Blood transfusion: the epidemic continues

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There have been many advances in transfusion medicine over recent decades. There is also an increasing body of evidence relating to adverse effects of transfusion impacting on short- and long-term outcomes after cardiac surgery [1] This has also been reported in critically ill patients, those with acute coronary syndrome and trauma patients.

Blood transfusion undoubtedly saves lives, but at what cost? Bhaskar recently reviewed the evidence relating to adverse outcomes, at the same time providing a foundation for transfusion practice, especially with regard to red cell transfusion [2]. Rawn commented on the silent risks of transfusion and characterized the impact of adverse events related to the disease processes noted above, referring to it as an epidemic [3].

Like any lifesaving therapy, there are risks and benefits. The risk–benefit equation relates to:

- the benefit outweighing the risks, both short term (infection, survival, transfusion-related acute lung injury (TRALI), transfusion-related circulatory overload (TRACO) and long term (survival);
- the risks of anaemia and the ability of the patient to compensate;
- the ability of transfusion to correct these risks, not well demonstrated;
- in the bleeding patient, the ability of blood products to correct the risks of anaemia and the ability of the patient to compensate as the in

These risks relate, in part, to the modulation by the living cells of transfused blood of the immune system of the recipient as well as the inflammatory network, creating a multi-pronged attack on the recipient.

What is perhaps disturbing are the repeated reports of what would appear to be inappropriate transfusion practices. In 1991, Goodnough surveyed 540 patients undergoing elective first-time
CABG. (30 patients in 18 centres) [4]. The percentage of patients transfused with homologous RBCs ranged 5 to 100%. The mean transfusion of RBCs ranged from 0.4 (± 0.2) to 6.3 (± 0.6) units per patient. Some 7 years later, Stover, in a report from the McSPI database (EPI I), analysed transfusions in 713 of the 2417 patients on whom data were collected [5]. This subgroup was selected to minimize the effect of patients at high risk for transfusion (non-urgent, first-time sternotomy, age <75 years and CABG alone were selected). In this group, the proportion of patients transfused with RBCs varied from 27 to 92%. At 13 centres ≥50% of patients received no RBCs. Administration of other blood components was quite variable in both reports, and reflects the differing approaches to the bleeding patient.

More recently, Bennett-Guerrero et al. reported using data from the STS database, on transfusion practices from 798 hospitals and involving 102,470 cases [6]. Restrictions similar to those in Stover’s report were applied to these patients. RBCs were transfused in 56.1% of patients, and platelets in 24.7%. Patients being transfused were likely to be older, female and those who had received platelet adenosine di-phosphate inhibitors. They concluded that there was wide variability in transfusion rates, which was independent of case mix.

Cardiac surgery uses a significant proportion of blood, and often with what seems to be little proper direction. This is despite the production of comprehensive guidelines from the STS [7].

In this edition of the Journal, Jakobsen reports on a national study of transfusion practices in cardiac surgery and its impact on late outcomes [8]. In a study that provides an exemplar for data matching and completeness, the Western Denmark Heart Registry reviewed data collected between 1999 and 2010 on 20,001 patients who had valid data and who had survived CABG, AVR, MVR and combinations thereof. Patients who did not survive 30 days were excluded to reduce the impact of other potential causes of death which they considered might not be related to transfusion. This does, however, exclude transfusion-related events such as TRALI (~50% mortality) and other infectious or transfusion misadventure.

The key finding, however, is the relationship between EuroSCORE, transfusion and long-term survival. The low-risk group (EuroSCORE < 4) shows decreased survival within the first year and continuing to the maximum period of observation. Even 1–2 units of RBC transfused in this group has a significant effect on survival.

As widely used as EuroSCORE is, it still has some limitations. It provides a risk score that has been criticized for the lack of validity in the higher risk strata. However, in the lower range groups it relates well to observed vs. expected mortality. Thus, despite the failure to collect an unknown risk factor or factors, which may have a confounding effect here, needless to say, the message remains that transfusion in a low-risk group is of low benefit. In this group, some 15% received >5 units of transfusion compared with 20.4% in the EuroSCORE 5–9 group and 20.4% in the EuroSCORE >9 group. One has to speculate upon the reasons for these figures—a bleeding problem in a low-risk case is not common, but may be more frequent than one assumes based on these data.

How appropriate then might have the 62% of 1–2 unit transfusions or even the 3–4 unit transfusions (22.4%) been in this group? Had they not been transfused, might not the survival curve be quite different?

Hajjar reported on a randomized controlled trial of a restrictive vs. more liberal transfusion practice in cardiac surgical patients [9]. A non-inferiority study protocol, similar to that of Hebert (see above), was used to control RBC transfusions. An Hct of 24% was considered adequate for oxygen transport in the restrictive group and 30% in the liberal group. A total of 512 patients were enrolled. The restrictive practice did not result in worse outcomes relating to death, re-operation for bleeding, respiratory or cardiac complications. The risk of death at 30 days was increased by the transfusion of 5 or more units.

Jakobsen has added to the body of evidence indicating that red cell transfusion is not good for the low-risk post-CABG patient [8]. Unfortunately, in many of the reports referenced, a significant proportion of patients receive inappropriate transfusions. Low haemoglobin that may otherwise engender a 1- or 2-unit top-up may not be to the detriment of the patient. One has only to look at the reports of surgery on people of the Jehovah’s Witness faith to see how an aggressive policy can be associated with no increase in mortality or morbidity, supporting the findings of Hajjar et al. [9].

Transfusion may need to be a quality indicator (but attracted by a carrot, not driven by the stick) [10]. The search for alternatives to blood for oxygen transport continues. Perhaps stem-cell-derived blood may provide an answer. The impact of the storage of blood and its age needs more detailed investigation.

More research is needed and will likely result in another incremental improvement in the outcomes of cardiac surgery.

REFERENCES