Transfusion Medicine Issues Pertaining to Patients With Cancer

In the United States, blood transfusion was the most common procedure performed in hospitals in 2010 and occurred in 11% of hospital stays requiring at least 1 procedure. Red blood cells (RBCs) are the most likely blood component to be transfused due to their role in treating symptomatic anemia. RBC units are often provided to patients with cancer because anemia occurs in more than 40% of these patients. Most patients receiving chemotherapy can be expected to require RBCs, platelet transfusions, or both during the course of therapy. Currently, approximately 80% of all platelet transfusions are administered to patients with hypoproliferative thrombocytopenia, generally due to chemotherapy, hematopoietic stem cell transplantation, or underlying disease. Although blood transfusions can be life-saving measures and allow for more aggressive therapy, they are not without risk. This issue of Cancer Control addresses select issues related to transfusion medicine that pertain to patients with cancer.

Measures to improve the safety of the blood supply have resulted in the lowest rates of transfusion-transmissible infection and disease since blood was first used. Although post-transfusion hepatitis occurred in about one-third of multiple-transfused patients in the 1960s, today transfusion-transmitted rates of hepatitis B and C viruses each result in about 1 case per 1 million units transfused. The risk of transfusion-transmitted HIV infection was around 1% in metropolitan areas like San Francisco in the early 1980s. Currently, the risk of HIV transmission via blood in the United States is less than 1 per 1 million units transfused. Mitigation strategies to lower the rates of nonviral transfusion adverse events have also allowed for reaction rates well below previous rates of about 5%; current averages are typically less than 1%. Measures such as leukoreduction, γ irradiation, and the preparation of male-only donor plasma have lowered risks of human leukocyte antigen (HLA) alloimmunization, transfusion-associated graft-vs-host disease, and transfusion-related acute lung injury, respectively. The annual transfusion reaction rates at the H. Lee Moffitt Cancer Center & Research Institute have consistently been 0.6% for the last 3 years, with many of these events being fever occurring during transfusion and likely due to neutropenia, not the blood infused.

In this issue of Cancer Control, Dr Leparc reviews the blood donation process and safety measures currently employed to reduce the risks of transfusion transmitted disease. Drs Dasararaju and Marques cover nonviral transfusion adverse events and their diagnosis, treatment, and prevention. Whether older units of blood result in significant harm to recipients has been questioned recently, and Drs Qu and Triulzi review the storage lesion and summarize key study results, including data from recent randomized controlled trials.

Blood transfusion can be misused and unnecessary transfusion is a common problem. Drs Watkins, Surowiecka, and McCullough address the appropriate use of RBCs, plasma, and granulocytes, and Drs Fletcher, DomBourian, and Millward cover indications for platelet transfusion. Most blood components are given for therapeutic benefit due to anemia, bleeding, or both. Platelets are the one component commonly used prophylactically — generally in the oncology setting for patients with hypoproliferative thrombocytopenia. Whether selected populations of patients could be moved to receive therapeutic platelet transfusion alone is an area of current investigation and preliminary data suggest that this may be possible. Blood component support in patients receiving hematopoietic stem cell transplantation can present unique challenges and this topic is reviewed by Dr Cohn. She focuses on the pre-, peri-, and post-transplantation treatment periods, with special attention to ABO-incompatible recipient-donor pairings. The transfusion service must provide blood components to minimize hemolysis and other adverse events, such as transfusion-associated graft-vs-host disease and transfusion-transmitted cytomegalovirus infection.

Apheresis technology can be applied in both the donor and patient settings. Apheresis platelets, plasma, and RBCs (the equivalent of 2 units of RBCs from 1 donor) are commonly collected from volunteer donors. Therapeutic aphereses are often performed for the treatment of several oncological diseases. As in the donor population, blood fractions such as plasma, leukocytes, RBCs, or platelets can be selectively removed. Unique to therapeutic apheresis is the option to modify the collected component as in extracorporeal photopheresis before reinfusion back to the patient. Drs Connelly-Smith and Linenberger review indications for use of therapeutic apheresis as well as a number of practical issues to consider when beginning these specialized procedures.

The HLA system is crucial in our immune response; it may play a role in our response to certain medications, may increase our risk for certain diseases, and has a critical function in both solid organ and hematopoietic stem cell transplantation. Dr Fung and I address...
HLA assays commonly performed today and their use in pharmacogenomics, disease association, and platelet transfusion and transplantation.

The American Board of Internal Medicine Foundation has initiated a campaign known as Choosing Wisely to help health care professionals reduce the overuse of tests and procedures, and the AABB (formerly the American Association of Blood Banks) developed a list of 10 recommendations in support of this campaign as well as to promote better blood management among patients. The first recommendation is to avoid transfusing more blood than absolutely necessary, noting that a restrictive threshold of 7.0 to 8.0 g/dL should be used for the vast majority of stable, hospitalized patients without evidence of inadequate tissue oxygenation. In addition, single RBC unit transfusions — instead of the traditional minimum 2 units — should be the new standard for hospitalized patients without bleeding. Although blood transfusion has allowed for the aggressive treatment of patients with cancer, it is not without risk and must be judiciously used in this patient population.

The next 3 AABB recommendations are also apropos to patients with cancer, cautioning health care professionals to avoid transfusing RBCs for iron deficiency in patients without hemodynamic instability. Iron deficiency anemia should be treated with oral and/or intravenous iron supplementation in such cases. Another recommendation relates to blood components, such as plasma, which the AABB notes should not be routinely used to reverse warfarin because vitamin K alone is often sufficient. Prothrombin complex concentrates offer advantages over plasma transfusion in more emergent situations such as in the setting of significant bleeding, nonselective surgery, or both. The AABB also recommends against performing serial blood counts on patients who are clinically stable. Hospitalized patients with new clinically significant conditions may require frequent blood counts to be performed; however, the AABB notes that serial counts in stable patients are unlikely to benefit patient care and are likely to result in iatrogenic anemia.

In order to improve outcomes among our patients requiring blood transfusion, we must apply patient blood management (PBM), which is the use of efficacious and safe medical and surgical techniques to prevent anemia, treat anemia, or both, as well as decrease the risk of bleeding and optimize hemostasis. When providing blood transfusion therapy to our patients, we must provide the right blood component in the right amount at the right time to maximize the clinical benefit and minimize any potential adverse effects.

In addition to the topics relating to transfusion medicine, 2 Special Reports are also included in this issue. In the first report, Dr Costa and coauthors discuss the mobilization and transplantation patterns of autologous hematopoietic stem cells in multiple myeloma and non-Hodgkin lymphoma. In the second, Dr Busch and colleagues review the functional health literacy, chemotherapy decisions, and outcomes among a cohort of volunteers with colorectal cancer.

Also included in the January issue of Cancer Control is a Pathology Report by Dr Jones and others who present 2 cases of familial gastrointestinal stromal tumor syndrome with KIT exon 11 mutations. Mr Frieling and colleagues have authored a Tumor Biology Report discussing the current and emerging therapies for bone metastatic castration-resistant prostate cancer.

We hope you enjoy and benefit from reading this issue of Cancer Control.

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References