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Patient blood management – The new frontier



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As one of the oldest and most common procedures in clinical practice, allogeneic blood transfusions face many issues including questionable safety and efficacy, increasing costs and limited supply. The need to provide effective care for a relatively small population of patients who could not be transfused for various reasons gave rise to 'bloodless medicine and surgery', which was subsequently proposed as a care strategy for all patients, with the goal of minimising the use of allogeneic blood components. The next evolution came from the shift from a 'product-centred' approach towards a 'patient-centred' approach, that is, a focus on patient outcome rather than use of blood components, which gave birth to 'patient blood management'. Defined as "the timely application of evidence-based medical and surgical concepts designed to maintain haemoglobin concentration, optimise haemostasis and minimise blood loss in an effort to improve patient outcome", patient blood management is

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expected to reshape the future of transfusion medicine and the way blood components are used in clinical practice.

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The pace of progress in the field of medicine has been staggering with new frontiers being reached and newer horizons being opened every day. Thanks to the advancement in technologies such as genomics and proteomics, we are gaining a far better understanding of the pathophysiological basis of the diseases, with the development of many safer, more effective, targeted therapies within grasp. Equally important is the gain in knowledge about existing treatments and the ability to better define their target populations/indications as well as their safety and efficacy in improving the well-being of the patients.

The discipline of transfusion medicine is no exception. Rooted in the heart of medicine in the last two centuries, it too has gained in both knowledge and safety. The relationship between humans and blood has often been emotional and mixed with myths throughout the history of many cultures and civilisations. Being seen as the gift of life and protector from death caused many to seek and explore ways to use blood in the treatment of various ailments with many colourful reports, with occasional frightening consequences often being cited.¹ The historic role of blood took a new turn in the first decades of the 20th century with the discovery of blood groups and cross-matching. New understanding of the coagulation system and finding reliable ways of processing and storing donated blood paved the way for allogeneic blood transfusions as a reliable medical therapy. The two world wars were pivotal in demonstrating the effectiveness of this new-old treatment in saving the lives of thousands of injured soldiers who could have otherwise bled to death. By the end of the Second World War, the American Red Cross had collected some 13 million pints of blood through its national blood donation programmes.^j

Subsequently, blood transfusion underwent a rapid growth in use and popularity among clinicians and became a staple of routine clinical practice in many civilian patient populations and settings. Blood transfusion was viewed by many as an easy and readily available means to quickly raise the haemoglobin level and presumably 'facilitate' recovery. In addition to being used in management of active life-threatening bleedings, transfusions were increasingly used 'prophylactically' in stable patients.

During the same period, few complications and risks of transfusion – namely viral hepatitis – were noted, but they were largely considered to be controllable through better donor screening and selection as well as testing of donated blood. The emergence of the human immunodeficiency virus (HIV) in the 1980s with several cases of transmission through transfusion caused a significant setback to the reputation of blood transfusion and severely tarnished its view as a generally safe treatment.² The fear and panic that followed the HIV outbreak led many to raise the question of risks versus benefits of blood transfusions and resulted in some of the first attempts to reduce and avoid the use of allogeneic blood transfusions. The fears subsided somewhat with the development and implementation of tests to screen for and detect HIV in the early 1990s. History was repeated with other infective agents emerging as new risks of blood transfusion from time to time (e.g., prions and West Nile Virus).³ Nonetheless, the overall risk of transmission of known blood-borne infections through transfusions kept decreasing to extremely low levels (though not completely eliminated).⁴

With the infectious risks of transfusion declining (but not eliminated), clinicians began to focus more on the non-infectious risks of blood. Acute haemolytic reactions were among the first to surface and also among the first to be controlled thanks to understanding the blood groups and cross-matching. For many other complications, it was more difficult to see the causal relationship given their delayed timing and inconspicuous nature. What was initially observed as a seemingly beneficial effect of transfusion among the transplant recipients was later on discovered to be a more profound process with far-reaching adverse effects (immunomodulation).⁵ Another example is the case of transfusion-related acute lung injury (TRALI) which was (and continues to be) often mistaken with other pathologic processes and aetiologies and, as a result, remained under-appreciated and under-reported.⁶

As these more 'generic' complications of transfusion began to be noticed, more evidence started to emerge linking allogeneic blood transfusions with unfavourable outcomes. Largely dominated by

^j The American Red Cross. History of Blood Transfusion. Available at: <http://www.redcrossblood.org/learn-about-blood/history-blood-transfusion> (Last accessed on 12/12/12).

observational studies, an ever-increasing wealth of data suggests that transfusion recipients are often more likely to suffer from various morbidities, have longer length of hospitalisation, have higher mortality rate and incur higher overall cost of hospital stay. Despite the ongoing heated debate on whether this increased risk is due to transfusions, or due to underlying independent factors that also increase the odds of getting transfused, both phenomena are likely to play some role, and transfusion often emerges as an independent risk factor of worse outcomes after adjustment of confounding factors.⁷

A handful of controlled randomised studies have also looked into the impact of transfusions on outcomes of patients. Spearheaded by the Transfusion Requirements in Critical Care (TRICC) trial, these studies compared 'restrictive' transfusion triggers versus more 'liberal' haemoglobin-based triggers in various patient populations and have unanimously reported that despite significant reduction in use of allogeneic blood in the study arms randomised to restrictive transfusion strategies, the outcomes of the patients remained unchanged or improved compared with those randomised to more liberal transfusion strategies.^{8–12} These findings have been reflected in recent transfusion guidelines.^{13–19} The extent to which these guidelines are applied in practice, however, is a completely different matter, with evidence indicating that there is still significant room for improvement.^{20,21}

