Hospital-Acquired Infections

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- Hospital-acquired infection
- Catheter-related bloodstream infection
- Ventilator-associated pneumonia • Surgical site infection
- Catheter-associated urinary tract infection

Health-acquired conditions (HACs) are complications that emanate from a stay in a medical facility. HACs are increasingly scrutinized and apparent because of the staggering gravity of the problem and their threat to sustainability.[1,2] Preventable complications associated with health care in the United States are estimated to cost $88 billion per year.[3] In addition, a 2007 study by Aon suggests that HACs accounted for 12.2% of the health care facilities' total legal liability costs.[4]

The Centers for Medicare & Medicaid Services (CMS) no longer allows additional payment for 4 HACs involving infection. This subset of HACs, health-acquired infection (HAI), is defined by the Centers for Disease Control and Prevention (CDC) as a "localized or systemic condition resulting from an adverse reaction to the presence of infectious agent(s) or its toxin(s)." This article focuses on these HAIs that are well studied, common, and costly (direct, indirect, and intangible). The HAIs reviewed are catheter-related bloodstream infection (CRBSI), ventilator-associated pneumonia (VAP), surgical site infection (SSI), and catheter-associated urinary tract infection (CAUTI). This article excludes discussion of *Clostridium difficile* infections and vancomycin-resistant *Enterococcus*.

The Study on Efficacy of Nosocomial Infection Control elucidated the impact of HAIs when published in 1992. In 2002, the incidence of HAIs was estimated at 1.7 million.[5] More recent data suggest that HAIs may contribute as much as $35 to $45 billion per year.[6] These HAIs are associated with approximately 6% mortality (100,000 deaths per year) in the United States.[6] This total exceeds the mortality attributed to breast and

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colon cancer combined! The average adjusted length of stay for a hospitalized patient is 5 days, whereas the average length of stay for a patient with an HAI is 22 days.[7]

Fortunately, legislators, CMS, and private health insurance companies are modifying reimbursement schemes to reward quality and disallow additional payments for a growing number of HACs and HAIs. This shift in policy is broadly known as value-based purchasing and integral to the National Quality Strategy (NQS).[8] The NQS aims to improve the overall quality through accessible, safe, reliable, and patient-centered care. In addition, the NQS intends to address the affordability of health care and result in improved health of individuals and communities.

Transparency, through public reporting, compliments the aforementioned alteration in incentives. Various public reporting sites and entities exist, including Hospital Compare, HealthGrades, US News & World Report, Thomson Reuters, and various federal, state, and privately sponsored efforts. The prototype for leadership in transparency is the Society of Thoracic Surgeons partnership with Consumers Union to voluntarily report process and outcome measures associated with adult cardiac surgery.[9] This leadership is commendable and provides a template for other societies to define and report on the quality of their efforts.

To ascertain quality, health care teams must do the right things by using evidence-based medicine (EBM) guidelines. Information technology (IT), through computer order entry and decision support, supports EBM. Simultaneously, health care teams must ascertain that they are doing things right by continuously improving performance and reliability. Goal sheets, bundles, checklists, and multidisciplinary care are integral to high performance in today's dynamic, competitive, and transparent environment.[10–16]

Education, including novel simulation methods, is a mainstay in performance improvement. A thorough knowledge of microbiological factors associated with HAIs (methicillin-resistant *Staphylococcus aureus* [MRSA] and methicillin-resistant *Staphylococcus epidermidis* [MRSE] and multidrug-resistant [MDR] gram-negative aerobes) is necessary. The adoption of affordable innovative technology and processes are also central to the quality improvement journey. IT can catalyze the process of data management and surveillance by assisting in the collection of accurate real-time data. These data should be rapidly analyzed and reviewed by "learning" health care teams who strive to provide their patients with high-quality care.

CRBSI

Definition and Diagnosis

CRBSI is a clinical definition used when tests implicate the catheter as the source of the infection. CRBSI is commonly suspected when a patient with an intravascular catheter has local and/or systemic signs/symptoms consistent with infection and no other source of infection. For example, a central venous catheter (CVC) may have erythema, induration, purulence, or tenderness at the insertion site. Alternatively, a patient with a CVC may have only fever and/or leukocytosis. A central line–associated bloodstream infection (CLABSI) may be defined as a bloodstream infection (BSI) in a patient who had a CVC within the 48-hour period before the development of the BSI and is not related to a remote infection.[17]

The offending organism is preferentially cultured from the catheter tip, although it may be cultured from the site, from blood through the catheter, or through peripheral blood culture. Methods used to culture from catheter tip include sonication or roll plating. Other methods to assist in diagnosis include differential time of blood culture positivity, acridine orange leukocyte cytospin, and paired quantitative blood culture.[18–20]

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