How to Establish an Effective Midline Program: A Case Study of 2 Hospitals

Nancy Moureau, BSN, RN, CRNI®, CPUI, VA-BC™
PICC Excellence Inc, Greenville Memorial Medical Campus, Greenville, SC, and Griffith University, Brisbane, Australia
Gordon Sigl, MSN, RN
Advocate Illinois Masonic Medical Center, Chicago, IL
Margaret Hill, RN
Piedmont Henry Hospital, Stockbridge, GA

Abstract

Introduction: *Establishing an effective midline program involves more than simply learning an insertion technique for a new product. Midline catheters provide a reliable vascular access option for those patients with difficult venous access who would otherwise require multiple venipunctures or the use of higher-risk central lines to maintain access. An effective midline program establishes a protocol for device selection and includes standing orders to facilitate speed to placement.*

Methods: *Our retrospective descriptive review evaluated the successful integration of midline programs into existing vascular access bedside insertion programs in 2 acute care hospitals. The investigator reviewed a convenience sample of hospital patients. Participants in the study included vascular access team managers and team members from the sample sites.*

Results: *The results of this 2-hospital study demonstrate successful integration of a midline program into a bedside insertion program with 0 midline-related infections since initiation. Documentation of overall central line-associated bloodstream infection rates for hospital 1 changed from 1.7/1000 catheter-days to 0.2/1000 catheter-days, reflecting a 78% reduction in infections and a projected cost avoidance of $531,570 annually. Both hospitals demonstrated reduced rates of infection following implementation of a midline program.*

Conclusions: *Midlines have a history of lower risk for both infection and thrombosis compared with central venous devices. Although more research is needed on the more recently developed midline catheters, available evidence suggests that midlines provide a safe and reliable form of vascular access, reducing costs and the risk of infection associated with central venous catheters, especially those placed solely for patients with difficult venous access.*

Keywords: *infusion, intravenous, catheter, indwelling, catheterization, peripheral/method*

Introduction

Selecting the best vascular access device for a patient involves having a clear understanding of what options are available for either low-risk peripheral access or central access when infusates require central administration. With the vast majority of acute-care patients requiring intravenous medication and venous access, the need continues for expanded options for reliable extended access devices that can be inserted by nurses. Short peripheral catheters may not always serve the needs of patients, especially those with difficult-to-access veins. The slightly longer midline catheter works well with intermediate needs of a few days to a month or more. This continued need for reliable, extended vascular

Correspondence concerning this article should be addressed to nancy@piccexcellence.com
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access has caused a resurgence of interest in midlines for both acute care and home care applications.

Peripherally inserted central catheters (PICCs) have continually gained in popularity in the United States during the past 25 years. Now there are approximately 2.5 million inserted per year, the majority of which are placed by nurses.[1] There are currently concerns with PICCs and all central venous access devices (CVADs) regarding the development of central line-associated bloodstream infections (CLABSIs) and the reimbursement penalties associated with these infections. Midlines provide a viable alternative to central lines when the primary need is for reliable access of 5 days or more and central placement is not indicated. The use of midlines is consistent with the Centers for Disease Control and Prevention (CDC) recommendations for safe strategies to reduce CLABSIs.[2] Midlines have a history of lower risk for both infection and thrombosis than CVADs and should be considered as a beneficial option for patients.[3-8] Evaluating patients on an individual basis for the most appropriate device (eg, peripheral short catheter, ultrasound-guided longer catheter, midline, PICC, internal jugular, subclavian, or other long-term device) follows the goal of vessel health and preservation.[9,10] Enabling specialty teams to choose devices and insert catheters based on patient need increases efficiency in treatment delivery, hospital through-put, and patient satisfaction.[11-20] Creation of a policy and referral process that includes midlines should be a part of an overall hospital strategy to reduce infections while effectively delivering treatment plans.[3-5,7,21-25] The aim of our study was to provide a descriptive review of 2 acute care hospital midline catheter programs.

Methods

This was a 2-site, retrospective descriptive review to evaluate midline programs successfully integrated into existing vascular access programs. Inclusion criteria were for a 2-cohort sample of acute care hospitals with operating midline programs consisting of bedside insertions, policies, and outcomes of >2 years. Excluded were hospitals without functional midline protocols and hospitals in excess of 2. This project was designed as a case study; aggregated facility public outcomes were based on data collected from prior years of hospital use and surveillance for CLABSI using National Health Safety Network definitions. No patient medical information or medical records were reviewed in conjunction with this case study. Management, institutional review board, and ethics chairs approved this case study under waiver without full submission in accordance with federal policy and found it exempt because it used public or privately held records or interview procedures without access to patient health information.

A midline catheter, as defined by the Infusion Nurses Society, is a venous catheter access device measuring 3-8 in (6-20 cm) with the distal tip in the basilic, brachial, or cephalic veins at or below the axillary fold, distal to the shoulder.[26] Difficult intravenous access (DIVA) was defined by Keyes in 1999[27] as 2 unsuccessful attempts, by Costantino in 2005 as the inability to obtain intravenous access after at least 3 attempts in a group of patients with known difficult access,[28] and by Weiner in 2012[29] as those patients with 2 or more failed attempts or with known history of difficult intravenous placement. A literature review of midline use from 1985-2015 was performed with results integrated into the study discussion.

Study Procedures

The investigator reviewed a convenience sample of hospitals to determine their eligibility for inclusion into the study based on having an existing midline program. The 2 hospitals meeting the inclusion criteria submitted their policies and outlines of their programs, subsequently receiving approval for the study. Participants in the study included vascular access team managers and team members from the sample sites. The results of observations and interviews were used to describe the recommended processes to develop an effective midline program. Processes for acquiring information involved a series of interviews with team managers and team members with a focus on program development, motivation for development, structure of the program, device use, challenges and solutions, midline indications, infection outcomes, and use of staff education for integration of the program.

Participants and Setting

Hospital 1

The first hospital, an urban Midwestern 400-bed Magnet-recognized (American Nurses Credentialing Center's (ANCC) Magnet Recognition Program®) teaching hospital designated as a level-1 trauma center, had been working to reduce CLABSIs since 2006. Infection control professionals identified a plateau in the reduction of bloodstream infections from 2009-2012 and were motivated to make changes. The CLABSI committee, dedicated to reducing CLABSIs, re-emphasized education of the central line bundle (previously implemented) for all CVAD insertions.[30] Secondary solutions included an evaluation of patient indications before each CVAD placement with an intended goal of reducing the use of central lines, especially peripherally inserted central catheters (PICCs), and implementation of ultrasound guidance for the placement of peripheral and midline catheters for those patients whose main indication was difficult access, blood draws, computed tomography for those patients requiring only a few days of therapy, and for patients whose medication did not require a CVAD. In 2010, a proposal to create a vascular access team was submitted and accepted for implementation. Originally formed under collaborative practice with the interventional radiology department where PICCs were placed by physicians, the nursing team was organized to begin PICC placement at the bedsides.

The hospital originally approved a local midline policy specific to the diagnostic imaging department. The protocol, which included evaluation of patients, device selection, and insertion of midline catheters, was performed by the vascular access team without requiring a physician's order. As the program expanded, the protocol was eventually submitted to the medical director, risk management, and the entire system for committee review and hospital-wide approval.

The midline program at this hospital was initiated with the release of a new, accelerated Seldinger technique (AST) midline device (Powerglide; Bard Access, Salt Lake City, UT). The AST midline device was chosen due to an integrated