Alternative to Blood Replacement in the Critically Ill

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KEYWORDS

• Blood transfusion • Blood management • Blood alternatives
• Transfusion alternatives

KEY POINTS

- Blood volumes can be managed with a patient-specific approach.
- Blood transfusion and anemia are common in critical illness.
- Iatrogenic blood loss can be reduced.
- Progress has been made in manufactured blood products.
- Prevention and critical anemia protocol are followed when blood is not an option.

INTRODUCTION

Anemia and the need for blood transfusions in critical illness is a common occurrence.[1] Patients become anemic through multiple causative factors: blood loss, increased phlebotomy, decreased red blood cell (RBC) production, and longevity. Blood transfusions have been associated with poorer outcomes, warranting the inclusion of non-blood therapies and strategies in managing patient blood volume. A conference on transfusion outcomes reported 88% of blood transfusions were associated with a worse outcome or provided no benefit.[2] The *Circular of Information for the Use of Human Blood and Blood Components* (2016) reports the indication for RBC transfusion is a critical or symptomatic insufficiency of oxygen-carrying capacity and red cell exchange transfusion.[3] RBC transfusions are not indicated for anemia that can be treated with hematinic medications or as primary treatment of volume expansion and a mechanism to increase oncotic pressure.

The American Board of Internal Medicine Foundation initiated the Choosing Wisely campaign to lower the overutilization of testing and procedures. Within the campaign,

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blood transfusion as the most performed procedure in the United States included the following[4]:

- Dosing of blood products
- Correction of nutritional deficiencies in stable patients instead of transfusion
- Advisement against the use of blood products to reverse warfarin
- Elimination of serial blood testing in stable patients
- Refrain from transfusing O blood to non-O except in emergencies for women of childbearing age without blood group identification.

Nonblood treatments or strategies are centralized in minimizing blood loss, restoration and maintenance of intravascular volume, and accelerating production of RBCs. Situations may arise in which blood transfusion is not an option, such as patients having multiple alloantibodies so that it becomes difficult to obtain cross-matched blood products, or patients may decline the use of blood products due to personal or religious belief. Patient blood management (PBM) uses multiple modalities to achieve the best patient outcomes for all patients regardless of ability to receive blood transfusions. There are several tenets within blood management (**Box 1**). The primary pillars are described as anemia tolerance, management of bleeding, and supporting erythropoiesis.[5] The art of medical practice is in the selection of the right combination of therapies. This is complex due to the number of potential patient variables and is open to wide differences in practice. Therefore, several items should be taken into consideration when contemplating a cellular or acellular transplant of blood products and a PBM plan of care (**Box 2**).

IATROGENIC ANEMIA

Iatrogenic anemia can be defined as anemia caused by hospital procedures, not by patient illness. A recent article reported that 74% of patients admitted to the hospital with normal hemoglobin values went on to develop hospital-acquired anemia.[6] Of those admitted to the intensive care unit (ICU), 60% to 66% are anemic; by ICU day 8, 97% are anemic.[7] Surgical procedures, coagulation disorders, inflammation, renal failure, gastrointestinal bleeding, and phlebotomy are all causal factors in the development of iatrogenic anemia, as well as a variety of comorbid conditions (**Table 1**).

Box 1
Tenets of patient blood management

Rights to transfusion: right patient, right blood product, right indication, right time, right dose
Blood loss management
Identification and management of coagulopathies, including preventative assessments
Minimize iatrogenic blood loss
Blood-sparing modalities
Pharmaceuticals
Anemia management
Fluid therapy
Oxygen therapy