

Institution of a Hospital-Based Central Venous Access Policy for Peripheral Vein Preservation in Patients with Chronic Kidney Disease: A 12-Year Experience

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ABSTRACT

Purpose: To describe the implementation of nursing-based venous access team (VAT) and standardized interventional radiology (IR) protocols in accordance with Kidney Disease Outcomes Quality Initiative (K/DOQI) guidelines to provide central venous access while preserving peripheral veins in patients with chronic kidney disease (CKD).

Materials and Methods: Review of peripherally inserted central catheter (PICC) and small-bore central catheter (SBCC) referral and placement data from VAT and IR databases was conducted over a 12-year period. SBCC referral was automatic for patients with creatinine levels ≥ 3 mg/dL or a renal transplant regardless of creatinine level unless dialysis was not planned. All SBCC insertions, regardless of referral source, were identified and reviewed, and SBCC placements prompted by K/DOQI PICC contraindication were identified. Catheter types, indications, access sites, technical success, and complications were ascertained.

Results: A total of 35,781 requests for PICC placement were made to the VAT; 1,889 (5%) were referred to IR for SBCC placement per institutional policy, and 2,200 SBCCs were attempted or newly placed during this period, 1,879 (85%) based on K/DOQI contraindications. Primary indication for SBCC placement was antibiotic therapy (59%). Access sites included right internal jugular vein (IJV) (70%), left IJV (24%), right external jugular vein (EJV) (3%), left EJV (2%), right common femoral vein (CFV) (0.3%), and left CFV (0.2%). Technical success rate of SBCC insertion was 99%. Six minor (0.3%) and three major (0.1%) complications occurred.

Conclusions: Automatic referral for SBCC placement in patients with CKD via VAT and IR protocols may eliminate PICC placement and thereby protect peripheral veins needed for hemodialysis. SBCC placement has high technical success and low complication rates.

ABBREVIATIONS

AVF = arteriovenous fistula, AVG = arteriovenous graft, CKD = chronic kidney disease, EJV = external jugular vein, GFR = glomerular filtration rate, IJV = internal jugular vein, IR = interventional radiology, K/DOQI = Kidney Disease Outcomes Quality Initiative, PICC = peripherally inserted central catheter, SBCC = small-bore central catheter, VAT = venous access team

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Peripherally inserted central catheters (PICCs) provide intermediate-term venous access for antibiotic, hyperalimentation, and other infusion therapies. According to the Kidney Disease Outcomes Quality Initiative (K/DOQI) vascular access guidelines, PICCs are contraindicated in patients with chronic kidney disease (CKD) (1–3). These guidelines state a contraindication to venipuncture or intravenous catheter placement in arm veins of individuals initially based on the threshold of serum creatinine level ≥ 3 mg/dL, and, since 2006, based on stage 4/5 CKD, on the basis of preserving peripheral veins for potential future construction of arteriovenous fistulae (AVFs) (1–3).

Small-bore central catheters (SBCCs) are subcutaneously tunneled soft, small-caliber catheters typically placed via the internal jugular vein (IJV) or external jugular vein (EJV) under radiologic guidance (4,5). SBCCs minimize vascular damage and are associated with low complication rates, and are therefore used as alternatives to PICCs in patients with CKD (4–7). Like PICCs, these catheters may be used for 2–12 weeks or longer. However, SBCCs are preferable to PICCs in patients with a serum creatinine level ≥ 3 mg/dL and those undergoing hemodialysis because the consequences of losing peripheral veins far outweigh those resulting from loss of jugular veins in these individuals (4,8). SBCC placement is also indicated in patients with a renal transplant regardless of creatinine level because of the potential for future hemodialysis (4,8).

Demand for central venous access has led to the widespread use of nursing-based venous access teams (VATs) that specialize in bedside placement of PICCs in outpatient and inpatient settings. A VAT must work in close collaboration with the interventional radiology (IR) division to offer appropriate venous access for patients with CKD. Because the VAT is commonly the first to receive requests for venous access device placement, these practitioners must be familiar with the K/DOQI guidelines and have protocols in place to translate these guidelines into best management and practice strategies.

The purpose of the present study is to describe a single-institutional experience with the implementation of standardized nursing-based VAT and IR protocols in accordance with K/DOQI guidelines to provide central venous access while preserving peripheral veins in patients with CKD over a 12-year period.

MATERIALS AND METHODS

This study was conducted with institutional review board approval and compiled in accordance with the Health Insurance Portability and Accountability Act. Retrospective review of PICC and SBCC placement data from VAT (Excel 2010; Microsoft, Redmond, Washington) and IR (HI-IQ; Conexsys, Lincoln, Rhode Island)

quality-assurance databases and radiology reports between September 2001 and April 2013 (12 y) was conducted. Referral data from the first quarter of 2007 were unavailable, and therefore this interval was excluded from this study.

The institutional policy for venous preservation (created in 2001 and reviewed biannually by a multidisciplinary team including a nephrologist and an interventional radiologist) was developed for patients who meet three specific criteria: serum creatinine level ≥ 3 mg/dL, ongoing hemodialysis or peritoneal dialysis, and presence of a renal transplant. Of note, no distinctions were made between acute kidney injury and CKD or among causes of renal dysfunction. The creatinine threshold was based on the 1997 and 2000 K/DOQI Vascular Access Guidelines, which explicitly stated this threshold (1,2). The 2006 K/DOQI Vascular Access guidelines changed the threshold to stage 4/5 CKD, and there are no more current updates (3). At the time of the 2006 update, the policy owners considered changing to a glomerular filtration rate (GFR)-based definition; however, because GFR was not reported by the laboratory at the institution, the decision was made to continue the creatinine-based threshold until that occurred. According to the institutional policy, “[PICCs] or subclavian vein catheters should be avoided in these patients.” This policy was widely distributed and implemented by attending physicians, house staff, department directors, and nursing personnel, including the VAT. With respect to logistical implementation of the policy, when the VAT received a request for PICC placement, the patient was screened for elevated creatinine level, hemodialysis or peritoneal dialysis, and history of renal transplantation. Any patient meeting one of the three criteria was automatically referred to the IR service. A member of the IR department then saw the patient for a brief consultation, confirmed the indication for SBCC placement, and reviewed the patient’s history for known central venous occlusions. Patients were placed on the IR procedure schedule for SBCC placement within 24 hours of the initial consultation to avoid delay in treatment. In patients who did not intend to receive hemodialysis, such as those in hospice care, the VAT was advised to proceed with PICC placement.

The total number of PICCs requested and VAT referrals to IR for SBCC placement during the study period were identified. Of note, patients with a history of venous occlusion and previous failed PICCs were tracked by using the HI-IQ database. Upon consultation for PICC placement in patients not automatically meeting the aforementioned criteria, VAT personnel examined and questioned patients to evaluate for known central venous occlusions and consulted with the IR coordinator and/or IR consultation physician in the event that such an occlusion was suspected. The database was reviewed, and patients with documented occlusions were referred directly to the IR department.

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