Transition from Estimated Blood Loss to Quantitative Blood Loss in Labor and Delivery

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Background
Hemorrhage is a leading cause of morbidity and mortality in pregnant persons and is often preventable. Early recognition of hemorrhage is key to management, but providers visual estimation of blood loss is frequently inaccurate. ACOG recommends measurement of blood loss using quantitative methods.

Methods
Using "SlicerDicer" function within Epic EMR, percent QBL reported for deliveries was reviewed as percentage over study period to evaluate for adherence. When consistently documenting QBL, quarterly incidence of postpartum hemorrhage in all deliveries (vaginal and cesarean) was evaluated with average pre- and post-QBL compared to median. The administration of uterotonic hemorrhage medications and tranexamic acid, administration of blood products, and ICU admission were then evaluated in comparison to pre- and post-QBL implementation.

Results
The longitudinal results of incidence of obstetrical morbidity over evaluated time period are demonstrated in Figure 3. There was increased incidence of postpartum hemorrhage following QBL implementation. There was also small though significant increase in use of hemorrhage medications and blood product administration. Table 1 demonstrates this overall increase from 17.9% to 20.6% and 1.98% to 2.74% respectively. ICU admission was evaluated as a balancing measure, with no increase in ICU admission with implementation of QBL.

Table 1: increased incidence of postpartum hemorrhage (EBL, PPH incidence of 4.8% for two years prior to implementation of QBL; QBL PPH incidence of 12.1% during evaluated period). Use of uterotonic/other PPH medications and transfusion rates increased ICU admission with no statistically significant change.

<table>
<thead>
<tr>
<th></th>
<th>EBL</th>
<th>QBL</th>
<th>p</th>
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<tbody>
<tr>
<td>PPH</td>
<td>4.8</td>
<td>12.1</td>
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<tr>
<td>Transfusion</td>
<td>198</td>
<td>274</td>
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<tr>
<td>Hemorrhage Medication Administration</td>
<td>17.9</td>
<td>20.6</td>
<td></td>
</tr>
<tr>
<td>ICU Admission</td>
<td>0.60</td>
<td>0.60</td>
<td>0.34</td>
</tr>
</tbody>
</table>

After implementation of QBL and adjustments for improved collection, there was consistent adherence to QBL in >70% of both vaginal and cesarean deliveries. Subsequently, an increase in recorded incidence was demonstrated with increase of postpartum hemorrhage to approximately 12% using QBL compared to approximately 4.8% using estimated blood loss (EBL).

Figure 1: PDSA Cycle 1 goal of quantitative blood loss greater than 70% of the time within three months of implementation. An outcome of postpartum hemorrhage was evaluated with percent QBL documentation as a process measure for implementation.

Figure 2: Run chart for PDSA Cycle 2 and Cycle 3. Line graph showing rate of postpartum hemorrhage, with green line documenting median PPH of 6.2%. Black line indicates start of PDSA Cycle 3.

Figure 3: PDSA Cycle 3 demonstrating significant increase in documented PPH over time (green), with small upward trend in administration of blood products (red) and administration of hemorrhage medication (orange). ICU admission (blue) stable over observed period.

Conclusion
Collection of QBL reached goal levels, maintained greater than 70% of the time, after adjustments of increased provider and nursing education, practical changes such as increase in scale availability for measurement of blood loss, and increased experience with use. With institution of QBL, the subsequent increase in reported postpartum hemorrhage likely correlated with prior studies that suggested providers tend to underestimate blood loss when hemorrhage is occurring rather than any true increase in bleeding. Use of uterotonic and other medications for postpartum hemorrhage and incidence of transfusion increased proportionally less than incidence of PPH, therefore more likely accurately reflecting true incidence of hemorrhage. Other measures negatively impacting accuracy of QBL were identified during implementation through subjective provider experience with use, such as inaccurate measurement of amniotic fluid, unmeasured blood on provider clothing, and other contaminants in the field. These processes have been gradually adjusted to improve accuracy as much as possible. Future steps include investigation of benefits of QBL for patient outcomes and standardization of recommended QBL measurement approaches.

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