Implementing a blood utilization program to optimize transfusion practice

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Blood utilization review programs educate clinicians on guidelines for appropriate transfusion, review local transfusion practice, and provide feedback on transfusion trends. To gather data on transfusion practice, modern blood utilization programs leverage electronic medical records and computerized physician order entry with automated decision support. Data may be collected and feedback may be given in real-time for individual transfusions or retrospectively with aggregated data. Important elements for a successful program include a multidisciplinary group that can champion the effort, adequate documentation and data capture for transfusions, and regular discussions about trends with ordering clinicians. Blood utilization programs are popular because they can lower transfusion risk, improve quality outcomes, and lower costs.

Learning Objectives

- Education, utilization review (auditing), and giving feedback to ordering clinicians are 3 core activities of a blood utilization program
- Blood utilization programs lower transfusion risk, improve quality outcomes, and lower costs

This article summarizes concepts and approaches that should be considered for a successful blood utilization program. Blood utilization review is not a new concept. Even though current methods rely more heavily on electronic medical records and electronic notifications, the principles and fundamental procedures remain the same.[1] Every blood utilization program is unique, and its structure depends on the available electronic and personnel resources, the clinical focus of the program, and the approach taken. Aside from regulatory requirements that mandate blood utilization review, it is in everyone's interest to use blood wisely because transfusion has risk, quality, and cost implications.

What is a blood utilization program?

The primary goal of a blood utilization program is to ensure judicious use of blood components. All blood transfusions have risks of adverse outcomes. In general, blood transfusion is safe, but in aggregate, blood transfusions cause morbidity and mortality. The recognized risks have changed over time, in part due to increased ability to diagnose and mitigate these risks and in part due to demographic changes in donor populations. For example, an understanding of the pathophysiology of transfusion-related acute lung injury (TRALI) has led to male-only plasma donor policies that have reduced the incidence of TRALI from plasma by approximately one-half.[2,3] Even as identified threats to blood safety are mitigated, new threats to transfusion safety cannot be eliminated. For example, transfusion-transmitted *Babesia microti*, transfusion-associated circulatory overload, and acute hemolytic transfusion reactions are ongoing safety risks.

Due to the inherent risks of blood products and the fact that individual clinician practices can vary, regulatory bodies such as the Joint Commission and AABB require that transfusion services review transfusion practices. Elements for review include ordering patterns, appropriateness of blood use, blood administration policies, and completeness of documentation for transfusion. Blood utilization programs can aggregate transfusion data for trending and identification of outliers and/or monitor individual transfusions in real-time. Thus, blood utilization programs are an integral part of hospital transfusion committees. However, without the granular data that blood utilization programs provide, it is difficult for transfusion committees to document current practice and implement change.

Because blood utilization is a peer-review activity, data are needed to review. Today, electronic medical records (EMRs) and computerized physician order entry (CPOEs) are critical for data acquisition. These tools capture the ordering provider, the product and dose transfused (how many units), and recent laboratory data relevant to transfusion decisions. These data may be organized into individual, location-specific, procedure-specific, departmental, or institutional levels. Peer review also involves benchmarking data to calibrate individual and collective practice against peers. An important aspect of peer review is the opportunity to discuss data, and blood utilization should serve as a catalyst for discussion, not merely a regulatory tool.

Blood utilization programs can be thought of as one component of patient blood management (PBM), a term used to describe a comprehensive approach to maximizing the judicious use of blood components and minimizing the need for transfusion through targeted interventions in anemia and perioperative management. Successful PBM programs are multidisciplinary collaborations with

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a combination of hematologists, anesthesiologists, surgeons, perfusionists, transfusion medicine specialists, and nurses. Within PBMs, hematologists are primarily concerned with anemia management to correct iron and vitamin deficiencies, treating anemia with erythropoietin-stimulating agents when appropriate, coordinating autologous blood donation, and minimizing iatrogenic blood loss, primarily from phlebotomy. Surgeons, anesthesiologists, and perfusionists intraoperatively utilize cell salvage devices, perform isovolemic hemodilution immediately prior to surgery (for transfusion intraoperatively), and use techniques and antifibrinolytic agents to minimize blood loss. An organized program is required to minimize transfusion needs longitudinally for medical patients and pre-, intra-, and postoperatively for surgical patients. Publications on PBM are becoming more frequent, as demonstrated by the addition of a dedicated PBM section in the journal *Transfusion* in 2011, and a recent special issue of *Transfusion* devoted exclusively to PBM.[4]

