Blood loss assessment using a novel automated system improves recognition of maternal hemorrhage

Rubenstein AF, Zamudio S, Douglas C, Sledge S, Tully GW, Thurer RL

Hackensack Meridian Health, Hackensack, NJ, United States

Objective

Underestimation of blood loss and delayed diagnosis of obstetric hemorrhage contribute to maternal morbidity and mortality for patients having both cesarean and vaginal deliveries. Accurate and objective quantification of blood loss is therefore recommended to facilitate rapid recognition and implementation of hemorrhage protocols and improve outcomes. We compared hemorrhage recognition using a novel system that measures blood loss during delivery to traditional visual estimation of blood loss.

Methods

For vaginal delivery patients, an automated system that quantifies blood loss (Triton L&D™, Gauss Surgical, Los Altos, CA, USA) was compared to the attending physician's clinical blood loss estimate during 300 deliveries. The system batch weighs all blood containing sponges, towels, pads and other supplies and automatically subtracts their dry weights. It also facilitates measurement of blood collected in the under-buttocks drape and subtracts the measured amount of amniotic fluid. Each method was performed independently, and clinicians were blinded to the device's results. For cesarean delivery, we compared blood loss using a related system (Triton OR™, Gauss Surgical, Los Altos, CA, USA) in 756 patients to visually estimated blood loss in an historical control group of 2, 025 patients. Using image-processing algorithms, Triton OR™ accurately measures blood loss by photographing surgical sponges and canisters and calculating their hemoglobin content. For cesarean delivery, we compared blood loss using a related system (Triton OR™, Gauss Surgical, Los Altos, CA, USA) in 756 patients to visually estimated blood loss in an historical control group of 2, 025 patients. Using image-processing algorithms, Triton OR™ accurately measures blood loss by photographing surgical sponges and canisters and calculating their hemoglobin content.

Results

In the vaginal delivery group, the mean blood loss determined by the device (405. 8 ± 275. 2 ml) was greater than the visually estimated blood loss (304. 9 ± 135. 2 ml) (P<. 0001). The device determined a blood loss > 500 ml in 27. 7% of patients compared to 5. 1% of patients using visual estimation (P<. 0001). Visual estimation of ≥ 1, 000 ml was recorded in only 1 patient, whereas 13 patients (4. 3%) had a blood loss > 1, 000 ml by the device (P<. 0001). For cesarean deliveries, the mean device blood loss (555. 8 ± 327. 0 ml) was lower than the visually estimated blood loss (662. 1 ± 195. 3 ml) (P<. 0001). Blood loss >1, 000 ml was recognized in 1. 9% using visual estimation while measured blood loss of >1, 000 ml occurred in 8. 2% of device patients (p<0. 0001).

Conclusion

For patients having both vaginal and cesarean deliveries, blood loss measurements using an objective automated system that provides accurate contemporaneous measurement of bleeding identified more patients with excessive blood loss than visual estimation. This allows for more timely institution of hemorrhage treatment protocols and escalated clinical management. As a public health measure, early recognition can have a significant impact upon maternal safety and reduce morbidity and mortality. Clinicians should move beyond the long-known inadequacies of subjective, visually estimated blood loss.