Care of Peripheral Venous Catheter Sites: Advantages of Transparent Film Dressings Over Tape and Gauze

Stéphanie F. Bernatchez, PhD

Critical and Chronic Care Solutions Division, 3M Company, St Paul, MN

Abstract

Peripheral intravenous (PIV) catheters are the most commonly used catheters in hospitals, with up to 70% of patients requiring a peripheral venous line during their hospital stay. This represents 200 million PIV catheters used per year in acute-care hospitals in the United States alone. These medical devices are also used in other health care settings, such as long-term care facilities and nursing homes, and common indications include the administration of medications, nutrients, and fluids. These catheters require proper maintenance and care to avoid complications such as phlebitis, infiltration, occlusion, local infection, and bloodstream infection. Recently it has been suggested that PIV catheter use may lead to a higher rate of complications than previously thought. This is important because some studies have claimed that the rate of bloodstream infections due to PIV catheters is actually comparable to the rates observed with central venous catheters, rather than much lower as previously thought. Moreover, catheter-related infections are now seen as largely preventable. Our goal was to review the current literature and provide an overview of the various approaches used to manage PIV catheter sites as well as review current recommendations.

Keywords: *dressings, peripheral IV site, transparent films*

Introduction

Various parameters have an influence on possible catheter complications, such as the type of catheter, the site of insertion, the skin preparation method used, the dressing selected to cover the site, the securement method, the catheter dwell time, the frequency of replacement, and the patient population studied. For example, a recent publication looked at various parameters relevant to peripheral intravenous (PIV) catheters and their influence on phlebitis.[1] It is difficult to determine the contribution of each of those parameters when complications occur, and it is beyond the scope of this article to cover all these factors or try to determine their relative importance. Our focus is on the dressings used to cover PIV catheters and their role in preventing infection. Figure 1 illustrates examples of different dressing approaches for PIV access sites, from lowest to highest cost (ie, only considering unit cost and not overall cost of treatment). With each unit cost increase, additional features of the product increase benefits for the care of PIV catheter insertion sites.

How common are PIV catheters?

A variety of different catheters are used in hospitals and PIV catheters are the most frequently used.[2,3] A larger body of literature exists on the complications associated with central venous catheters because they are perceived as being more invasive and more likely to have serious complications. Recently, more attention has been given to PIV catheters because the frequency of their use is higher, and they are also more likely to be inserted in emergency situations where it is not always possible to follow a strict protocol. Therefore the rate of complications for these devices has been hypothesized to be higher than previously thought,[4-6] or at least significant in absolute numbers of patients affected given the large numbers of patients who receive them.[7] This becomes even more important in light of the many reports suggesting overuse of these devices, especially in emergency departments where the insertion is likely to be a routine procedure at admission and done in conditions that are often not optimal

Correspondence concerning this article should be addressed to sfbernatchez@mmm.com

http://dx.doi.org/10.1016/j.java.2014.09.001

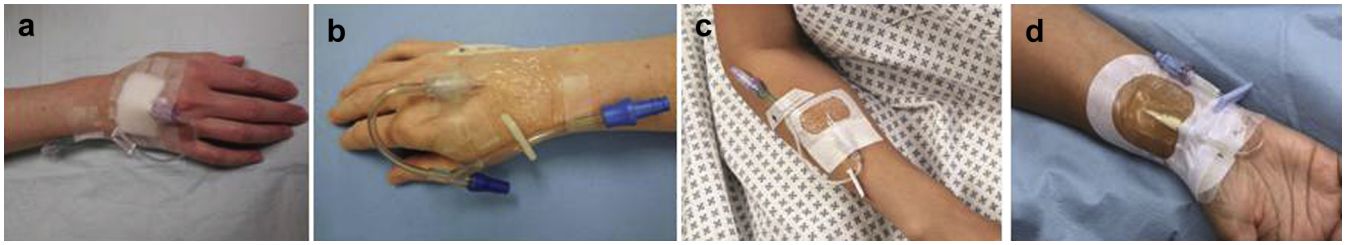

Figure 1. **Examples of dressings for peripheral intravenous access sites. (A) Gauze and tape. (B) Transparent film dressing. (C) Bordered transparent film dressing. (D) Bordered transparent film dressing with chlorhexidine gluconate gel patch. © 3M 2013, 2014. All rights reserved.**

given the urgency of the situation. Pujol et al[4] published a study showing that the number of bloodstream infections (BSIs) caused by PIV catheters and central venous catheters was similar, and that PIV catheters inserted in the emergency department caused the highest number of episodes. Abbas et al[8] found in a small study (106 patients, 86 with PIV catheter insertion) that 49% of the PIV catheters inserted at emergency department admission were never used. Guidance from epic3[9] includes removing these devices as soon as they are no longer needed.

