VIEWPOINT

From Product to Patient—Transfusion and Patient Blood Management

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Viewpoint page 1839

Related articles pages 1824 and 1892

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Blood transfusion is firmly established in contemporary medical practice. More than 16 million units are administered each year in the US,[1] cementing its status as one of the most commonly used medical procedures. Over the past century, pioneers in transfusion medicine have markedly improved the safety of allogeneic transfusion from donor recruitment and screening through collection, processing, testing, modification, storage, administration, and posttransfusion monitoring. These advances have established transfusion medicine as a mature branch of medicine and a cornerstone of modern surgical and medical care.

Although the 20th century was largely focused on developing a scalable blood collection infrastructure and establishing standards for collection, testing, and storage, the 21st century has seen rapid growth in understanding recipient outcomes, including who should be transfused, with what, and when. The consistent message is generally one of less is more. Regarding red blood cells (RBCs), for example, restrictive strategies are noninferior to more liberal strategies and are recommended across most patient groups.[2] Despite an overall message that has not much changed from years past, this information remains important for clinicians and health care systems looking to improve blood product utilization because transfusion remains a costly intervention with limited supply, frequent overuse, and potential for harm. Furthermore, donated blood undergoes a multitude of biochemical and rheological changes during storage. Outside of extreme circumstances, the best blood for the patient is undoubtedly that which is already circulating within their vasculature.

Recent years have also exposed vulnerabilities in blood inventories. As the most prominent example, the COVID-19 pandemic led to cancellations of many community-based and mobile blood collections, culminating in the declaration of a national blood crisis by the American Red Cross for the first time in history. In response, the American Medical Association, in partnership with the American Hospital Association and American Nurses Association, issued a joint statement in January 2022 describing the worst blood shortage in more than a decade and urging blood donation from all eligible persons. Not long after, the AABB, in collaboration with 17 leading US health care and blood collection organizations, launched the Alliance for a Strong Blood Supply to track and coordinate information and public communications about blood inventories and explore mechanisms to improve blood supply resilience.

Although blood inventories have generally stabilized in the past year, yet another shortage declared in September 2023 has solidified the notion that expansion of the blood supply is but one side of the coin. Equally important are efforts to reduce demand for blood products, including reducing or eliminating transfusions without demonstrable benefit, a strategy that can indefinitely prevail, even during supply shortages. To this end, research efforts to identify patients most likely to benefit or be harmed by transfusion are essential. However, evaluations of transfusion strategies in isolation, especially those based solely on laboratory-based decision-making, are insufficient for the optimization of patient-centered outcomes.

Recognizing that blood health entails more than determining when to give or withhold transfusion, the World Health Organization (WHO)[3] issued a 2021 policy brief outlining the urgent need to globally implement patient blood management (PBM), a patient-centered rather than transfusion-centered approach to improve outcomes through preservation and management of a patient's own blood.[4] Multiprofessional PBM programs, which may be organized at governmental, health care system, or hospital levels, are tasked with overseeing the design and delivery of educational, quality improvement, research, and clinical practice initiatives to move the focus from product to patient. PBM certification is now offered to US hospitals through a collaboration between AABB and the Joint Commission, with educational materials, quality standards, and a certificate course available through the Society for the Advancement of Patient Blood Management.

PBM programs promote blood health through such activities as anemia screening, diagnosis, and etiology-directed treatment. Outside of the PBM strategy, anemia is often considered an innocent bystander of disease and/or an accompaniment to medical care that may be disregarded until severe enough to warrant transfusion. Within this framework, anemia is considered a potentially modifiable risk factor for adverse outcomes, which should be actively prevented. Those developing anemia, regardless of the clinical setting, should receive prompt evaluations with treatments tailored to the underlying etiology(s) of anemia (eg, iron therapy for iron deficiency, with subsequent evaluations to identify and address the cause of iron deficiency). This may be realized through the creation of dedicated anemia care pathways,[5] supported by practice engagement and educational efforts. Although RBC transfusion should be considered for those with critical anemia as defined by signs and symptoms of inadequate tissue oxygenation or ongoing large-volume hemorrhage, transfusion should not be the default response to a hemoglobin concentration in isolation. Despite numerous clinical trials comparing restrictive to liberal hemoglobin-based transfusion strategies, patient outcomes of withholding transfusion until even lower hemoglobin concentrations are

