

# Central Venous Catheter Site Care for Blood and Marrow Transplant Recipients

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Central venous catheters (CVCs) are indispensable in blood and marrow transplant (BMT) recipients when administering IV fluids, medications, chemotherapy, parenteral nutrition, and blood products. The use of intravascular devices is complicated by local and systemic infections that increase morbidity and mortality. According to data from the National Nosocomial Infections Surveillance System Report (2001), the median rate of catheter-related bloodstream infections ranges from 2.4–7 episodes per 1,000 catheter days in the intensive care unit setting. BMT recipients are at even greater risk of infection because of the use of immunosuppressive agents, presence of neutropenia, protracted duration of CVC indwelling time, and disruption of skin integrity from high-dose chemotherapy regimens. In fact, one retrospective analysis of catheter-related infections reported a rate of 11.5 infections per 1,000 catheter days in BMT recipients compared to an overall rate of 3.3 infections per 1,000 catheter days (Keung et al., 1995). Other studies have found that 16%–44% of BMT recipients with CVCs experience catheter-related infectious complications (Elishoov, Or, Strauss, & Engelhard, 1998; Moosa, Julian, Rosenfeld, & Shadduck, 1991; Petersen et al., 1986; Uderzo et al., 1992; Ulz et al., 1990).

## Source of Catheter-Related Infections

The most common causative organisms of catheter-related infections are ubiquitous skin

Treatment-induced neutropenia, long central venous catheter (CVC) dwell times, and the use of immunosuppressive agents place blood and marrow transplant recipients at high risk for CVC infection. The most common causative organisms of CVC infection are ubiquitous skin flora of hospitalized patients. A great deal of research on CVC care, including dressing change procedures and frequency, has been conducted; however, variations in study design, patients studied, and terminology used to define CVC infection limit the generalizability of the findings. This article reviews significant studies of CVC care and infection rates and describes the findings of a survey of CVC care practices of Blood and Marrow Stem Cell Transplant Special Interest Group members of the Oncology Nursing Society.

**Key Words:** catheterization, central venous; bone marrow transplantation; infection

flora of hospitalized patients, including staphylococcus epidermidis, staphylococcus aureus, gram-negative bacilli, enterococci, and candida species (Baranowski, 1993; Conly, Grieves, & Peters, 1989; Elishoov et al., 1998; Maki, Goldman, & Rhame, 1973). Molecular subtyping methods have confirmed a correlation between organisms isolated from catheter-related bacteremias and pericatheter skin flora in patients with short-term, nontunneled catheters (Conly, Stein, & Peters, 1990; Mermel, McCormick, Springman, & Maki, 1991). Additional studies have found that cutaneous colonization at the CVC site is highly predictive of catheter-related infection and sepsis (Banks, Yates, Cawdrey, Harries, & Kidner, 1970; Bernard, Stahl, & Chase, 1971; Maki, Ringer, & Alvarado, 1991; Maki, Stolz, Wheeler, & Mermel, 1997). Diligent catheter site care lowered the catheter-related infection rate to 0%–3.8%,

compared to infection rates of 20%–28% with nondiligent site care (Ena, Cercenado, Martinez, & Bouza, 1992; Johnstone, 1982; Nelson, Kien, Mohr, Frank, & Davis, 1986; Ryan et al., 1974; Wagman, Kirkemo, & Johnston, 1984).

Although the pathogenesis of catheter-related infections in short-term, nontunneled CVCs (in situ < 10 days) is related to cutaneous colonization, the pathogenesis of catheter-related infections in long-term, nontunneled and tunneled catheters (in situ > 10 days) most often is attributed to hub colonization or intraluminal colonization (Crnich & Maki, 2002; Garland et al., 2001; Raad, Humphrey, Khan, Truett, & Bodey, 1993). Therefore, strategies to prevent cutaneous colonization may effectively prevent catheter-related infections in short-term catheters but may be less effective for long-term catheters because hub and, occasionally, intraluminal colonization become the more predominant sources of catheter-related infections.

## Transparent Versus Gauze Dressings

A great deal of research has been conducted to examine the practice of CVC care

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