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THEORETICAL ARTICLE/ESSAY

Evidence-based practice in peripheral intravenous catheterization: The road ahead in Portugal

Prática baseada em evidência no âmbito da cateterização venosa periférica: O caminho a seguir em Portugal

Práctica basada en la evidencia en el cateterismo intravenoso periférico: Camino a seguir en Portugal

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Abstract

Background: Vascular access is a rapidly evolving field in modern healthcare that presents challenges across diverse clinical settings. Recent data indicate shortcomings in peripheral vascular access care for patients and nurses in Portugal.
Objective: Given the ongoing challenges faced by Portuguese nurses in providing quality care to patients requiring peripheral intravenous access, we aim to identify and discuss potential ways forward in this field.
Main Topics Under Analysis: The advancement of the field in Portugal involves the development of a clinical standard of care for peripheral intravenous catheterization in pediatric and adult patients, as well as the formal recognition of vascular access as an enhanced nursing competency. Additionally, a long-term focus on institutional initiatives to establish permanent Vascular Access Specialist Teams in Portuguese primary and tertiary care settings is recommended.
Conclusion: The proposed pathways are consistent with the current evidence-based, patient-centered nursing care paradigm, as well as with international calls to action on fostering efficient, sustainable, and safe patient care.

Keywords: evidence-based practice; nurses; catheterization, peripheral; Portugal

Resumo

Enquadramento: Os acessos vasculares são uma área dos cuidados de saúde em rápida evolução, apresentando desafios em diversos contextos clínicos. Dados recentes indicam lacunas na prestação de cuidados relacionados com a cateterização venosa periférica, tanto para utentes como para enfermeiros, em Portugal.
Objetivo: Considerando os desafios enfrentados pelos enfermeiros portugueses na prestação de cuidados de qualidade a pessoas com necessidade de cateterização venosa periférica, pretendemos identificar e explorar potenciais caminhos neste domínio.
Principais tópicos em análise: O avanço desta área em Portugal será possível através do desenvolvimento de uma norma clínica para a cateterização venosa periférica em doentes pediátricos e adultos, assim como através do reconhecimento formal de competências acrescidas em Enfermagem no âmbito dos acessos vasculares. Além disso, recomenda-se a necessidade de desenvolver iniciativas organizacionais que culminem na formalização de equipas especializadas de acesso vascular que apoiem as unidades de cuidados de saúde primários e hospitalares em Portugal.
Conclusão: Os caminhos apresentados convergem com o atual paradigma de cuidados de enfermagem informados por evidência e centrados na pessoa, assim como com recomendações internacionais no que respeita à promoção de cuidados de saúde mais eficientes, sustentáveis e seguros.

Palavras-chave: prática clínica baseada em evidências; enfermeiras e enfermeiros; cateterismo periférico; Portugal

Resumen

Marco contextual: El ámbito de los accesos vasculares se ha desarrollado rápidamente en Portugal y se suma a los retos en una amplia variedad de contextos clínicos. Datos recientes muestran que existen lagunas en la prestación de cuidados en este ámbito, tanto para los pacientes como para los profesionales.
Objetivo: Considerando los retos a los que se enfrentan los enfermeros portugueses a la hora de proporcionar cuidados de calidad a las personas que necesitan un cateterismo venoso periférico, pretendemos identificar y discutir posibles formas de avanzar en este ámbito.
Principales temas de análisis: El progreso en este ámbito en Portugal será posible a través del desarrollo de un estándar clínico nacional, así como a través del reconocimiento formal de un aumento de las competencias de enfermería en el ámbito de los accesos vasculares. Además, es necesario desarrollar iniciativas organizativas que conduzcan a la formalización de equipos de acceso vascular en los contextos clínicos portugueses.
Conclusión: Los caminos presentados convergen con el paradigma actual de los cuidados de enfermería basados en la evidencia y centrados en la persona, así como con las recomendaciones internacionales actuales relativas a la promoción de unos cuidados sanitarios más eficaces, sostenibles y seguros.

Palabras clave: práctica clínica basada en la evidencia; enfermeras y enfermeros; cateterismo periférico; Portugal

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Introduction

Obtaining vascular access is one of the most common procedures in modern healthcare for the administration of drugs, fluids, nutrients, or blood products and for diagnostic purposes (e.g., contrast medium administration, blood collection). Given its technical simplicity, low cost (compared to other vascular access devices), and the possibility of a rapid response in a variety of clinical scenarios, vascular access is often achieved through the insertion of short peripheral intravenous catheters (PIVCs).