understudied. So it remains unknown at what hemoglobin concentration RBC transfusion may be indicated for any given patient or whether transfusion strategies incorporating patient clinical features, patient-specific physiological responses, and/or markers of tissue oxygenation may improve transfusion decisions and clinical outcomes. Interestingly, in critically ill adults, regression discontinuity analyses comparing outcomes for those transfused or not at a hemoglobin threshold of 7 g/dL reveal that routine transfusion does not ameliorate and may worsen organ dysfunction.[6] Furthermore, there are now decades of published experience demonstrating similar outcomes when comparing Jehovah's Witness patients who choose not to receive blood products with their transfused counterparts.[7]

PBM also focuses on prompt diagnosis and correction of coagulopathy, recognizing that abnormalities of hemostasis contribute to blood loss, anemia development, and subsequent transfusion exposures. This may include the use of non-RBC blood products and fractions, pharmacological therapies, point-of-care and viscoelastic laboratory testing, blood conservation techniques, and blood-related care pathways and treatment bundles. Indeed, there has been rapid growth in clinical trials evaluating these various PBM components, particularly in trauma, perioperative care, and obstetrical hemorrhage, with programs subsequently tasked with translating evidence into practice. Furthermore, PBM emphasizes the minimization of surgical, procedural, and health care–associated blood loss, recognizing that iatrogenic blood loss is a major contributor to anemia development and transfusion exposures.[8] By keeping more blood in the patient through techniques such as reduced-volume blood draws, smaller blood collection tubes, closed-system blood sampling, clinician-decision support to avoid duplicate or unnecessary blood ordering, and elimination of low-value practices such as routine daily laboratory testing, the severity of anemia development during hospitalization may be attenuated.

A growing number of health care systems worldwide have successfully established PBM programs to improve patient outcomes, with transfusion reductions being a corollary effect rather than principal goal.[9] Although adoption has been less comprehensive in the US given the absence of a unified national health care system, PBM implementation is feasible and is accompanied by transfusion reductions and concomitant improvements in clinical outcomes, including reduced hospital durations and lower rates of organ dysfunction.[10] Simply stated, PBM does not operate through a transfusion-first lens nor does it center on any particular intervention. Rather, PBM incorporates a diverse set of evidence-based tools to prevent, treat, and attenuate the consequences of abnormalities in blood health for each patient. Importantly, PBM is firmly grounded in the shared decision-making framework, such that patients and clinicians work collaboratively to facilitate decisions about blood health. These programs, which typically include a medical director, program coordinators, transfusion medicine representatives, and a diverse array of clinician champions, are essential to ensure that PBM principles appropriately fit within complex and rapidly changing practice environments. Furthermore, these programs bridge the gap between predominantly laboratory-based transfusion medicine professionals and clinicians, ensuring alignment of goals and facilitating open communication and understanding between independent yet mutually supporting practices. Finally, a robust data and analytics infrastructure is critical for supporting PBM initiatives, including providing feedback to clinicians, monitoring real-time blood inventories and transfusion utilization, and tracking patient outcomes over time.

In summary, blood transfusions are important facilitators of modern medical care. Efforts to further improve the safety of blood collection and storage, address vulnerabilities in the blood supply, and enhance our understanding of recipient outcomes are critical to ensure sustainability and growth in clinical practice and improvement in patient outcomes. However, it is time to look beyond transfusion as the fundamental driver of blood health optimization. As clearly outlined by WHO, professional societies, and international experts, the principles of PBM must drive collective efforts to preserve a patient's own blood, moving away from comparisons of restrictive vs liberal transfusion strategies and toward comprehensive programs for the maintenance of blood health.

ARTICLE INFORMATION

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