Comprehensive maternal hemorrhage protocols improve patient safety and reduce utilization of blood products

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OBJECTIVE: The purpose of this study was to assess the effectiveness of instituting a comprehensive protocol for the treatment of maternal hemorrhage.

STUDY DESIGN: The protocol was separated into 4 stages, designated 0-3, based on the degree of blood loss and the patient response to interventions. Key components included admission risk assessment, measurement of blood loss, early but limited use of uterotonic agents, early presence of obstetrical and anesthesia staff, and transfusion with fixed ratios of blood products. Data were collected retrospectively and prospectively relative to the start of the protocol.

RESULTS: We noted a significant shift toward resolution of maternal bleeding at an earlier stage ($P < .01$), use of fewer blood products ($P < .01$), and a 64% reduction in the rate of disseminated intravascular coagulation. In addition, there were significant improvements in staff and physician perceptions of patient safety ($P < .01$).

CONCLUSION: Comprehensive maternal hemorrhage treatment protocols improve patient safety and reduce utilization of blood products.

Key words: comprehensive, maternal hemorrhage, patient safety, protocol

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Maternal hemorrhage remains a major source of maternal morbidity and mortality in both developed and underdeveloped countries.[1] Nationwide, the rate of postpartum hemorrhage from 1995 through 2004 has steadily risen, and in 2004 approximately 3% of all births were complicated by postpartum hemorrhage.[2,3] The nationwide rate of transfusion during admission for labor and delivery nearly doubled during the 8-year period from 1997 through 2005.[3,4] Similar trends from 1991 through 2004 have been noted in Canada, Australia, and Europe.[5] This increased need for transfusion in the peripartum period has been attributed to many factors. Although significant concerns have been raised regarding abnormal placentation,[6,7] the increased rate of transfusion has been primarily related to increased rates of uterine atony[2,3,5,8] and can only partially be explained by changes in obstetrical practice.[3] Although most patients respond to therapy, "near miss" events, defined as blood loss of ≥1500 mL, occur in about 15% of patients experiencing postpartum hemorrhage.[9] These data suggest that approximately 18,000 women per year in the United States have life-threatening hemorrhage during the course of childbirth.

Obstetricians, anesthesiologists, and obstetrical nurses all have experience with treatment of obstetrical hemorrhage. However, the frequency at which any one provider will be faced with significant obstetrical bleeding is low, suggesting that standardized and coordinated intervention is critical for optimal maternal and neonatal outcome.[10,11] Active vs expectant management in the third stage of labor has been shown to decrease the risk for postpartum hemorrhage. If bleeding continues, then consistent and aggressive management of the postpartum period has been shown to reduce the severity of maternal hemorrhage.[10,12] Recently the Joint Commission recommended the adoption of protocols to address maternal mortality and morbidity associated with postpartum hemorrhage.[13]

In 2008, we instituted a hospitalwide comprehensive patient safety initiative that was directed specifically at the treatment of maternal hemorrhage. This was designed to facilitate coordination between all hospital personnel and ancillary services that would potentially be involved with treating patients with maternal hemorrhage. The objective of this study was to assess 2 key components of this policy. First, did institution of the hemorrhage protocol reduce the severity of obstetric hemorrhage? Second, did early intervention reduce the number of patients requiring transfusion or the number of units (U) transfused?

Materials and Methods

Collection of data for this study was approved as part of an ongoing clinical patient safety monitoring program and as

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TABLE 1
Admission risk assessment

Low risk (clot-to-hold)	Medium risk (type and screen)	High risk (cross-matched and blood bank alert)[a]
• Unscarred uterus • No Hx of postpartum hemorrhage • ≤4 previous vaginal deliveries • Singleton pregnancy	• Prior uterine surgery • Hx of postpartum hemorrhage • ≥4 previous vaginal deliveries • Multiple gestation • Large uterine fibroids • Chorioamnionitis • Magnesium sulfate use • Positive antibodies on antepartum screen	• Previa/accreta • Hematocrit <30% with other risk factor • Bleeding on admission • Coagulation defect • Platelets <100,000

Hx, history.

