Patient Blood Management: the new standard

Preoperative anemia,[1] high blood loss,[2] and transfusion of allogeneic blood products[3-6] all adversely affect patient outcome. Patient Blood Management (PBM) aims to reduce the need for blood transfusions preemptively to improve patient safety and outcome.[7] The three pillars of PBM consist of treating preoperative anemia, reducing perioperative blood loss, and optimizing anemia tolerance. In addition, the use of restrictive, evidence-based, and patient-centered transfusion triggers is an integral part of PBM.[3,8]

Implementing one or more PBM measures has indeed improved certain patient outcomes in the past,[8-12] and some of these studies included well over 100,000 patients.[10,13] What is then so unique in the landmark study by Leahy and colleagues[14] in this issue of **TRANSFUSION** in which they describe the success of the health system–wide PBM program implementation in Western Australia? Its uniqueness includes:

- The largest ever number of patients studied: 605,064.
- Multi-centric: four major adult tertiary care hospitals.
- Health system–wide PBM program not focused on surgical disciplines alone.
- Multiple outcomes assessed:
  - Safety;
  - Clinical outcomes;
  - Transfusions;
  - Costs.
- Duration of the study: 6 years.

The results are indeed impressive. The authors report a progressively reduced adjusted in-hospital mortality (−28%), a shorter hospital length of stay (−15%), less hospital-acquired infections (−21%), and a reduced rate of myocardial infarction or stroke (−31%). Transfusions of allogeneic blood products were also reduced by 41% whereby transfusions of red blood cells (RBCs) were down 41%, fresh-frozen plasma (FFP) down 47%, and platelets (PLTs) down 27%. These trends resulted in reduction of blood product acquisition costs of more than US$18M and a reduction of activity-based transfusion costs of more than US$80M.

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There is another, more remarkable achievement: the percentage of elective patients admitted with anemia decreased from 20.8% to 14.4%. This result can be attributed to consistent identification and treatment of existing anemia and iron deficiency in the weeks before hospitalization. To my knowledge, this study is the first worldwide so far reporting a substantial reduction of the preoperative anemia rate. This achievement is highly remarkable given the logistic complexity of preoperative anemia treatment.

How was this program better than any other PBM program so far? The current article does not give a definitive answer. However, the extremely intense educational activity of the proponents of the Western Australia PBM program already described in a previous report by Leahy and colleagues in 2014[13] may be a key element in increasing the awareness of the high incidence of preoperative anemia and iron deficiency and its negative consequences on outcome.[1,15,16] In addition, hospital physicians and referring general practitioners could consult readily accessible diagnostic and therapeutic algorithms (http://www.healthnetworks.health.wa.gov.au/modelsofcare/docs/Elective_Joint_Replacement.pdf). Ironically, the highest-quality studies on the success of pre- and postoperative anemia treatment[17-20] were published years after the start of the Western Australia PBM program. However, a consensus is growing that elective surgery should be delayed until anemia correction. This movement started with individual claims.[3] Then experts stopped a prospective randomized study on the efficacy of preoperative treatment of iron deficiency anemia with intravenous (IV) iron due to a much more favorable outcome in the treatment group as compared to placebo group.[17] Finally, a professional society (Association of Anaesthetists of Great Britain and Ireland [AAGBI])[21] recommended delaying elective surgery until anemia correction in patients with an expected blood loss of more than 500 mL or an expected transfusion rate of more than 10%.[8,22] In addition, preoperative correction of iron deficiency without anemia has become recognized as likely to be beneficial for patient outcome.[22]

The time course of the improvements of the clinical outcomes is highly interesting. For most clinical outcomes, it took 2 to 3 years until they became significantly improved (Table 2 of the paper[14]). This lag period may well explain why other big PBM programs could only detect trends toward an improvement in clinical outcomes since most analyses published so far analyzed only the first year after the implementation of

the PBM program.[10] An observation period of 3 years thus should be the minimum time of assessment when analyzing the success of a PBM program.

Cost savings were also most remarkable: A one-time investment of only US$4.4 million resulted in total savings of more than US$18 million for blood product acquisition costs. Interestingly, the reduction of the use of allogeneic blood products was progressive and was lowest in the last year of the study, the financial year 2013/2014 (Fig. 3 of the paper[14]). With these blood product usage data and the price data provided in the appendix, one can calculate that the product acquisition costs were 37% lower in financial year 2013/2014 compared with the reference year 2008/2009. Accordingly, the cost savings in the last year of the study were US$6.8 million—and these are yearly cost savings provided that the transfusion rate remains low, which indeed is the case according to Fig. 1 of the paper.[14] In addition, if we talk about yearly savings of US$6.8 million we underestimate the true cost savings since the product costs represent only a fraction of costs to a hospital when the true costs of administering blood products are calculated according to the established activity-based costing model.[23,24] Taking into account all accompanying costs the true cost savings increase to at least US$29 million yearly. Of course, the costs for pre- and postoperative anemia treatment with drugs such as IV iron, vitamin B12, folic acid, and erythropoietin rather than RBC transfusion and the use of coagulation factors rather than FFP or PLT transfusions has not yet been included. However, the costs for a prolonged hospital length of stay, treatment of hospital-acquired infections, and myocardial infarction or stroke have not been included in the overall analysis. Overall, my personal prediction is that the true yearly cost savings may be closer to US$29 million than US$6.8 million.

Another aspect of the landmark paper by Leahy and colleagues deserves mentioning: The health system–wide PBM program did not focus on surgical disciplines alone.[14] This broader scope is of particular relevance given the fact that close to 70% of blood products are used at current time in nonsurgical disciplines.[25] Therefore, highly successful surgery-oriented PBM programs should consider expanding their target patient population to nonsurgical patient groups.

The take home message is: PBM is safe and efficacious in improving patient outcome, in reducing the need for allogeneic blood product transfusion, and in lowering costs. The Western Australia Department of Health should be congratulated for their courageous and visionary decision 10 years ago to support this statewide PBM program and the local champions for implementing the program for many years. With the current achievements, this program is clearly number one worldwide and as such has set new standards.

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