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Impacts of Hospital-Acquired Bloodstream Infections in Patients Undergoing Hemodialysis Through a Central Venous Catheter

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BACKGROUND

- Hospital-acquired infections (HAIs) are of considerable interest given the association with increased morbidity, mortality, and hospital resource utilization
- Among HAIs, central line-associated bloodstream infections (CLABSI) represent the highest rates of mortality and additional costs
- While all central venous catheters (CVC) carry risk for bloodstream infections, long-term catheter use comes at an increased risk
- Hemodialysis patients are one population that utilize CVCs for extended durations
- While the impacts of bloodstream infections on outpatient hemodialysis patients have been reported previously, little data exist describing bloodstream infection risk and outcomes for inpatients receiving hemodialysis
- This study characterizes the demographics and outcomes associated with the development of hospital-acquired bloodstream infections (HA-BSI) in patients undergoing hemodialysis through a CVC (HD-CVC)

METHODS

- Retrospective data were collected from the Premier Healthcare Database
- All inpatient admissions with discharge dates in calendar years 2020-2022 that received hemodialysis with the presence of a CVC, based on procedure and/or ICD-10 codes, were included
- Bloodstream infections were identified using ICD-10 codes and onset was assessed using procedural blood culture code dates
- Bloodstream infections were defined as hospital-acquired if the blood culture collection date was ≥3 days after the admission date; all other patients with bloodstream infections were deemed as present-on-admission and were excluded from the analysis
- Descriptive analyses were conducted for HD-CVC patients that developed HA-BSI and included: baseline demographics, clinical characteristics, and outcomes
- Comparisons of outcomes were made between HD-CVC patients that did not develop a BSI and those with HA-BSI
- For incidence calculations, each day within the hospital with evidence of a catheter present was assumed to be a catheter day

RESULTS

- Over the 3-year collection period, 166,394 admissions were identified from 91,448 patients (Figure 1)
- HA-BSI were seen in 5,833 (3.5%) admissions from 5,714 (6.2%) patients
- The overall incidence of HA-BSI was 7.54/1000 catheter days
- The demographics of the HA-BSI patients are listed in Table 1
- All-cause mortality rates for HA-BSI patients were 27.7%
  - Among these patients, in-hospital mortality was 85.4%
- Length of stay and ICU utilization for all patients are shown in Table 2

Table 1. Baseline Demographics for HD-CVC Patients (n=5,714) that Developed HA-BSI

Characteristic, Evaluated as of Date of First Admission During Study Period		
Age in years, median (range)	64	(18, 89)
Age category, years, number (%)		
<60	2,119	(37.1%)
≥60 to <75	2,457	(43.0%)
≥75	1,138	(19.9%)
Male, number (%)	3,246	(56.8%)
Race, number (%)		
White	3,364	(58.9%)
Black	1,617	(28.3%)
Asian	171	(3.0%)
Other	421	(7.4%)
Unknown	141	(2.5%)
Ethnicity, number (%)		
Not Hispanic or Latino	4,837	(84.7%)
Hispanic or Latino	877	(15.4%)
Baseline Conditions, number (%)		
Congestive heart failure	3,245	(56.8%)
Diabetes, chronic	3,498	(61.2%)
Renal disease	4,743	(83.0%)
Charlson Comorbidity Index, median (range)	5.0	(0, 18)

HD-CVC: Hemodialysis via central venous catheter; HA-BSI: Hospital-acquired bloodstream infection

Figure 1. Identification of Inpatient Admissions

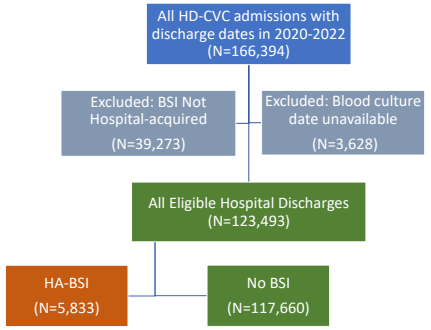

Table 2. Impacts of Hospital-acquired Bloodstream Infections on Length of Stay and Hospital Utilization in HD-CVC Patients

Patients	Median (range) Length of Stay	Admissions with ICU Stays	Median (range) Non-Zero ICU LOS
HD-CVC, no BSI	6 (1, 417)	19.6%	3 (1, 138)
HD-CVC, HA-BSI	25 (3, 1,058)	65.7%	12 (1, 400)

HD-CVC: Hemodialysis via central venous catheter; BSI: Bloodstream infection; HA: Hospital-acquired; ICU: Intensive care unit; LOS: Length of stay in days

SUMMARY

- Patients undergoing dialysis through a central line are at risk for developing hospital-acquired bloodstream infections
- These infections are associated with relatively high rates of all-cause in-hospital mortality
- When compared with patients that did not develop bloodstream infections, hospital-acquired infections were associated with longer lengths of stay, both in-hospital and within the ICU
- Given the link between length of stay and hospital costs, these infections result in an increase in total cost of care
- Future studies could consider prevention strategies for this high-risk population