

New studies show reduced platelet utilization and improved patient care using advanced platelet management

Dan Millar¹, Audrey Labrie¹, Elisabeth Maurer^{1,2,3}

¹LightIntegra Technology Inc, ²Canadian Blood Services, ³University of British Columbia, Vancouver, Canada.

Background

- Refractoriness is a common complication in patients requiring prophylactic platelet transfusions.
- Reasons for refractoriness in majority of cases is not identified.
- Results from our CoDIVO study: highest risk for developing refractoriness was when patients with elevated body temperature receive activated platelets with high microparticle content (i.e. heterogeneous platelets).

Aim

Determine if testing the composition of platelet transfusions and avoiding activated platelets for prophylaxis prevents refractoriness, evident as reduced platelet usage.

Methods

- Microparticle (MP) content of platelet transfusions routinely screened with ThromboLUX prior to transfusion (N=997 for CoDIVO and N=641 for US quality initiative).
- In Canadian CoDIVO study (ISRCTN01292427) risk for refractoriness was calculated as: microparticle content (heterogeneity) of the platelet transfusion measured by ThromboLUX (MP) times patient body temperature above 37.2°C ($\Delta T_{\text{above normal}}$)

$$\text{Risk} = \text{MP} * \Delta T_{\text{above normal}}$$

- 3-month quality initiative in medium-sized US hospital: Platelet management to avoid transfusion of activated platelets to hematology-oncology patients and reduce risk of refractoriness. Average inpatient platelet usages for the 10 months before quality initiative (baseline) compared to 3 months of ThromboLUX quality initiative.

Results

- A 40 year old male patient diagnosed with AML in remission (A-, CMV+, HLA negative throughout the entire treatment, received mostly ABO identical transfusions) became refractory after 6th platelet transfusion with high microparticle content indicating activated platelets when body temperature was 39.5°C (high risk). (**Figure 1**)

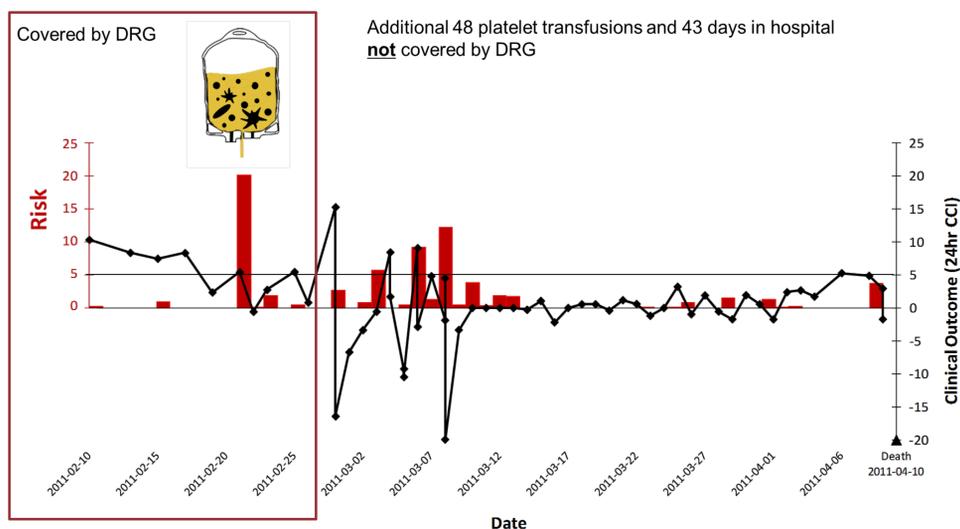


Figure 1. Example of platelet transfusion risk and clinical outcome during treatment for a CoDIVO patient.

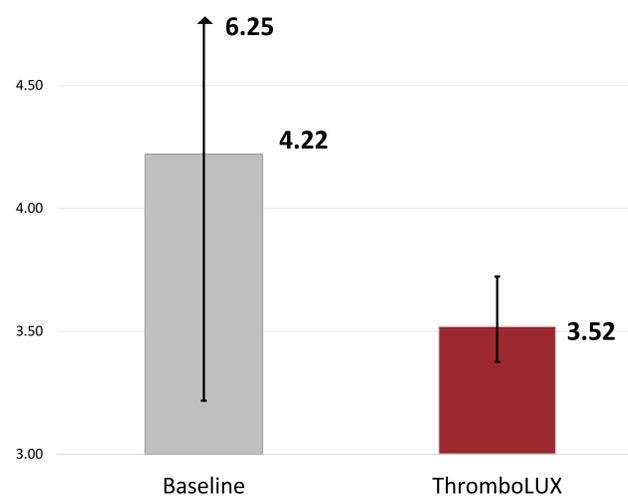


Figure 2. Reduction in Platelets per Patient with platelet inventory management

- During ThromboLUX quality initiative Platelets per Patient for inpatients was significantly reduced by 17% ($P=0.03$) and variability decreased by 80% (**Figure 2**).
- Reduced Platelets per Patient corresponded to 127 fewer platelet transfusions over 3 months (**Table 1**).

Baseline Number of platelets	2,504
Baseline Number of patients	593
Quality Initiative Number of platelets	641
Quality Initiative Number of patients	182
Baseline Platelets per Patient	4.22
Quality Initiative Platelets per Patient	3.52
Difference in Platelets per Patient	0.70
% Reduction in Platelets per Patient	17%
P-Value against Baseline (1-tailed t-test)	0.03
Transfusions mitigated in Quality Initiative	127

Table 1. Summary from quality initiative in a medium-sized US hospital

Conclusions

- Platelet refractoriness is a severe condition marked by long, often unsuccessful treatment of hematology-oncology patients at high emotional and financial cost
- A 2-factor model for risk of refractoriness is proposed: One factor, microparticle content of platelet transfusions, can be addressed by platelet screening and inventory management.
- The impact of platelet management was tested in a quality initiative in a US hospital. We found a significant reduction in inpatient platelet use and variability likely due to prevented refractoriness.
- Using 5 years of historical data we verified that seasonal variations were not causing variability of inpatient platelet utilization

Acknowledgments: We would like to thank the staff and donors who made these studies possible NetCAD (Canadian Blood Services), Vancouver, Canada,.

