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Retrospective Analysis of Culture-Positive Peripherally Inserted Central Catheter Infections at an Academic Medical Center

To the Editor—Long-term intravenous (IV) access is often necessary for the administration of medication in the form of antibiotics, total parental nutrition (TPN), and chemotherapy. The trend in long-term IV access has been shifting toward the use of peripherally inserted central catheters (PICCs) instead of surgically placed catheters. PICCs are inserted without the use of general anesthesia and with a lower risk of hemothorax or pneumothorax. Although the convenience of insertion is an advantage, published studies have described various complications such as infection, phlebitis, thrombosis, catheter fracture, and catheter malposition. The intent of this retrospective pilot study was to identify potential modifiable risks associated with culture-documented PICC infections.

The current literature reports no difference in infection rates between central venous catheters and PICCs in hospitalized patients. However, the average life of a PICC in the study was only 11.3 days.[1] The quoted infection rate for PICCs in all types of patients is reported as approximately 7%.[2]

The Ohio State University (OSU) Wexner Medical Center (OSUWMC) is a 980-bed tertiary-care center in Columbus, Ohio. OSUWMC includes the James Cancer Hospital, an active transplantation program, and a level-1 trauma center. The center has an average of 45,000 admissions annually. The OSUWMC PICC team comprises specifically trained registered nurses (RNs) who are board-certified in vascular access.

A query of the OSUWMC Information Warehouse (IW) database was performed to identify positive culture results for samples collected from all intravenous catheters, including PICCs, during the period July 1, 2008, to June 30, 2009. The cases identified in this search were then screened to evaluate whether the infection was a true PICC infection. Infection was defined as (1) a positive PICC blood culture result and a negative peripheral blood culture result; (2) a time differential between a positive PICC blood culture result and a positive peripheral blood culture result, with a positive PICC blood culture result occurring first; or (3) a positive PICC or unrecorded site blood culture result and a positive catheter tip culture result (>15 colony forming units).[3] Clinical patient data were collected and descriptively analyzed for possible risk factors. The OSU Office of Responsible Research Practices Institutional Review Board approved this study.

The search of the IW database identified 126 culture results as indicating possible catheter infections. Results for prisoners were excluded. After screening, 20 PICC infections were identified in 18 evaluable patients. Eleven patients were female. Three (15%) of 20 of the PICCs involved were placed at an outside facility, the RN PICC team at OSUWMC placed 15 PICCs (75%), and the interventional radiology team placed 2 (10%). Three (17%) of 18 patients had active malignancies (Epstein-Barr virus [EBV]–associated Burkitt's lymphoma, appendiceal carcinoma, and leiomyosarcoma). The patient with EBV-associated Burkitt's lymphoma was also HIV positive.

The average period from PICC placement until time of infection was 50 days (median, 33 days). In 15 (75%) of the 20 cases we evaluated, patients had been discharged from the hospital with a PICC in place when the infection occurred. A urinary catheter was present in 13 patients (65%) during their hospital stay. Four patients (20%) were on a ventilator when their infection occurred, and 4 PICC infections occurred in 3 patients (19%) who were receiving active chemotherapeutic agents. In addition, 2 other infected patients (10%), 1 who had multiple sclerosis and 1 who had Castleman disease, were treated with immunosuppressive agents including cyclophosphamide, prednisone, intravenous immunoglobulin, rituxan, and methylprednisolone. Eight (40%) of the 20 infections occurred in patients who were receiving TPN. The most common bacterial species isolated was coagulase-negative *Staphylococcus* species, followed by other gram-positive organisms: *Enterococcus* species and *Staphylococcus aureus.*

During a 1-year retrospective review, 20 cases of culture-positive PICC infection were identified at a large academic medical center. In this limited data set, the majority of patients who had PICC infections either had a PICC but were no longer in the hospital or had a urinary catheter in place when their infection developed. About one-third of infections occurred in patients receiving TPN; surprisingly, this is a lower rate than observed in those who were out of the hospital or who had a urinary catheter. TPN has historically been identified as a risk factor for PICC-related infections. In a study by Marra et al[4] of 47 patients receiving long-term TPN, 38 (80.9%) of patients developed a catheter-related blood-

TABLE 1. Potential Risk Factors Associated with Peripherally Inserted Central Catheter (PICC) Infections

Potential risk factor	No. (%) of infections with associated risk factor, $N = 20$
Out of hospital with PICC line	15 (75)
Foley catheter	13 (65)
Active chemotherapy or immunosuppressive therapy	6 (30)
Total parental nutrition	8 (40)
Ventilator	4 (20)
Chest tube	1 (5)

stream infection. The catheters in that study included but were not limited to PICCs. Additional potential risk factors included associated chemotherapy or immunosuppressive therapy and exposure to medical devices such as mechanical ventilators or chest tubes.

The data from this small study are quite limited but deserve further investigation, especially when considering hospital risk factors (Table 1). These risk factors have not been extensively evaluated in the literature. To expand our understanding of PICC infections, we have implemented a prospective trial involving close, concurrent monitoring of a cohort of patients who received a PICC in the hospital, for the life of the PICC. We are further analyzing characteristics identified in this retrospective study as potential risk factors, including out-of-hospital care of a PICC, duration that a PICC is in place, and comorbid conditions including paralysis, recent surgery, receipt of immunosuppressive agents, and obesity.

PICC use has become a mainstay in health care, and associated complications tie directly to patient safety and quality. As modifiable risk factors are identified, we anticipate that attempts can be made to correct these risks to improve patient care and safety in both the inpatient and outpatient environments.

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Surveillance for Influenza Using Hospital Discharge Data May Underestimate the Burden of Influenza-Related Hospitalization

To the Editor—In New Zealand, as in other places, a number of complementary surveillance systems are used for monitoring influenza activity. These systems include laboratory-based surveillance using virological data, sentinel surveillance of influenza-like illness (ILI) presentations in primary care, and monitoring of influenza-associated hospitalizations.[1-3] Coded hospital discharge data are often used as an epidemiological tool to monitor influenza disease burden.[4] However, the accuracy of this approach for determining the true burden of influenza in hospitalized patients is not well established, and to date, few studies have specifically evaluated the validity of hospital discharge data for influenza surveillance.

In this context, we performed a retrospective cross-sectional analysis of all patients with laboratory-confirmed influenza infection at our hospital over 2 influenza seasons. Our aim was to determine the sensitivity and specificity of coded hospital discharge data for identifying influenza infection in hospitalized patients with laboratory-confirmed influenza.

Auckland District Health Board in New Zealand is an 1,100-bed tertiary level institution serving a population of approximately 500,000 inhabitants. By searching our laboratory database, we identified all patients admitted to our hospital who had a sample sent for influenza testing between January 2010 and December 2011. To exclude patients for whom there was a clinical suspicion of nosocomial influenza, we included only those patients who had a sample sent for influenza testing within the first 72 hours of hospital admission. Samples were tested for influenza virus by real-time reverse-transcription polymerase chain reaction (RT-PCR) using previously described methods.[5]