[a] Depending on factors involved, larger numbers of blood products may be prepared.

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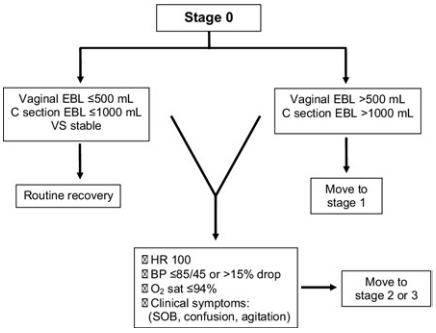
FIGURE 1
Protocol algorithm for stage 0



In event of bleeding beyond expected as normal or abnormal maternal vital signs were present, patient's status was elevated to higher level of care.

EBL, estimated blood loss; *IV*, intravenous; *MD*, physician; *RN*, nurse.

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part of an approved hospital continuous quality improvement program.

There were 3 main phases of preparation prior to protocol initiation: development, education, and team training/simulation. Protocol development, November 2008 through January 2009, was designed to optimize prompt action from health care providers and clinical services, as well as a system that facilitated communication between health care providers and ancillary services (diagnostic laboratories and blood bank).[9,10,12,14,15] After development and designation of the hemorrhage stages, an educational phase was carried out from February 2009 through April 2009. At this time, adjustments and modifications were suggested and adopted by the different groups that were going to participate in the protocol. Nursing personnel also had blood loss skills training.[16-18] Finally, labor and delivery simulations were carried out. These were designed to enable each member of the team to practice their role and to determine how the different aspects of the protocol are integrated.[19] After this was accomplished, the protocol was officially launched in May 2009.

The overall goal of the protocol was to facilitate early intervention, early treatment with blood products, and reduce the incidence of disseminated intravascular coagulation (DIC). Key elements of the protocol were graded assessments of patient acuity and standardization of interventions. The patient's status and the interventions were grouped into 4 categories (stages 0-3). The protocol was initiated at the time of admission to labor and delivery. At that time, an initial risk assessment was made related to patient's potential risk for obstetrical hemorrhage (Table 1).[2,20,21] Patients were then categorized as low, medium, or high risk. Based on the admission risk assessment, different levels of "status alerts" were given to the blood bank. Patients initially assessed as low risk had a request for a clot-tube to be held in blood bank. Medium-risk patients had a "type and screen" carried out, and those patients who were deemed high risk had cross-matched blood prepared. The patient's risk status could change during the course of her labor and delivery. This process was done primarily to streamline rapid access to blood products when needed.

Although patient status was assessed in both the intrapartum and postpartum time periods, protocol interventions were primarily designed to address postpartum hemorrhage interventions. The bleeding status of each patient was continuously assessed and assigned a clinical hemorrhage stage. Stage 0 was designated as a normal intrapartum and postpartum course. Stage 1 was defined as bleeding greater than expected for normal vaginal delivery (500 mL) or cesarean section (1000 mL).[22] Stage 2 was defined as bleeding not responding to conservative treatment outlined in stage 1, and stage 3 was defined as continued bleeding with actual or expected blood loss >1500 mL. Additional details of each stage are outlined in Figures 1-4.

Due to recognized inaccuracies in blood loss estimates even after training,[16] measurement of blood loss was assessed by weighing all lap sponges, bedware if needed, and fluid in collection systems.[23] Nonblood fluid in delivery collection systems, particularly prior to delivery of the placenta, was subtracted from the estimated blood loss. Although there is some risk that there will be amniotic fluid included in the blood loss estimate, this method has been shown to improve the accuracy of blood loss.[18,24] After delivery, bedding was changed to eliminate the risk of amniotic fluid contamination from that point forward. Aberrations of maternal vital signs (sustained heart rate >100 bpm, blood pressure <85/45 mmHg, or patient symptoms [shortness of breath, confusion, or agitation]) were deemed significant enough to warrant a higher-level care.[13] At any time during the course of care, symptoms or aberrations of vital signs caused patient care status to be elevated to either stage 2 or stage 3.

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