The Team Focus on Improving Blood Transfusion

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Abstract: The current literature pertaining to associated morbidity and mortality with homologous blood transfusion in the surgical patient seems to be pointing only in one direction, which is we must start reducing our patients exposure to homologous blood and products. There appears to be ever mounting evidence of increases in infraction, stroke, transfusion related lung injury, infection, and death that authors are associating with transfusion.

A number of authors are reporting success in reducing their patients’ requirements for homologous transfusion simply by working as a team or what is known as a multidisciplinary approach and following set transfusion protocols and algorithms.

At our institution we have taken note of these reports and have taken the first steps in the formation of a Cardiac Surgical Transfusion Management Group where all specialties involved in the decision making process of transfusion in the cardiac surgical patient can have representation and be directly involved in the establishment of protocols, transfusion algorithms, and a transfusion audit system. The main goal of this group is to implement a change in transfusion practice and to assess the impact the change has had on transfusion requirements and make appropriate recommendations to the treating specialists. Keywords: cardiac surgery, transfusion, multidisciplinary.

The increasing concern of the morbidity and mortality associated with blood transfusion is rapidly becoming the catalyst for the move towards reducing the surgical patient’s exposure to homologous blood transfusion (1–5). The literature constantly refers to cardiac surgery as an area where empiric transfusion practice occurs and needs to be controlled (6–9). Avidan et al. tested the hypothesis that a management algorithm based on point of care testing would reduce blood loss and blood component use after routine on-pump coronary artery bypass surgery when compared with an algorithm based on routine laboratory results, or with clinical discretion (10). The results in all three groups showed a similar median blood loss. The transfusion of packed red blood cells or non-cellular components was higher in the clinician discretion group (p < .05) but showed no difference between the two algorithm groups. The authors concluded that following algorithms based on either point of care or laboratory guidelines does not decrease blood loss, but reduces the transfusion rate of red cells and blood products as compared to clinical discretion.

Levy and colleagues concluded in their review of the 2008 Hemostasis Summit that in many clinical settings maintaining hemostatic balance is poorly understood and remains complex and furthermore, that limited evidence is available to guide treatment of these patients and that current laboratory tests are not sufficient to guide optimal biological or pharmacologic therapy in the surgical setting (11). Blood product transfusion—the mainstay of treatment for bleeding—is often given without a full appreciation of the benefits, risks, and cost. They added that practitioners cannot afford to guess how to manage the bleeding patient as over-treatment with blood products, antifibrinolitics, and hemostatic agents risk increased postoperative morbidity and mortality due to thrombotic complications, while under-treatment or postponing the administration of hemostatic agents could result in increased bleeding, re-operation, multi-organ failure, or death from exsanguination. They further concluded that ongoing communication among advocates for hemostasis research from all disciplines is critical to improving treatment and patient outcomes (11).

In a multidisciplinary retrospective study, Brevig and colleagues reported their results of 2331 consecutive cardiac surgical procedures performed during a 5-year period with the goal of using fewer blood products. Their
incidence of red cell transfusion was decreased from 43% in 2003–18% in 2007. They concluded that a multidisciplinary approach to blood conservation can result in lower transfusion rates with equivalent patient outcomes (12). A similar decrease was reported by Reddy et al. in a retrospective audit of blood product usage in patients undergoing cardiac surgery performed by a single surgical team, following an in-house protocol for blood conservation. Their strategies included maximizing autologous blood generation by including intra-operative donation, cell saving, retrograde autologous priming, minimizing intra-operative fluids, preoperative iron supplementation, meticulous surgical hemostasis, optimizing coagulation status, and the use of antifibrinolytic drugs. Of the 310 consecutive patients, 54 patients (17.4%) required one or more units of homologous transfusions either intra or post-operatively until discharge. They concluded that a standardized multidisciplinary approach to blood conservation in cardiac surgery decreases bleeding and transfusion requirements in a safe and cost effective manner (13).

Perhaps the report by DeAnda and colleagues best outlines what is achievable with the team approach and gives a realistic perspective on how this may be achieved (14). They stated that there are numerous reasons to reassess the use of blood and blood products but identified that institutional inertia exists, and that if not directly preventing the implementation of a blood conservation program, this inertia at least slows down its adoption. In their experience specific to a cardiothoracic surgery, they demonstrated that such a program could be successful but highlighted two major conditions for success. First, a multidisciplinary approach was critical as all care providers need to accept the program in order for it to succeed, and second, that continuing assessment, re-evaluation, and implementation are necessary so that the program not only becomes implemented but evolves further to meet the organizational needs and capabilities.

