

Preventing and Managing Infections in Neutropenic Stem Cell Transplantation Recipients: Evidence-Based Review

Marlon Saria, MSN, RN, AOCNS®

The number of hematopoietic stem cell transplantations (HSCTs) performed annually is increasing. Although general survival rates have risen since 1990, mortality and morbidity from preventable complications can be improved. As a result, this article will review developments in preventing and managing infections in neutropenic HSCT recipients.

In the history of medicine, technical advances often have preceded scientific research, as in the case of hematopoietic stem cell transplantation (HSCT). Developments in the related fields of supportive care, including transfusion medicine and antibiotics, histocompatibility testing, conditioning regimens, and management of complications, enabled the advancement of the science of transplantation (Wingard, 2007). Techniques used in stem cell collection have been enhanced by the development of more efficient blood cell separators, whereas advances in pharmacology dramatically improved cell mobilization techniques and management of treatment-related toxicities. Clinical management of the complications of transplantation continuously evolves in response to breakthroughs in diagnostic techniques and pharmacologic interventions. The significant discoveries have contributed to better outcomes reported in the transplantation literature. Despite unparalleled growth in the field of transplantation, improvements are needed as treatment-related mortality and morbidity remain a concern for recipients, practitioners, and scientists.

Infection is a major source of treatment-related mortality and morbidity in patients with cancer receiving HSCT (Munshi & Montgomery, 2000). Infection has been reported as the leading cause of non-relapse mortality among allogeneic HSCT recipients (Laffan & Biedrzycki, 2006).

Causes of death in the first 100 days post-transplantation are mainly related to the primary disease, graft-versus-host disease, infection, and end-organ damage. From 2003–2008, fewer deaths related to primary disease (35%) were reported among unrelated donor transplantations; however, infection-related deaths are higher in this group (17%) compared to human leukocyte antigen-identical sibling or autologous transplantations (Pasquini & Wang, 2010).

The risk of developing a life-threatening infection is associated primarily with the obligatory period of neutropenia that follows the myelosuppressive conditioning regimen used in preparing for transplantation. Prompt recognition of and reaction to potential infection may define success in managing neutropenia and reducing mortality and morbidity in this population (de Naurois et al., 2010). To date, strategies to reduce the risks and manage the complications of neutropenia include nonpharmacologic interventions such as environmental manipulation and lifestyle modifications (neutropenic precautions) and pharmacologic interventions with the use of antibiotics and colony-stimulating

growth factors. The interventions have been widely investigated, but any improvement has been modest at best.

Neutropenia: A Necessary Evil

Human bone marrow transplantation began in 1957 when laboratory workers who were exposed to radiation during the Vinca nuclear reactor incident were treated with allogeneic bone marrow (Wingard, 2007). In 2009, more than 32,000 autologous and 26,000 allogeneic transplantations were performed worldwide. Of those, almost 12,000 autologous and 7,000 allogeneic transplantations were performed in the United States (Pasquini & Wang, 2010).

HSCT is considered by many as a supportive therapy that permits the use of lethal doses of chemotherapy and radiation therapy for malignant diseases. In 2008, the most common indication in North America were plasma cell disorders and lymphomas, accounting for 60% of all transplantations. Less than 3% of transplantations were performed for nonmalignant diseases (Pasquini & Wang, 2010).

Marlon Saria, MSN, RN, AOCNS®, is a neuro-oncology program nurse specialist in the Moores Cancer Center at the University of California in San Diego. The author takes full responsibility for the content of the article. The author did not receive honoraria for this work. No financial relationships relevant to the content of this article have been disclosed by the author or editorial staff.

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