

# Management and Nursing Strategies in the Prevention of Central Venous Catheter-Related Bacteremia in Pediatrics

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## Abstract:

### ➤ *Introduction*

Central venous catheters are an indispensable resource in the life support of critically ill pediatric patients, allowing the administration of complex treatments that peripheral venous catheters cannot tolerate. However, their use carries significant risks of mechanical and infectious complications that increase morbidity, mortality, and hospital operating resources. Globally, bloodstream infections associated with these devices represent alarming mortality rates, especially in intensive care units.

### ➤ *Objective*

To synthesize the current scientific evidence on the most effective interventions to prevent central venous catheter-related infections in the pediatric population.

### ➤ *Methodology*

A descriptive bibliographic review was carried out of scientific literature indexed in databases such as SciELO and Pubmed, selecting articles published between the years 2020 and 2025.

### ➤ *Results*

The evidence highlights that the implementation of "care bundles" and compliance with aseptic standards are the most effective barriers against bacterial colonization.

It was identified that factors such as the insertion site (the jugular route being the one with the lowest infectious risk) and continuous technical training of nursing staff are determinants for clinical success.

### ➤ *Conclusion*

The safety of pediatric patients depends on a multidisciplinary approach that prioritizes the standardization of evidence-based protocols to mitigate preventable risks.

**Keywords:** *Bacteremia, Central Venous Catheter, Care Management, Pediatrics, Infection Prevention.*

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## I. INTRODUCTION

Central venous access devices are essential tools in modern medicine, designed to reach the bloodstream at a deep level. They are fundamental in pediatrics, as they facilitate the administration of critical therapies, inotropic support, and parenteral nutrition that cannot be managed via peripheral lines. Depending on the treatment required, these devices can be temporary or permanent. (1)

Despite their benefits, these catheters are the leading cause of primary nosocomial bacteremia. In pediatric patients, the risk of infection is increased by factors such as underlying pathology, the number of lumens, frequent manipulation, and the insertion technique. The anatomical site of placement has been documented to have a significant influence; while the femoral route has a high colonization rate (50.7%), the jugular route is associated with a lower incidence of infections. (1)

The impact of these complications is severe. In the United States, 250,000 cases of catheter-related bloodstream infections are reported annually, with a mortality rate of between 12% and 25% in pediatric intensive care units. In Mexico, these infections are the most frequent, leading to a substantial increase in hospital stays and healthcare operating costs.

To mitigate this problem, the implementation of evidence-based protocols, such as "checklists," has proven remarkably effective. These programs have reduced infection rates from 2.9 to 0.8 cases per 1,000 catheter-days in recent years. (2) Therefore, it is imperative that healthcare personnel have a clear consensus on diagnosis and prevention, ensuring the rigorous application of aseptic and antiseptic measures. (3)

## II. MATERIAL AND METHOD

A descriptive and documentary literature review was conducted on strategies for preventing central venous catheter-associated infections in the pediatric population. The search focused on scientific articles and clinical reports indexed in the SciELO database and in the journal *Enfermería (Nursing)*.

A literature search was conducted on the prevention of venous catheter-related infections in pediatric patients; the search was performed in SciELO, a nursing journal.

As a selection criterion, recent publications between the years 2020 and 2025 were considered. To locate the documents, specific descriptors and keywords were used in both Spanish and English, such as: Catheter, Infection, Pediatrics and nursing.

The analysis process was structured around 3 fundamental axes

- The identification of current preventive strategies.
- The analysis of the clinical impact of these interventions.

- A detailed description of the role played by the nursing professional in the monitoring and maintenance of these devices.

In total, 5 main articles that met the criteria of temporality and thematic relevance for the fulfillment of the study objectives were selected and analyzed in depth.

## III. RESULT

The findings of this review confirm that the implementation of standardized strategies, specifically the care bundles, constitute the most relevant and necessary intervention in the current clinical setting. These protocols, supported by scientific evidence, have proven to be the primary tool for reducing the risk of adverse events in care and ensuring compliance with aseptic techniques. (2)

A key element that emerges from the analysis is the leading role of the nursing professional. As the person responsible for all maintenance and monitoring of the device, their performance is crucial to the success of any prevention program. The literature analyzed between 1999 and 2018 underscores that the effectiveness of these interventions depends on three strategic pillars: the clear identification of preventive techniques, the constant measurement of their impact, and the empowerment of the nurse as a manager of patient safety. (4)

However, the application of these protocols faces significant structural challenges. Critical barriers limiting prevention practices have been identified, including work overload and insufficient supply of personal protective equipment. Furthermore, technical factors such as the choice of insertion site and the type of needle used remain variables that favor the proliferation of microorganisms if not properly managed. (3)

Finally, the data reveal that the choice of infection rates is not an isolated event, but the result of a multidisciplinary approach that includes institutional will, continuing education, and constant feedback on the results obtained.

## IV. CONCLUSION

Implementing strict protocols and evidence-based strategies for preventing central venous catheter-associated infections is an essential priority in pediatric hospital management. These complications not only pose a direct threat to the stability and lives of the most vulnerable patients, but also impose an excessive economic burden on healthcare systems due to increased length of stay and the consumption of additional resources.

It is concluded that success in reducing infection rates depends on a multidisciplinary approach where continuous training, epidemiological surveillance, and adherence to care

bundles are the norm. In this scenario, the nursing professional is consolidated as the central pillar of patient safety, with their role as caregiver and technical manager being the decisive factor in mitigating preventable risks. Finally, it is necessary for institutions to guarantee the supplies and optimal working conditions so that staff can effectively and safely implement these preventative practices.

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