The role of the perfusionist should not be underestimated when discussing the multidisciplinary approach. Zelinka and colleagues have demonstrated what can be achieved in the reduction of homologous transfusion by utilizing a number of modalities available to the perfusionist. These included vacuum assisted drainage with 3/8” dry tubing, retrograde autologous priming, removal of prime from cardiopulmonary bypass circuit, coated circuits, hemoconcentrators and cells-savers, all determined on a case-by-case basis for use. Their retrospective study of 2979 consecutive cardiac surgical patients showed a reduction in red cell transfusions from 43–13.6% for all patients and 38.5–8.7% for coronary artery bypass patients. The authors noted that their first step was to achieve standardization among the perfusion team for a successful blood conservation program (15).

An argument often advocated to defer the introduction of methods to reduce transfusion is that the potential clinical benefits come at an increased procedural cost. These costs include those incurred with the routine use of cell savers, coated circuits, point of care coagulation testing, and pharmacological strategies with use of Erythropoietin or Recombinant factor VII. In systems where such costs may be partitioned between different carriers in the patient pathway (e.g., theatre versus intensive care), the cost benefit is not apparent.

**THE ROYAL NORTH SHORE HOSPITAL EXPERIENCE**

The Royal North Shore Hospital has undertaken the first steps in the process of developing a team approach with the formation of a “Cardiac Surgical Transfusion Management Group” where all parties involved in the decision making process of transfusion in cardiac surgery have representation and can voice concerns over choices in management. This group is made up of a perfusionist, cardiac surgeon, cardiac anesthetist, intensivist, and hematologist, with each member having the same objective of reducing the patient exposure to homologous blood wherever possible. This group was formed in 2009 and meets every quarter and has set its agenda to achieve the following: establish a pathway of communication to all cardiac surgical specialists; review the current literature in the management of transfusion for cardiac surgery; coordinate recommendations and guidelines for transfusion; and establish a set of transfusion categories for cardiac surgical patients. At each quarterly meeting, the group assesses the impact the introduced change has had on transfusion requirements and after review of the yearly audit of blood use, makes appropriate recommendation to the treating specialists.

The transfusion group has identified a number of issues through its multidisciplinary approach which it is attempting to address including:

1. Ensuring appropriate preoperative assessment for all nonemergency cases:
   a) Particularly aiming to identify patients at high risk of excessive bleeding and ensure optimization of hemoglobin and iron stores for all patients.

2. Introduction and assessment of measures to reduce coagulopathy and blood loss including:
   a) Reduction of hemodilution through the use of 500 mL intravenous fluid bags prebypass.
   b) Introduction/trial of retrograde autologous priming of cardiopulmonary bypass circuit.
   c) Introduction/trial of intraoperative hemodilution in suitable patients

3. Development of algorithms to guide blood component replacement, which outline:
   a) Recommended laboratory or point-of-care testing.
   b) Specific to clinical scenarios (e.g., deep hypothermic arrest and prior use of antiplatelet therapy).
4. Ongoing data collection and review including:
   a) Assessment of perioperative bleeding and use of anti-platelet agents.
   b) Assessment of interventions (e.g., retrograde autologous priming and intraoperative hemodilution).
   c) Efficacy of use of algorithms including blood product use and patient outcomes.

In the team approach to transfusion, all specialties must be diligent in their tasks at all stages of the cardiac surgical patients care if blood and/or products are to be reduced. The anesthetist must be willing to restrict intravenous fluids and choose appropriate pharmacological strategies. The perfusionist must restrict priming volumes by reducing circuit size, retrograde autologous priming, deploying cell-savers and hemoconcentrators, and be willing to spend extra time salvaging every last red cell from the bypass circuit at the end of bypass. Perfusionists should also become proficient with point of care coagulation analyzers to help the anesthetist appropriately transfuse. The surgeon must be meticulous in securing surgical hemostasis throughout the procedure. Intensive care must be willing to adopt the same transfusion guidelines and algorithms and not transfuse on blood loss alone. Furthermore, transfusion services must be willing to provide blood and/or products rapidly when required and be able to offer advice to the anesthetist or intensivist of other therapies available for use other than blood products. The last and the most important factor is that no one individual should be able to make the decision on whether a patient requires a blood transfusion—it must at all times be a team decision whether in the operating room or intensive care unit.

With the growing amount of evidence in relation to transfusion harm we must start moving forward on ways to reduce exposure to homologous transfusion and perhaps a multidisciplinary approach should be the starting point for us all.

REFERENCES