Blood Product Usage Pre- and Post-Implementation of ROTEM® Thromboelastometry

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Introduction
Rotational thromboelastometry (ROTEM®) is a point-of-care coagulation test recently implemented at the Royal Brisbane and Women’s Hospital (RBWH) in August 2014 as part of the blood management program incorporating massive transfusion protocol (MTP), intraoperative cell salvage (ICS) and ROTEM®.

Methods
Raw blood product usage data was obtained from the Blood Bank and coded into Diagnostic Related Groups (DRGs). This data was cross-correlated with Auslab data on blood products issued and ROTEM® tests, cell salvage records, Operating Room Management Information System (ORMIS) records and the Automated Anaesthesia Record Keeping (AAR) database. Intraoperative blood product usage (packed red blood cells, pooled platelets, cryoprecipitate, fresh frozen plasma/extended life plasma (FFP/ELP)) was evaluated for a defined six-month period prior to the implementation of ROTEM® from August 2013 to January 2014 (2013/2014), and this was compared to the post-ROTEM® implementation period from August 2014 to January 2015 (2014/2015).

Results
455 of the 14852 patients who presented for surgery (emergency and elective) during the two six-month periods required the transfusion of 2943 units of blood products. Emergency surgery was the predominant area for blood product use accounting for approximately 65% of intraoperative transfusions in both financial years. While the number of patients requiring a transfusion remained very similar (222 in 2013/14 vs. 233 in 2014/15), and the distribution of blood product use has changed. In the six-month period following the implementation of ROTEM®, red blood cell transfusion increased by 19.2%, fresh frozen plasma by 17.5%, cryoprecipitate by 124.7% and platelet transfusion by 10.4%. Overall, this data shows the potential increased utility of ROTEM® in ICS, MTP and certain additional surgical specialties including colorectal surgery.

Discussion
Although the uptake of this new test has been gradual, a change in practice in blood transfusion management is reflected particularly by the increase in cryoprecipitate use and the decrease in platelet administration. The increase in cryoprecipitate cost was related to an increase in individual product cost and an increase in usage during the ROTEM® implementation period. This data is comparable to trends seen at other tertiary hospitals. This change in cryoprecipitate usage may provide an indication for the introduction of fibrinogen concentrate which would reduce blood bank turnover costs, paragone transmission, risk of transfusion related acute lung injury (TRALI) due to the lack of major antibodies, and also improve the availability of fibrinogen replacement therapy due to shorter preparation time and longer shelf-life. A limitation of this analysis is the absence of parameters to measure a change in patient outcomes as a result of this new utility in blood management. The ICU length of stay (LOS) was 9.9 days for the trauma group of patients in 2014/15, which had decreased from 12.6 days for 2013/14. However, there are multiple confounding factors that determine a patient’s LOS in ICU.

Of these seven patients, four were for elective open abdominal aortic aneurysms (AAA), one for an emergency open AAA, one for a Whipple’s procedure and one for an open hepatocectomy. During the post-ROTEM® period, 43 massive transfusion protocols (MTP) were triggered hospital-wide with 35 ROTEM® tests being performed on 16 of these patients. Fourteen of these MTPs were triggered intraoperatively, of which five patients had ROTEM® tests performed intraoperatively. Sub-analyses were performed on various surgical categories where ROTEM® had been used on at least three patients to compare the differences in blood product usage pre- and post- ROTEM®. Usage was compared in major vascular procedures, caesarean sections, rectal resections and multi-trauma patients requiring neurosurgery. Although there were slight variations between the number of patients requiring transfusions in each group (1.1 +/- 4), the results do show a significant increase in the use of cryoprecipitate post-ROTEM®. Plasma and platelet use appear to be similar, whilst red blood cell use was variable pre- and post-ROTEM®.

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![Graphs and diagrams showing blood product usage and ROTEM® implementation impact]

![Top 10 Procedures for Cryoprecipitate Use]

![Diagrams showing blood product usage by type of surgery]

![Tables showing blood product usage pre- and post-ROTEM®]