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## SPECIAL ARTICLE

# Peripheral venous catheter, a dangerous weapon. Key points to improve its use

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**Abstract** Catheter-related bacteremia is one of the most important causes of nosocomial infection. It is associated to high rates of morbidity and mortality, including an economic burden. Peripheral venous catheter bacteremia is a leading cause of nosocomial infection in internal medicine departments. In this article, we review some important key points to improve its use and avoid infections.

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### Catéter venoso periférico, un arma peligrosa. Puntos clave para mejorar su uso

**Resumen** La bacteriemia relacionada con el uso de catéteres venosos es una de las principales causas de infección nosocomial que se asocia a importante morbilidad, mortalidad e incremento del gasto sanitario. El catéter venoso periférico es una causa importante de bacteriemia nosocomial en los servicios y/o unidades médicas. En este artículo revisamos los aspectos más importantes de su uso que pueden contribuir a prevenir la infección relacionada con estos catéteres periféricos.

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Catheter-related bacteremia (CRB) is an important cause of nosocomial infection, associated with high morbidity and mortality rates and a considerable economic burden.<sup>1,2</sup> In 2006, Maki et al. graded the risk of bloodstream infection in adults with various intravascular devices,<sup>3</sup> concluding that the risk is higher in patients with large central venous catheters (CVCs) than in those with short peripheral venous catheters (PVCs), according to the number of days the catheter is in place.

Standard recommendations for prevention of catheter-related infection based on the best available evidence are periodically published by scientific societies.<sup>4-6</sup> This has contributed to reducing the infection risk of venous catheterization, mainly in intensive care units (ICU) where CVCs are commonly used. However, there is scant information about prevention in relation to PVCs. Recently, an expert consensus document was published on the prevention, diagnosis, and treatment of short-term PVC-related infection in adults.<sup>7</sup> The aim of this article is to present and discuss the key points that can contribute to better use of short-term PVCs in hospital wards.

## The magnitude of the problem

A recent prevalence study showed that 81.9% of patients admitted to Internal Medicine departments have one or more catheters inserted, among which 95% were short-term PVCs.<sup>8</sup> PVC use is much more extensive than the use of CVCs. For example, in one community hospital in our setting, 60 PVCs were placed for each CVC (unpublished data from Mataro Hospital; Mataro, Spain).

In the laboratory-based surveillance registry of hospital-acquired CRB in Catalonia (northeast Spain) during 2007–2010, which included 2977 CRB episodes from 40 hospitals, 1 out of 5 episodes was caused by a PVC.<sup>9</sup> Analysis of data from outside the ICU has shown that PVC infection is even more relevant in this setting. In one university-affiliated hospital, 150 CRB episodes were detected in non-intensive care patients over a 12-month period: 77 were PVC-related and 73 CVC-related.<sup>10</sup> Furthermore, *Staphylococcus aureus* was more commonly the cause of PVC episodes than CVC episodes ( $p < 0.01$ ) and this led to a higher rate of infectious complications, including nosocomial endocarditis, in patients with PVCs. Mortality was similar in the two groups. A study carried out in a community hospital<sup>11</sup> also showed the importance of *S. aureus* as a cause of PVC bacteremia; the complication rate and related mortality were not inferior to those of CVC bacteremia. These data underscore the relevance of PVCs and their high associated risk of nosocomial bacteremia.<sup>12</sup> Clearly, preventive measures focusing on the management of peripheral lines should be implemented and adopted in clinical practice.

## State of the art

A prevalence survey about PVCs management was carried out in 47 Internal Medicine departments ( $n = 2090$  patients).<sup>8</sup> It included an interview with the head nurses using a standardized questionnaire to assess local policies and practices for daily care of intravenous catheters as compared to international standards. The results showed a huge need for

improvement regarding catheter use and care. It was estimated that 19% of the catheters in place were no longer necessary. A daily record of the need for a catheter was available in only 40.6% of cases.<sup>8</sup> In addition, several observational studies have shown that there is a lack of knowledge on how to use PVCs by attending staff and great differences in the handling of these devices.<sup>13-16</sup>

## Opportunities to improve

Based on the results of observational studies and the evaluation of staff knowledge about the risk factors for infection and handling of PVCs, we think there are many opportunities to improve catheter use and care. Several guidelines and consensus documents are available on the prevention, diagnosis, and treatment of CVC-related infections, especially in the ICU, and these have contributed to reduce the risk of infection. However, these guidelines do not focus on peripheral lines.<sup>4-6</sup>

In 2016, a panel of experts from the Spanish Societies of Internal Medicine (SEMI), Cardiovascular Infections (SEICAV), Chemotherapy (SEQ) and Thoracic and Cardiovascular Surgery (SECTCV) joined forces to establish recommendations based on the best available evidence for PVC management. Many recommendations had a low quality of evidence because of the lack of well-designed studies in this field.<sup>7</sup> In the current article, we will discuss some recommendations that we believe are key points to improve PVC management, and that will contribute to reduce PVC bacteremia episodes.

First, we should consider the need for a PVC. A venous line should not be placed as a routine act.<sup>17</sup> Many practitioners prefer to prescribe intravenous drugs, even though the patient's clinical condition would allow oral administration, and treatment alternatives with an equally effective pharmacokinetic profile are available. Prevalence studies have shown that almost 38% of PVCs are not necessary.<sup>17,18</sup> Avoiding unnecessary venous catheterization is obviously the main action to prevent catheter-related bacteremia. When an intravenous access is needed, it is mandatory to choose the catheter type in accordance with the expected duration of catheterization and the use for which it is required. Intravenous therapy planned for more than 6 days, or a catheter needed for major procedures such as hemodialysis, plasmapheresis, chemotherapy, parenteral nutrition, or monitoring fluid replacement therapy, among others, require the use of a central line rather than a peripheral one.<sup>6,19</sup>

Second, inserting a PVC into a central vein does not make much sense. If it is necessary, upper extremity veins are preferable to minimize the risk of infection. Insertion of a PVC does not require a sterile surgical field, as is mandatory for CVCs, but an aseptic technique is mandatory. The skin must be disinfected, and no differences have been seen between the use of alcoholic chlorhexidine or iodine. The insertion site should not be touched after disinfection. The caregiver inserting the PVC can wear clean single-use gloves instead of sterile ones, and the catheter must be handled from its proximal end. Additional measures of asepsis are not required. Nonetheless, when there are doubts about adherence to these basic rules, the catheter should be removed and replaced by another, if needed.

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