How often is infection a problem?

Hospital-acquired BSIs are important causes of complications and mortality in the United States, and the proportion due to antibiotic-resistant organisms is increasing in US hospitals. This information was reported through a surveillance study involving 24,179 infections observed over a period of 7.5 years in 49 participating hospitals.[10] Intravascular devices were the most frequent predisposing factor for BSIs, and half of cases occurred in a critical-care setting. The authors further estimated that there may be >10,000 PIV catheter-related *Staphylococcus aureus* bacteremia infections in hospitalized adults in the US each year.[10] In addition to the pain and discomfort experienced by patients, the added costs of BSIs to the health care system are significant.[11]

Infection in PIV catheter sites is believed to occur mainly from normal skin flora bacteria migrating into the puncture wound made at the time of insertion.[12,13] *Staphylococcus epidermidis* has been reported to account for approximately 70% of catheter-related infections.[14-16] Other authors have cited *Staphylococcus aureus* as the main cause of infection,[4] or at least as another significant contributor.[5] Therefore, the skin disinfection method used before the insertion of a catheter and the type of dressing used to cover the site and protect it from outside organisms have significant influences on the risk of infection. For skin disinfection, chlorhexidine gluconate has recently been found to be superior to povidone-iodine and octenidine in a clinical trial involving 57 patients and measuring catheter-related colonization and sepsis.[17] This is reflected in current guidelines from the Infusion Nurses Society, which advocates the preferred use of chlorhexidine gluconate for skin preparation, except in infants younger than age 2 months.[18] For dressings, if using gauze and tape, the gauze used should be sterile and the tape should be from a sealed packet. It is important to note that although gauze may be sterile coming out of its package, it does not provide a waterproof barrier and over time it can get contaminated and will need to be changed more often. Partially used surgical tape rolls that have been open for undetermined amounts of time have been found to be frequently contaminated with bacteria, including multidrug-resistant organisms.[19] The frequency of dressing change is also a factor to consider: Dressings definitely need to be changed if soiled or damaged, but if still intact, changing a dressing may contribute to introducing contamination. A recent study[20] demonstrated that clinically indicated replacement of PIV catheters instead of routine replacement was adequate and did not lead to increased complications. The topic of clinically indicated catheter replacement was considered an unresolved issue in the 2011 Centers for Disease Control and Prevention guidelines,[13] but the findings of a 2012 study[20] have been incorporated into the recent 2014 epic3 guidelines.[9] A clear implication of reducing the frequency at which PIV catheters are changed is that the dressings used need to effectively hold on longer than when catheters were changed every 48-96 hours. Transparent films allow visual inspection of an insertion site and can typically be changed less frequently than gauze and tape, and they are therefore favored in the new epic3 guidelines.[9]

The implementation of an evidence-based educational program and a defined protocol can successfully reduce PIV catheter-related complications in a hospital setting. Fakih et al[21] described improvements in PIV catheter care after the implementation of an educational program in a 804-bed tertiary-care teaching hospital in Michigan and provided information on infection rates before and after the intervention. They reported a preintervention rate of PIV catheter-associated BSI of 2.2 cases per 10,000 patient-days, and a postintervention rate of 0.44 cases per 10,000 patient-days, which represented a statistically significant improvement ($P = .016$). This study[21] included 4,434 PIV catheters over a period of about 1 year and the authors concluded that enforcing compliance to guidelines is key to reducing PIV catheter-related infections, and this is possible through an educational intervention paired with an evaluation of performance. Although their study did not focus specifically on dressings but on documentation of PIV catheter duration and scrubbing the hub, all aspects of PIV catheter care are important to reduce