Preventing infections in hemodialysis: An executive summary of the APIC Elimination Guide

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This article is an executive summary of the APIC Hemodialysis Infection Elimination Guide. Infection preventionists are encouraged to obtain the original, full-length APIC Elimination Guide for more thorough coverage of hemodialysis infection prevention.
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More than 300,000 patients receive maintenance hemodialysis (HD) in the United States each year.[1] HD patients are at high risk from infection, and infection development in this population often results in hospitalization. Hospitalization related to infection in HD patients has increased in recent years. Between 1993 and 2007, the rate of HD patients requiring hospitalization for infections increased almost 38%.[2] Hospitalization rates of HD patients related to bacteremia and cellulitis have also increased.[2] In 2007, the rate of hospitalization for HD patients for bacteremia was 102 per 1,000 patient-years.[2] Rates of HD patient hospitalization related to pneumonia and vascular access infection decreased slightly in 2006-2007 but still remain much higher than rates from the early 1990s.[2]

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The APIC began publishing their series of Elimination Guides in 2007. Since then, 9 Elimination Guides have been developed that cover a range of important infection prevention issues, such as the prevention of catheter-related bloodstream infections, ventilator-associated pneumonia, catheter-related urinary tract infections, and mediastinitis surgical site surveillance. Multidrug-resistant organisms have also been the focus of APIC Elimination Guides, including methicillin-resistant *Staphylococcus aureus*, *Clostridium difficile*, and multidrug-resistant *Acinetobacter baumannii*. The content of each of these Elimination Guides will be summarized in a series of upcoming Brief Reports published in the *American Journal of Infection Control*.

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Recommendations for preventing infections among HD patients have evolved as new evidence is gathered and as the epidemiology of HD-associated infections change. The first set of guidelines was published in 1977 by the Centers for Disease Control and Prevention (CDC) and focused on preventing the spread of hepatitis B in dialysis centers.[3] These guidelines were updated in 1997 to reflect more current scientific evidence.[4] In 2001, the CDC expanded their recommendations from only addressing hepatitis B to the prevention of all infections among HD patients.[5] In May 2010, the Association for Professionals in Infection Control and Epidemiology (APIC) published an Elimination Guide for preventing infections among HD patients.[1] This article is an executive summary of the APIC Elimination Guide for Infections in Hemodialysis. The full-length document is available through the APIC Web site and provides a comprehensive approach to developing a dialysis-associated infection prevention program for all settings.

HD PATIENT INFECTION PATHOGENESIS AND EPIDEMIOLOGY

Patients receiving HD have numerous inherent risk factors for infection development, including exposure to invasive medical devices, immunosuppression, frequent close contact with other patients in the HD facility, and frequent hospitalizations. These factors increase susceptibility of HD patients to infections such as (1) *Staphylococcus aureus* infections, (2) methicillin-resistant *Staphylococcus aureus* (MRSA), (3) pneumococcal pneumonia, (4) *Clostridium difficile*, (5) hepatitis B and C, and (6) tuberculosis (TB).

HD PATIENT INFECTION SURVEILLANCE

Surveillance for infections in HD patients consists of the systematic collection, analysis, interpretation, and dissemination of clinical and/or laboratory data for

purposes that include informing performance improvement efforts and complying with regulatory requirements.[1] All health care facilities that provide hemodialysis services are required by the Centers for Medicaid and Medicare Services (CMS) to conduct surveillance, monitor infection rates, and develop strategies to minimize infection transmission.[6] Essential components of an infection surveillance program for HD patients include identification of metrics (ie, process and outcome measures) and documentation methods. Examples of surveillance metrics and data collection tools that can be implemented by HD facilities are outlined in the APIC Elimination Guide for HD Infections. Three common outcome measures for HD infection surveillance include the following: (1) exit site infection, (2) tunnel infection, and (3) catheter-associated bacteremia. After surveillance data are collected, it should be reported using outcome charts, which allows positive or negative trends to be identified. The facility's surveillance plan should delineate when an outbreak investigation and/or intervention would be necessary.

PREVENTION OF INFECTION IN HD PATIENTS

An infection prevention program for HD facilities consists of routine infection prevention strategies as well as heightened activities that should be implemented during outbreaks. Examples of routine infection prevention activities to prevent infection in HD patients include the following: (1) environmental decontamination, (2) adherence to hand hygiene protocols, (3) immunization of staff and patients, (4) TB screening, (5) medication/injection safety practices, (6) pre- and postsurgical infection prevention procedures, (7) standard and transmission-based precaution usage, (8) vascular access protocols, (9) water treatment, and (10) patient and employee education.[1] The APIC HD Infection Elimination Guide provides examples of checklists, templates, tools, and reference materials to assess compliance with these and other infection prevention strategies.

Environmental decontamination is vital to prevent the transmission of infection among HD patients, but it can be challenging in outpatient settings because HD facilities tend to be open areas that lack physical barriers between patients. Outpatient HD centers also tend to lack trained housekeeping staff to perform thorough environmental cleaning and disinfection between patients. This function is instead typically performed by health care staff in the short time between patient treatments. The APIC Elimination Guide for HD Infections outlines proper cleaning and disinfection procedures for HD facilities, including how to choose and use an appropriate disinfectant, ways to ''divide'' the patient space into patient zones, and identification of high-risk areas and equipment that require more frequent or stringent cleaning and disinfection.

Other important interventions to minimize infection risk in HD patients are strict adherence to hand hygiene protocols and implementation of standard and transmission-based precautions by staff, patients, and visitors. The APIC Elimination Guide for HD Infections outlines when and how to perform hand hygiene and implement standard and transmission-based precautions, including proper use of personal protective equipment by staff and patients in HD facilities. One practice that is unique to HD settings is the isolation of patients who test positive for the hepatitis B surface antigen, indicating that they are infected with the hepatitis B virus (HBV). Isolation of hepatitis B surface antigen-positive patients is critical in HD facilities because HBV is very environmentally stable, posing a risk of transmission on contaminated surfaces for up to 7 days, and because patients with HBV tend to have high viral titers.[1] Procedures for isolating HBV-positive patients, as well as patients with other diseases/conditions requiring isolation, are outlined in the APIC Elimination Guide for HD Infections.

Patient and HD staff immunization and TB screening are important interventions to prevent infection among HD patients. Vaccines for adult HD patients should include the following: (1) tetanus, (2) pneumovax, (3) seasonal influenza, (4) shingles, and (6) HBV.[1] All new HD patients should receive the 3-course regimen of HBV vaccine, which is given at a higher dose than HBV vaccine for non-HD individuals, and their antibody levels should be monitored to ensure that immunity develops. An appropriate dosage and vaccine schedule for HBV vaccine are provided in the Elimination Guide. HD staff should be immunized against vaccine preventable diseases to decrease the risk of spreading infections to their patients. A list of appropriate vaccines for HD staff is outlined in the Elimination Guide. CMS requires that all HD patients be screened for TB before the first dialysis treatment and after any known or suspected exposures thereafter. Patients who have end-stage renal disease and those from areas of the world where TB is endemic are at high risk for progression from latent to active TB disease.[1] Anergy is common among HD patients; therefore, TB screening should not rely on TB skin testing alone.[1] HD employees should be screened for TB upon hire and assessed annually.[1]

Bloodborne pathogen transmission may occur among HD patients unless proper medication safety and injection practices are followed. Outbreaks of hepatitis B and C have been reported resulting from unsafe practices, such as syringe reuse between patients, contamination of medication vials or intravenous (IV) fluid