calculator past the initially proposed 90-day department-wide pilot to allow the task force to recruit designated OB and anesthesia professional champions, improve provider engagement, and address variations in provider documentation. During this extension, IT analysts adjusted the cesarean birth postoperative note template to auto-populate the documented QBL value. Obstetric professionals and hospital leaders formally approved QBL as a standard of care for cesarean births in June 2021.

IMPLICATIONS

By the end of the pilot period, perioperative team members completed QBL on greater than 97% of performed cesarean births. By using an evidence-based practice mentorship model, QBL was successfully adopted as a standard of care during cesarean births at our facility. Implementing a QBL process will benefit patients by improving the accuracy of blood loss calculation in real-time. The early recognition of a PPH permits targeted interventions for the patient during and immediately after a cesarean birth. Quantitative blood loss represents a shift in perioperative practice and culture, requiring a team effort with perioperative team members playing a vital role in monitoring, quantifying, and documenting blood loss during cesarean births. The perioperative CNS and the perinatal safety nurse are analyzing data to evaluate the relationship between QBL and postoperative hemoglobin values. Additional research is needed to determine the specific effect of QBL during cesarean births, including its accuracy in identifying clinically significant blood loss, its role in the early recognition of PPH, and the ability to reduce the incidence of PPH-related maternal morbidity and mortality.

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