

## Patient Safety Tip of the Week

# January 21, 2014 The PICC Myth

In a casual conversation we recently heard about difficulty getting a central line for a patient the question “Why didn’t they just put in a PICC?” was asked. Unfortunately, that question is asked too frequently and too easily in hospitals across the country. RN’s place about 70% of the nearly 3 million PICCs that are inserted annually in the United States ([The Joint Commission 2012](#)). Particularly since most hospitals have developed PICC teams led by nurses and radiologists, it has become all too easy for physicians to order a PICC line without thinking much about it.

The potential complications of PICC (peripherally inserted central catheter) lines are at least as frequent as and probably more frequent than those from more traditional central lines. We used to kid about our ability to identify the service line of a patient by the location of their central line (if the patient had a subclavian line they were on the surgical service, if they had an jugular line they were on the medicine service). True, the most feared complications of those central line insertions (pneumothorax for the subclavian line, carotid arterial puncture for the jugular line) are not seen with PICC insertions but a host of serious potential complications are associated with PICC’s.

Chopra and colleagues ([Chopra 2013a](#)) did a systematic review and meta-analysis comparing the risk of venous thromboembolism associated with PICC’s versus that associated with other central venous catheters (CVC’s). PICCs were associated with a **more than two-fold increased risk of deep vein thrombosis** (OR 2.55) but not pulmonary embolism. PICC-related deep vein thrombosis was highest in patients who were critically ill and those with cancer, indicating the importance of patient-related risk factors as well.

In a study utilizing venous duplex imaging of the upper extremities Liem et al ([Liem 2012](#)) found an overall low incidence of symptomatic PICC-associated UE DVT but given the number of PICCs placed each year, they account for up to 35% of all diagnosed UE DVTs. Larger-diameter PICCs and malignancy were factors found to increase the risk for DVT.

Another study ([Marnejon 2012](#)) found trauma, renal failure, left-sided catheters, basilic placement, TPN, and infusion with antibiotics, specifically vancomycin, were significant risk factors for upper extremity venous thrombosis associated with PICC insertion.

Most healthcare professionals have probably assumed that the **risk of CLABSI’s** (central line-associated bloodstream infections) would be lower with PICC lines compared to conventional central lines. This appears to be the case for outpatients but is probably not so for inpatients. In another systematic review and meta-analysis Chopra and colleagues

([Chopra 2013b](#)) found 23 studies comparing CLABSI rates in patients with CVC's vs. PICC's. For outpatients rates of CLABSI were much lower in those with PICC's (RR 0.22). For hospitalized patients there was also a trend toward fewer CLABSI's in those with PICC's but when the rates were adjusted per catheter day, there was **no significant difference in CLABSI rate between the CVC and PICC groups**.

But the Chopra review reveals a couple problems. First, there was only a single small randomized controlled study. And few studies included patient- and device-related data. It is pretty clear that there are risk factors for CLABSI that are patient-related or device-related (eg. number of lumens, size of catheter, etc.). And most did not indicate what preventive measures were used for either CVC's or PICC's.

So we really don't know for sure whether PICC's have a lower or equivalent rate for CLABSI's. But rates of CLABSI in inpatients with PICC's are likely substantial. Anecdotally, we also tend to see far less adherence to well-known best practices for CLABSI prevention in patients not in ICU's and many such patients with PICC's are not in ICU's.

In a prospective study of non-ICU patients ([Al Raiy 2010](#)) with active surveillance and intervention to remove unnecessary or high-risk lines, CVC's and PICC's had similar rates of CLABSI's. The median time to development of infection was significantly longer in the patients with a PICC (23 vs 13 days), a temporal pattern often noted by others.

One of the most important interventions in prevention of CLABSI's (or, for that matter, infection of any indwelling device) is asking on a daily basis whether the catheter is still necessary. With PICC's we often forget to do that, particularly when the patient is not in the ICU. Tejedor and colleagues ([Tejedor 2012](#)) looked at how often central venous catheters and PICC lines were retained when not needed ("idle days") on non-ICU wards. They found that significant proportions of ward central line days were unjustified. Patients with PICCs had more days in which the only justification for the CVC was intravenous administration of antimicrobial agents. They suggest that reducing "idle CVC-days" and facilitating the appropriate use of peripheral IV's may reduce central line days and CLABSI risk.