The "triple threat" of blood utilization programs: lower risk, higher quality, and lower cost

Blood utilization programs are popular because they reduce risk, improve quality, and reduce costs. There has been increased awareness and implementation of blood utilization programs with initiatives from organizations, such as the American Board of Internal Medicine, ASH, and the Joint Commission. Campaigns, such as Choosing Wisely,[5] have focused on reducing unnecessary transfusion, specifically for RBCs, although the concept extends to all blood products. The increased attention to blood utilization has led to a heightened awareness for justifying each transfusion.

Blood utilization programs reduce risk. Avoiding unnecessary transfusion minimizes its inherent risk because the fewer blood products transfused, the lower the chance of adverse events in the population being transfused. If a blood transfusion is not indicated but still given, the transfusion represents 100% risk without benefit to the patient. Educational campaigns, such as "why give two when one will do" highlight the importance of assessing the need of each individual unit of blood. Of course, clinicians do not transfuse blood to intentionally do harm, but if clinicians are not informed about current transfusion thresholds and indications, then transfusions may unwittingly be given without prospect of benefit. A classic example is provided by an anaphylactic reaction reported by Arnold et al.[6] An 80-year-old woman had an international normalized ratio (INR) of 1.3 and was transfused prophylactically 2 units of plasma for a scheduled endoscopy. Two days later, she ate peanut butter and quickly developed anaphylaxis. Convincing clinical and laboratory data demonstrated that peanut-specific IgE had been passively transferred to the patient from one of the plasma units. Prophylactic plasma transfusion for an INR of 1.3 is unwarranted by current guidelines. A comprehensive blood utilization program would identify this transfusion as unnecessary and provide feedback to the clinician to change their practice, either in real-time during electronic ordering or in retrospect via audits.

Blood utilization programs improve quality. First, implementation of blood utilization programs reduces blood usage as unnecessary transfusions are avoided. This places less of a burden on the blood supply, which continually is strained, especially for platelets and group O RBCs. Improving the stability of the blood supply is a quality practice. Second, patient satisfaction is improved when patients know that transfusion practice is monitored and they have assurance that transfusions that they receive are warranted. Third, reducing transfusions, at least for RBCs, has been associated in some studies with improved patient outcomes, which is a measure of quality.

Mortality, infection rates, and length of hospitalization are primary quality indicators. Many retrospective studies and systematic reviews associate RBC transfusion with poorer quality indicators.[7,8] These data would suggest that restrictive transfusion RBC strategies are better for quality patient outcomes. On the other hand, some retrospective studies, particularly in surgical and cardiac patients, show that anemia is associated with poorer outcomes.[9] Retrospective studies on transfusion thresholds are confounded by indication to varying degrees. There is now fortunately a large body of evidence from RCTs that show that restrictive RBC transfusion strategies are equivalent to liberal strategies in both medical and surgical settings.[10] Although there are randomized control trial data that suggest restrictive strategies may be better[11,12] or worse[13] for RBC transfusion in select contexts with select outcomes, most physicians agree that restrictive RBC strategies (hemoglobin triggers of 7-8 g/dL) are appropriate, with the possible exception of patients with acute ischemia, eg, myocardial infarction or stroke. For platelet transfusion, the PLADO trial demonstrated that lower doses of platelets did not affect bleeding outcomes in the prophylactic setting for hematologic malignancy patients.[14] Although there have been very few RCTs of implementing blood utilization programs,[15] pre-/postimplementation analyses show that implementing blood utilization programs is associated with improved quality indicators for patient outcomes as well as lower costs.[16,17]