Parallel to these developments, another movement was underway to establish a set of strategies to permit clinical practice without transfusion of allogeneic blood components – a task that would have been viewed by many as simply impossible. Dubbed collectively as 'bloodless medicine and surgery' (BMS), these strategies were primarily developed for management of the patients who could not have been transfused for various reasons, ranging from religious beliefs to alloimmunisation and rare blood groups.²² BMS strategies were proven to be highly effective as demonstrated by numerous reports. The effectiveness of BMS combined with mounting evidence of the negative consequences of transfusions raised the prospect of applying similar strategies to all other patients who were commonly transfused. The generalisation of BMS led to the development of the concept of 'blood conservation'. The concept of blood conservation revolves around the thought that the patient's own blood was not considered to be just a fluid that could be easily replaceable but a valuable resource that should be protected and conserved by all means in order to avoid the need to allogeneic transfusions.^{22,23}

The above discussion has a general theme that is completely 'product-centred'. Making blood safe is only part of the equation since efficacy, in many clinical situations, has not been demonstrated.²⁴ Coupled with negative outcomes, poor efficacy and higher costs, a shift towards a 'patient-centred' approach has become inevitable.²⁵ As a result, the concept of blood conservation was redefined and evolved into the new concept of patient blood management (PBM).²⁶ Defined by the Society for the Advancement of (patient) Blood Management (SABM), PBM is "the timely application of evidence-based medical and surgical concepts designed to maintain haemoglobin concentration, optimise haemostasis and minimise blood loss in an effort to improve patient outcome".^k According to this definition, improving the clinical outcome of the patients is the primary goal and concern and all other issues and considerations – including the usage of allogeneic transfusions – are secondary.

PBM is an evolving concept and several modalities used under PBM are also under investigation. Nonetheless, PBM is not a drastically different way of practising medicine but rather a sensible and evidence-based approach which is, by definition, the best clinical practices. This is further supported by the encouraging observation that despite being a fairly new concept, various societies and national and international entities are recognising and endorsing PBM.²⁶ Notably, in May 2010, the 63rd World Health Assembly adopted the resolution WHA63.12 on 'Availability, safety and quality of blood products', requesting the World Health Organization to provide its member states with training and support on safe and rational use of blood products and on implementing PBM.^l These efforts have been recognised by the U.S. Department of Health and Human Services as well, and have been addressed by prominent health-care-quality organisations such as The Joint Commission and the Physician Consortium for Performance Improvement (PCPI; American Medical Association).^m

^k Society for the Advancement of Blood Management (SABM). Available at: www.sabm.org (Last accessed 12/12/12).

^l World Health Organization. Global Forum for Blood Safety: Patient Blood Management. 14–15 March 2011, Dubai, United Arab Emirates. Available at: http://www.who.int/bloodsafety/events/gfbs_01_pbm_concept_paper.pdf (Last accessed on 12/12/12).

^m American Medical Association. Physician Consortium for Performance Improvement (PCPI). Announcements. Oct 2, 2012. Available at: <http://www.ama-assn.org/resources/doc/cqi/pcpi-newsletter-100212.pdf> (Last accessed on 12/12/12).

Formal recognition of PBM and its inclusion as part of quality measures will undoubtedly facilitate the implementation of PBM as part of routine clinical practices. It must be noted that additionally and despite all the clinical evidence, economics will also play an important role in the drive for lasting change and adoption of PBM. Increasing awareness of the direct and indirect costs of blood transfusion is expected to help in promoting PBM as a cost-effective strategy, which is good for patients as well as society.²⁷

For years, our health-care system has been dominated by the volume-based care. The landscape is now changing with various stakeholders demanding value-based care and improved quality. PBM is by definition well posed to address this new challenge, thanks to its core emphasis on improving the patient outcomes. This edition of *Best Practice & Research, Clinical Anaesthesiology* addresses and promotes this concept in its entirety reviewing issues of transfusion as well accomplishments in PBM, conceptually and practically.

Transfusion medicine is deeply rooted in beliefs and assumptions dating back over a century. It is evident that the transfusion practices are not fully supported by the available evidence yet as indicated by substantial variation in blood use in similar populations across different centres and providers. This is not acceptable considering the risks, costs and limited supply of allogeneic blood. In our view, PBM is the new frontier and it is what is needed to bring transfusions to the 21st century.

Summary

Allogeneic blood transfusion remains among the most common procedures used in clinical practice today, but its use is often not fully supported by the available evidence, namely the link between transfusion and worsening of clinical outcomes and debated efficacy. PBM incorporates various evidence-based medical and surgical concepts to maintain haemoglobin concentration, optimise haemostasis and minimise blood loss in an effort to improve patient outcomes. PBM is increasingly adopted as part of routine practice, and it is expected to change the face of transfusion medicine and the way blood components are used in clinical practice.

Practice points

- Allogeneic blood transfusions are risky, costly and in limited supply and their use has been linked to worsening of patient outcomes.
- The approach towards transfusion should not be a 'product-centred' one (focussing on use of components), but a 'patient-centred' approach (focussing on improving the health and well-being of the patient).
- PBM is defined as the timely application of evidence-based medical and surgical concepts designed to maintain haemoglobin concentration, optimise haemostasis and minimise blood loss in an effort to improve patient outcome.

Research agenda

- More studies to better establish the link between allogeneic transfusions and outcomes of patients are needed and these studies should adequately address the role of the confounding factors.
- Studies on the impact of PBM strategies on patient outcome are needed.

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