But **other complications** may be seen with PICC's as well. One study ([Pikwer 2012](#)) found that catheter tip malpositioning, thrombophlebitis, and catheter dysfunction were more common with PICC's than CVC's. The two catheter types did not differ with respect to catheter-related infection rates.

Some studies have been done on more specific patient populations. In a retrospective review of neurological intensive care patients ([Wilson 2013](#)) there was a statistically significant difference in catheter-related large vein thrombosis with PICC's compared to CVC's, with no difference in CLABSI or line insertion-related complications. A study in oncology patients ([Johansson 2013](#)) concluded that although PICCs are frequently used in oncology, scientific evidence supporting any advantage or disadvantage of PICC when

comparing PICC with traditional central venous lines is limited, apart from a tendency towards increased risk for DVT and a decreased risk for catheter occlusion with PICC.

**Device-related factors** are also important. PICC diameter may pose the most modifiable risk for PICC-associated DVT and the risks increase as the number of catheter lumens increases. Evans et al. ([Evans 2013](#)) found a significant increase in the use of single-lumen PICCs in addition to the institutional adoption of smaller 5F triple-lumen PICCs was associated with a significant decrease in the rate of PICC-associated DVT.

So it is fairly clear that PICC's may be associated with a variety of complications. So any decision about use of PICC's must **balance the potential benefits against the potential risks**. There's little question that the benefits outweigh the risks in many cases. PICC's allow many patients to receive long-term antibiotics or chemotherapy at home rather than requiring inpatient hospital stays.

The benefit vs. risk decision is more difficult for inpatients. PICC lines have even made one of the **Choosing Wisely®** lists of things physicians should question ([Society of General Internal Medicine Choosing Wisely® list](#)). Specifically, the item is "**Don't place, or leave in place, peripherally inserted central catheters for patient or provider convenience**". They cite the potential complications noted above and the study ([Tejedor 2012](#)) that PICC's were often associated with "idle days" or days when the lines were not used for a relevant indication. The Choosing Wisely® list also notes patient demand as another factor that may drive increased use of PICC lines, as noted in the survey data below ([Chopra 2013c](#)).

One problem related to PICC's is a relative lack of **evidence-based indications** for their use ([Butterfield 2013](#)). Most indications have been based on practical considerations or expert consensus, both of which we know commonly lead to overuse. We, of course, encountered the same issue years ago when we first began addressing urinary catheters. Only once we defined appropriate indications for urinary catheters using evidence were we able to significantly reduce the overall use of urinary catheters, leading to subsequent reductions in CAUTI's. The article by Butterfield indicates that Chopra and others are planning a conference to develop evidence-based guidelines for PICC use.

A survey of hospitalists in Michigan ([Chopra 2013c](#)) identified numerous gaps in understanding and utilization of PICC's, with a substantial percentage of hospitalists suspecting that 10-25% of PICC's at their facilities might be inappropriately placed or avoidable. Most hospitalists did not themselves regularly examine the PICC's for evidence of external problems and a majority noted that, at least once, they had forgotten the patient had a PICC. Many noted placement of PICC's for venous access as opposed to a specific indication (like total parenteral nutrition or long-term antibiotic administration) and 82% reported having cared for a patient who specifically requested a PICC.

Wojnar and Beaman ([Wojnar 2013](#)) reviewed a hospital's inpatient use of PICC's to determine whether PICC's were appropriately indicated. They note that CDC ([O'Grady 2011](#)) recommends PICC's for patients with an intended duration of IV therapy >6 days.

The type of intravenous preparation is important. Indications for administration via PICC include vesicants (blistering agents, eg. chemotherapy), irritants, preparations with pH <5 or >9 or osmolarity > 600. But they also discuss patient-related factors that may be important in the decision to use PICC's. These include factors such as skin condition in elderly patients, morbid obesity, severe dehydration, complicated medical diagnoses, poor physical condition, abnormal coagulation status, and others.

So hopefully the next time you hear the question "Why don't they just put in a PICC?" you'll actually take time to weigh the pros and cons before answering. And hopefully you will apply the same degree of rigor to daily monitoring of the PICC and the need for its continuation that you would apply if the patient were in an ICU.

**See also our updates on central venous catheters and PICC lines:**

December 2014	<a href="#">"Surprise Central Lines"</a>
July 2015	<a href="#">"Reducing Central Venous Catheter Use"</a>
October 2015	<a href="#">"Michigan Appropriateness Guide for Intravenous Catheters"</a>
March 27, 2018	<a href="#">"PICC Use Persists"</a>

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