Implementation of Goal-Directed Transfusion Strategy Improves the Outcome of Pregnancies Complicated by Severe Postpartum Hemorrhage

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Introduction

- Postpartum hemorrhage (PPH) is the leading cause of maternal mortality worldwide (27% of maternal deaths) and the leading cause of direct obstetric death in developed countries. It is also a major cause of maternal morbidity and ICU admissions.
- Several international consensus bodies, including ACOG, have released guidelines based on damage control resuscitation (DCR).
- Since 2014, two point-of-care devices have been introduced on the Labor and Delivery unit at Yale-New Haven Hospital: an i-STAT® blood gas analyzer and a ROTEM® delta device.
- Utilization of these devices has allowed us to transition from a DCR strategy to goal-directed transfusion (GDT) for the management of PPH.

Methods

- Cohort study to compare outcomes among parturients with severe PPH (EBL 1500mL or more) between January 1, 2011 and July 31, 2015.
- Two groups: those whose resuscitations were performed after implementation of the goal-directed transfusion strategy and were based on the results of point-of-care testing (GDT group), and those who were treated before the point-of-care devices were available (non-GDT group).
- Implementation of GDT was determined only by the availability of personnel trained and certified to use point-of-care testing.

Results

- Between January 1, 2011 and July 31, 2015, 20,349 patients delivered at Yale-New Haven Hospital. There were 6,708 cesarean deliveries and 13,641 vaginal births. A total of 86 patients developed severe PPH, which represents 0.42% of all deliveries. Severe PPH occurred in 1.01% (n=68) of cesarean and 0.13% (n=18) of vaginal deliveries.
- The two groups showed no statistically significant differences in maternal age, race, obstetric history (gravidity, parity, gestational age, percentage of singletons), method of delivery (vaginal or cesarean), incidence of emergent intervention, or antepartum condition (BMI, ASA functional class, and preoperative hematocrit).
- Of the 86 patients with severe PPH, 58 (67.4%) were managed before implementation of GDT, and 28 (32.6%) were in the GDT group.

Discussion

- Goal-directed transfusion strategy in PPH is associated with decrease in use of blood products, reduced rate of cesarean hysterectomy, fewer ICU admissions, and shortened postpartum stay.
- There was no clear benefit in terms of clinical outcome in maintaining postpartum hematocrit higher than 24%.
- None of the patients in the GDT group demonstrated evidence of hyperfibrinolysis.
- Further studies are necessary to find the optimal thresholds for transfusion of blood products (i.e., RBC, cryoprecipitate, clotting factors) during the management of PPH.

Figure 1: Point-of-care Measurement Devices

Figure 1: Point-of-care measurement devices: Measurement of hemoglobin/hematocrit was performed using the i-STAT® handheld analyzer and i-STAT® CG8+ test cartridges (Abbott Point of Care, Princeton, NJ), viscoelastic testing was performed using a ROTEM® delta device (Tem Innovations GmbH, Munich, Germany)

Figure 2: TEMOGRAM

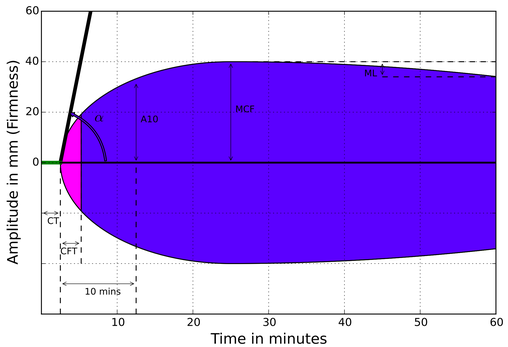

Figure 2: Schematic TEMOGRAM with thromboelastometry parameters: Clotting time (CT), clot formation time (CFT), maximum clot firmness (MCF), amplitude at 10 minutes (A10), and maximum lysis (ML).

Table 1: Goal-directed transfusion (GDT) group versus Non-GDT group

	Non-GDT (n=58)	GDT (n=28)	p-value
Hysterectomy	31 (53.5%)	7 (25.0 %)	**0.02**
HCT before (%)	34.3 (31.8-37.3)	34.7 (31.5-36.5)	0.69
HCT PPD-1 (%)	27.8 (24.5-30.0)	24.7 (23.0-26.6)	**0.0043**
EBL (mL)	3000 (2000-4000)	2000 (1600-2500)	**0.0005**
Crystalloid (mL)	3500 (3000-4100)	3500 (3100-4500)	0.88
RBC (units)	4 (2-8)	1 (0-2)	<**0.0001**
FFP (units)	5 (0-6)	0 (0-0)	<**0.0001**
Received PLT (%)	26 (44.8%)	0 (0%)	<**0.0001**
Received Cryo (%)	10 (17.5%)	6 (21.4%)	0.77
Admitted to ICU (%)	25 (43.1%)	1 (3.6%)	**0.0001**
Hospital stay (days)	5 (4-6)	4 (3-4)	**0.0001**

Table 1: Comparison of characteristics and outcomes among goal-directed transfusion (GDT) group and non-GDT group. Data are given as n (%) or median (interquartile range).

Figure 3: 3.5L Blood Loss

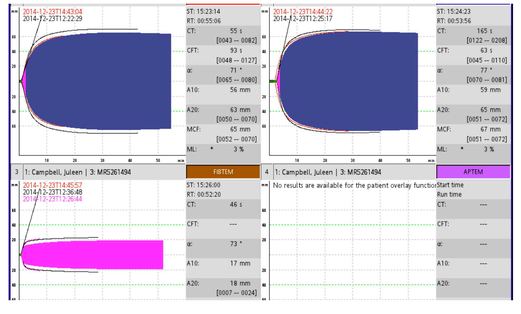

Figure 3: Minimal changes of TEMOGRAM after 3.5L of blood loss, and transfusion of 5L of crystalloid and 1 unit of RBC. The black line represents the preoperative TEMOGRAM, the red line represents the TEMOGRAM after two hours of surgery, and the filled-in curves represent the post-operative TEMOGRAM