Prevention of Central Line–associated Bloodstream Infections

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KEYWORDS

• CLABSI • CRBSI • Central line • Central venous catheter • Blood stream infection

KEY POINTS

- The incidence of central line–associated bloodstream infection (CLABSI) has decreased with the implementation of evidence-based practice guidelines.
- Clinical factors that may reduce the risk of CLABSI include catheter choice, catheter site selection, insertion technique, and catheter maintenance.
- Newer technology, such as needleless securement devices and disinfecting caps, have been shown to be additional effective strategies to further reduce the incidence of CLABSI.

INTRODUCTION

Central venous catheters (CVCs) are often essential in the care of critically ill patients. They allow safe administration of intravenous medications that cannot be given peripherally, aid in the administration of intravenous fluid resuscitation, and help in monitoring hemodynamic parameters in the management of patients with syndromes such as septic shock, cardiogenic shock, decompensated heart failure, and pulmonary hypertension. Despite the benefits of CVCs, they also serve as potential portals for localized and systemic bloodstream infections. For this reason, considerable effort has gone into reducing the incidence of bloodstream infections from CVCs.

DEFINITIONS

There are 2 major definitions used to describe bloodstream infections related to CVCs: catheter-related bloodstream infection (CRBSI) and central line–associated

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bloodstream infection (CLABSI). CRBSI is a clinical definition based on clinical criteria related to a specific patient in whom the diagnosis is being considered. This definition is more often used for research, and in some cases of clinical care, because it requires specialized microbiological techniques to specifically identify the catheter as the source of bacteremia, and these are not available in all hospitals. In contrast, the diagnosis of CLABSI is a simplified definition based on surveillance criteria that identify bloodstream infections in patients with CVCs in whom there is no other obvious secondary source for bacteremia.[1,2] The CLABSI definition has the potential to overestimate the incidence of CRBSI, because many primary bloodstream infections do not have an obvious secondary source. However, in the years since the US Centers for Disease Control and Prevention (CDC) instituted mucosal barrier injury as a category for secondary sources of bacteremia, this overestimation has been reduced. In addition, because many states now require public reporting of hospital CLABSI rates and the Centers for Medicare and Medicaid Services instituted financial penalties for hospital reimbursements for CLABSI, there is more granularity in the reviews of bloodstream infections in some institutions, and efforts that, in years past, may not have occurred are now made to thoroughly investigate the possibility of secondary sources. These public policy changes and financial incentives to produce low CLABSI rates have raised concerns that partially subjective surveillance definitions (eg, the National Healthcare Safety Network) applied inconsistently could be exploited or be prone to subconscious cognitive bias to reduce infection rates.[3] Because CLABSI is the more commonly used definition for quality initiatives, it is the focus of this article. However, it is important to understand the differences between the two definitions (**Table 1**).

CLABSIs are an important cause of morbidity and mortality in the intensive care unit, and lead to increased costs to the health care system. Although there was a 46% reduction in CLABSI rates in the United States between 2008 and 2013, an estimated 30,100 CLABSIs still occur in intensive care units and acute care wards each year.[4] Other studies have estimated that CLABSIs account for between 84,000 and 204,000 infections per year, resulting in up to 25,000 preventable deaths at a cost of up to $21 billion per year.[5] There are several measures that can be taken to decrease the incidence of CLABSI, and the introduction of the first widely adopted set of guidelines for the prevention of CLABSI in 2002 led to a substantial reduction in the incidence of CLABSI.[6] Between 2001 and 2009 the incidence of CLABSI declined by 58%, with a reduction in *Staphylococcus aureus* infections of 73%. The

Table 1
Comparison of catheter-related bloodstream infection and central line–associated bloodstream infection

CRBSI	Clinical signs of sepsis and positive peripheral blood culture in absence of an obvious source other than CVC with 1 of the following: • Positive semiquantitative (>15 CFU) or quantitative (>10^3 CFU) culture from a catheter segment with the same organisms isolated peripherally • Simultaneous quantitative blood cultures with a ratio of $\geq$3:1 (CVC vs peripheral) • Time to culture positivity difference no more than 2 h between CVC cultures and peripheral cultures
CLABSI	Primary bloodstream infection in a patient who had a central line within the 48-h period before development • Infection must not be related to an alternative cause

Abbreviation: CFU, colony-forming units.