By reducing transfusion, less money is spent on blood products, time, and disposables for transfusion, as well as adverse consequences of transfusion, such as fevers, fluid overload, and allergic reactions. One study estimated the total activity-based cost of RBC transfusion as $761 (in 2008 dollars).[18] Extrapolating to platelet transfusion, the total cost of platelet transfusion would be greater than $1,000 because of higher acquisition costs. A typical large hospital transfuses more than 30,000 RBC units and 10,000 platelets per year. Assuming these activity-based costs, small reductions in utilization translate into large amounts of cost avoidance. This cost avoidance may be used to financially justify the personnel and resources needed to operate a blood utilization program.

Implementing a blood utilization program

Transfusion practice is often local, varying among services and among individuals within a service. Understanding the dynamics that drive blood-ordering behavior can help shape the structure, scope, and goals of a blood utilization program. Certain clinical areas may be particularly problematic, and sometimes the ordering dynamic can be complex. One scenario is an interventionist service telling a medical team to transfuse platelets or plasma to a predefined threshold before a procedure can be performed, even if that threshold is not supported by guidelines, evidence, or even common sense, eg, for patients refractory to platelet transfusion or those with autoimmune coagulation factor inhibitors. For a hospital with this ordering dynamic, the blood utilization program could be tailored to include the interventionist group, even though the interventionists are not the ordering providers.

A simple construct to understand ordering behavior is the antecedent, behavior, consequence (ABC) model (Table 1), although comprehensive behavior theory can be applied to blood utilization.[19] In the example above, the antecedent is a demand from an interventionist for transfusion and the motivation for the medical team to get the procedure done, the behavior is the specific order for

Table 1. Implementing a comprehensive blood utilization program

1. Survey the behavior of current practice
   - Antecedent: Why are clinicians considering unnecessary transfusion?
   - Behavior: How are people transfusing (dose, frequency, appropriateness)?
   - Consequences: What happens when clinicians order unnecessary transfusions?
2. Implement change
   - Champions: Who is going to take responsibility for change?
   - Define the scope, goals, and approach of the program:
     - RBCs, platelets, plasma
     - Prospective, order entry, retrospective
   - Educate providers:
     - Guidelines, RCTs, meta-analyses
   - Follow-up (audit)
   - Give feedback:
     - Individual (most effective), group/unit, benchmarking
   - Huddle with clinicians who are outliers in transfusion practice
   - Intervene:
     - Systems approaches (restrictions in blood bank, order entry)
     - Incentivize consensus practices

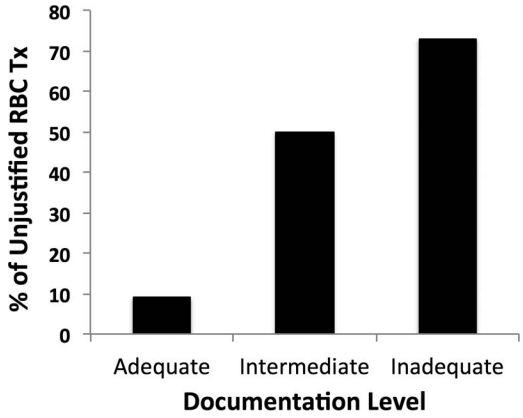

Figure 1. Comprehensive documentation is associated with appropriate transfusion practice. Transfusion justification was assessed by complete medical record review. Documentation adequacy was assessed independently of transfusion and consisted of documentation of a plan for transfusion, evidence to support transfusion, and a post-transfusion evaluation. Figure derived from data in Friedman and Ebrahim. [25]

a dose and frequency of blood product, and the consequence in terms of blood utilization is nothing, as there is no mechanism in place to change the process in this example. Without a blood utilization program, people involved in the scenario above are not educated about transfusion in a systematic way, the event is not captured as an auditable event, and the scenario can recur indefinitely because no there is feedback or intervention. Deconstructing ordering behavior can inform how to organize a blood utilization program and reveal what types of feedback and incentives could change behavior.

