Choosing Wisely – 5 Things Physicians & Patients Should Question

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Don't place, or leave in place, peripherally inserted central catheters for patient or provider convenience.

Peripherally inserted central catheters (PICCs) are commonly used devices in medical practice that are associated with costly and potentially lethal healthcare-acquired complications, including central-line associated bloodstream infection (CLABSI) and venous thromboembolism (VTE). Given the clinical and economic consequences of these complications, placement of PICCs should be limited to acceptable indications (e.g., long-term peripherally compatible infusions, non-peripherally compatible infusions, chemotherapy, palliative care, and frequent blood draws).[1] PICCs should be promptly removed when indications for their use end.

Summary of Update

We conducted a search of systematic reviews and meta-analyses of PICCs in non-critically ill, adult inpatients, from 2016 to November 24, 2021. After screening 44 citations, we found 32 relevant studies. On this basis, we reaffirmed the recommendation, added new references, and altered the discussion by adding new information about complications, attempts to mitigate complications, and new technologies to lessen risks associated with PICC use.

Discussion

Peripherally inserted non-tunneled, central venous catheters are inserted in the veins of the upper extremity. Because placement of PICCs in the arm avoids some complications associated with placement of central venous catheters (CVCs) into the veins of the neck and chest and trained personnel are able to place PICCs at the bedside, use of PICCs in hospitalized and ambulatory patients continues to be a practice used across the country.

Although PICCs were originally intended to provide short-term venous access, they frequently remain in place for weeks or months. In this context, an accumulating body of evidence suggests that PICCs are associated with important complications. PICCs are often implicated in the development of central-line associated bloodstream infections in hospitalized patients,[2-5] and they are associated with an increase in deep vein thrombosis of the upper extremity and pulmonary embolism.[6-10] These outcomes are not solely related to PICCs themselves; rather, multiple factors interact to increase the risk of complications, including patient characteristics (e.g., history of prior deep vein thrombosis or neutropenia), device characteristics (e.g., multi-lumen PICCs, or thicker-gauge devices), and provider characteristics (e.g.,

infusions of vancomycin, or use of anticoagulation).[5] Attempts to mitigate these risk factors have not affected complication rates.[11-14] As the use of PICCs frequently involves patients at high-risk of these very complications (e.g., those with cancer and critically-ill populations), there is an ongoing need to improve PICC utilization.

A large body of evidence supports the recommendation to place PICCs only in the presence of an acceptable indication and to remove them promptly when no longer indicated.

Several systematic reviews have reported an increased risk of complications among patients who receive PICCs compared to traditional central venous catheters. For instance, in a systematic review and meta-analysis, PICCs were associated with a more than two-fold increase in the risk of venous thromboembolism compared to CVCs.[10] In another systematic review comparing the risk of bloodstream infection with PICCs to CVCs, PICCs were associated with higher rates of bloodstream infections than cuffed and tunneled devices in hospitalized patients.[15] PICCs also have been associated with higher risk of catheter-thrombosis,[16] mechanical complications such as coiling and kinking, and superficial thrombosis relative to central venous catheters.[17] There is also emerging literature about spontaneous late migrations of PICC catheter tips.[18] Further, in patients requiring hemodialysis, a retrospective, case control study showed a strong independent association between prior PICC use and lack of a functioning arterial-venous fistula[19] which may be one factor contributing to lower fistula use in the US and supports the National Kidney Foundation guideline to “avoid PICC placement in the chronic kidney disease population.”[20]

Evidence suggests widespread variability in current use and appropriateness of PICCs. For instance, a study at a tertiary care academic medical center reported that PICCs were frequently associated with "idle-days" of non-use.[21] In a statewide survey of 180 hospitalists in Michigan, approximately half of all respondents reported that 10-25% of PICCs placed at their facilities might have been inappropriate or avoidable.[22] A prospective, multi-center study assessed physician awareness of CVCs where 60% of CVCs were PICCs. Nearly one-third of attending physicians and 16% of residents were unaware their patients had a CVC.[23]

Finally, PICC use is growing outside of intensive care units, posing challenges for monitoring central line-associated infections and assembling homogenous care teams.[24] PICC use in non-intensive care settings necessitates fundamental changes to existing paradigms of care. Moreover, as patients frequently transition with PICCs to outpatient treatment, fragmentation and non-uniform post-discharge care represent perils to safe PICC use. It is necessary to raise awareness of these issues to help ensure positive outcomes and patient safety.

Recently, there has been literature published regarding improved safety with PICC devices, though complication rates are still greater than when midlines or peripheral IVs are used.[25, 26] This includes the use of technologies to improve proper placement and securement.[27-30] Antimicrobial PICCs may reduce central line associated blood stream infections in high-risk groups.[31] There is some data that patients’ use of smartphone applications or multimedia reduces complications.[32] Operationalizing best practices by nurses and vascular access teams and the use of bundles also reduces risk of complications.[33, 34] There

is no clear benefit to routine vs. clinically indicated replacement of PICC lines in complications.[35] Due to a growing awareness of PICC line associated complications and financial penalties for central line associated bloodstream infections, use of midlines has increased.[36] Data suggests use of midlines is associated with fewer complications of bloodstream infections and occlusion than PICC lines, but venous thromboembolism risk is unclear.[37]

As with other healthcare innovations, the use of PICCs began in a defined population to solve an important clinical problem. Over time, PICC insertion has evolved to span other indications and patient populations. This diffusion has led to recognition that the known advantages associated with PICC use may be offset by risks, costs, and complications in particular instances. Restricting the use of PICCs to specific indications and ensuring timely removal of these devices may help mitigate these risks. Choosing to insert and remove PICCs wisely is thus critical to patient safety and outcomes.

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