There are 3 basic elements to a comprehensive blood utilization program: education, review (auditing), and feedback. Examples of education about blood utilization include grand rounds lectures to relevant departments, guideline development and dissemination, and journal clubs on papers relating to transfusion practices. The process of educating clinicians should be systematic so that expectations are similar across clinical groups.

Review, or auditing, of blood utilization has been transformed by electronic medical records because data capture is automated. Manual methods for capturing blood utilization data are tedious and therefore have inherent limitations. Manual methods include self-reporting (which has low adherence), real-time justification of individual transfusion orders (which is time-consuming and impractical for larger transfusion services), and chart audit (which is not comprehensive). Electronic medical records enable many useful tools: data capture of all transfusions and associated laboratory data for automated identification of outliers, automated logic and alerts to guide transfusion practice at the time of CPOE, clinical outcome data associated with transfusion practice, and large datasets for local benchmarking. How data are captured for review depends on the information systems available. Anesthesia information systems,[20] hospital electronic medical information systems,[21] and third-party data analyses[22] can all be used to assemble and review data.

CPOE is a particularly efficient tool for blood utilization review because it provides education, review, and feedback about transfusion practice all in one step when coupled with decision support logic.[23] In this arrangement, an electronic order for blood triggers a search of recent laboratory results and checks whether the order for a specific blood component is warranted based on programmed logic. Before the order is finalized, the clinician receives a notification or soft stop if the transfusion appears to be outside of guidelines. Physicians can override alerts, but these events are flagged for auditing.

Providing feedback is the effector arm of a blood utilization program. Giving feedback is both a form of benchmarking and an opportunity to incentivize specific ordering practices. As mentioned above, CPOE with decision support provides immediate feedback. When transfusion events are aggregated over time (weekly, monthly or quarterly), reports are sent to individuals and groups. Individual level performance is the best metric, as it focuses accountability and explicitly identifies with whom and to what extent change has to occur.[24] In hospitals with hospitalists, house officers, physician assistants, and nurse practitioners who are supervised by an attending, it is important at the point of implementation to make attending physicians responsible for the orders of all physician extenders they oversee.

Documentation is an important part of utilization review, particularly for determining justification for specific transfusions. Documentation need not be extensive, but the act of documentation reinforces the need to consider the justification for transfusion. Friedman and Ebrahim[25] found that the level of documentation for transfusion correlated with objective justification for transfusion (Figure 1). Requiring documentation, even if only from an electronic drop-down list, has the added benefit of reminding clinicians that their ordering practices are being monitored. This Hawthorne effect likely plays a role in all blood utilization programs.

In organizing a blood utilization program, champions of the mission must be identified. Champions are needed because blood utilization management is an iterative process. An individual or group needs to take responsibility for sustaining the education, auditing, and feedback activities. Education should be recurrent, review of blood utilization must be regular, and feedback needs to be both timely and regular, as well. Inroads toward appropriate blood utilization can be made with single interventions or combinations of education, audits, and feedback,[26] but the progress is less likely to be durable if the process is not continual.

A final note on implementing a blood utilization program: clinical medicine is complex, and many transfusions that may appear to be outliers are appropriate when considered in context. Especially as blood utilization programs use electronic systems more, there is an increasing reliance on clinical laboratory parameters to justify transfusions. Transfusions in people with acute hemorrhage, cyanotic heart disease, and congenital platelet disorders may have hematologic laboratory values that would appear to be relatively normal and not warrant transfusion. Thus, there will always be transfusions that appropriately do not conform to laboratory-based guidelines. Clinicians who specialize in certain fields may always appear to over-utilize blood products because of their unique patient population. Blood utilization programs need to be tactful and viewed as a partnership with ordering clinicians to achieve the goals common to all patients and providers.

Conclusion

Blood utilization programs ensure that each transfusion is the right decision and administered at the right dose with the right justification. The decision to transfuse should be based on current evidence and guidelines, but evidence is not available for every transfusion indication. Blood utilization programs should focus on changing transfusion practice around clearly unwarranted transfusions. By focusing on reducing outlier practices, blood utilization programs reduce transfusion risk, improve quality, and lower costs.

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