Approximately two billion PIVCs are inserted annually worldwide, making it one of the most common invasive procedures performed in clinical settings (Alexandrou et al., 2018). In Portugal, according to the most recent data from the private and public health sectors, the year 2021 witnessed a substantial volume of care activities, including 6.5 million emergency department visits, 1.1 million hospital admissions, and 1.173 million surgeries (Instituto Nacional de Estatística, I.P., 2023). With a conservative estimate that more than 60% of patients admitted from the emergency department to a regular ward may require a PIVC (Mattox, 2017), as well as the prevailing statistics in Portugal that 64.1% of surgical patients received a PIVC (Programa de Prevenção e Controlo de Infeções e de Resistências aos Antimicrobianos, 2022), it is reasonable to assume that at least 5.3 million PIVCs were used in the same year.

Despite their ubiquitous nature, they pose a risk to patient safety when multiple insertion attempts are needed or when they are improperly maintained by healthcare professionals. PIVCs may be the cause of significant local or systemic complications (Helm, 2019; Marsh, Webster, et al., 2020; Moureau, 2019), resulting in increased morbidity and mortality rates with a significant impact on health and social systems. This scenario represents a critical challenge for nursing as both a science and a profession.

In Portugal, as in most international settings, the insertion and maintenance of PIVCs fall under the responsibility of nursing teams (Alexandrou et al., 2018). Nurses' professional practice in vascular access is characterized by their role within a multiprofessional framework, where peripheral intravenous cannulation is a clinical intervention, where the nurse assumes responsibility for its implementation (Conselho de Enfermagem da Ordem dos Enfermeiros, 2001). Thus, from the initial assessment to the monitoring of post-cannulation outcomes, nurses' decision-making must be guided by the best available evidence, available resources, and patients' knowledge and care experiences, both in past and present admissions (Moureau, 2019).

Nevertheless, in Portugal, first-attempt failure rates range from 11% to 33%, and PIVC-related complication rates range from 25.8% to 70.5% (Santos-Costa et al., 2023). Based on our conservative estimates, at least 583,000 cannulations failed on the first attempt and approximately 1.2 million PIVCs failed prematurely in 2021. Despite the quality standards for nursing care proposed by the Portuguese Nursing Board (*Ordem dos Enfermeiros*), current care outcomes remain poor, as evidenced by both the high incidence of complications and the negative impact on patient health and well-being.

Given the ongoing challenges faced by Portuguese nurses in providing feasible, appropriate, meaningful, and effective care to patients requiring peripheral intravenous access, we aim to identify and discuss potential strategies and pathways in this field.

Development

Peripheral intravenous cannulation is not a recent intervention, with early mentions of this form of vascular access dating back to 1658. Since then, there have been substantial technological advancements and significant scientific progress on an international level. Despite developments in recent decades, vascular harm associated with poor PIVC insertion and maintenance practices remains a global threat to patient safety (Blanco-Mavillard et al., 2023; Helm, 2019).

Previous research conducted over the past two decades in Portugal has uncovered non-standardized interventions among nurses, both within care teams and across different clinical settings (Santos-Costa et al., 2023). These practices have been shown to have significant consequences, both in the immediate term (e.g., multiple puncture attempts, pain, and delays in intravenous treatment) and in the mid- to long-term (e.g., vascular depletion, microbial contamination, and increased risk of bloodstream infection). Similarly, we found alarmingly high rates of complications related to PIVCs in national studies (Santos-Costa et al., 2023), both in cumulative statistics by setting (range 25.8% to 70.5%) and at specific levels, such as phlebitis (9.0% to 61.5%), infiltration and extravasation (3.8% to 38.8%), obstruction (1.0% to 50.0%), and accidental removal (3.4% to 47.2%).

Paraphrasing Helm (2019), this phenomenon is acknowledged by nursing professionals and managers, but it would be unacceptable in other sectors, such as food processing and aviation. How can one of the most frequently performed invasive clinical procedures continue to pose such challenges, with the potential for adverse events? What are the current challenges faced by Portuguese nurses in this field, and what actions should be taken?

Standardization for improved patient safety

Contrary to the reality in other European and Australian settings (Australian Commission on Safety and Quality in Health Care, 2021; Cortés Rey et al., 2021), the lack of a government-endorsed standard for peripheral intravenous cannulation in Portugal leads to care variability across clinical settings and healthcare providers (Santos-Costa et al., 2023). Although the PIVC is the most common vascular access device in Portuguese care settings, care often deviates from the best available evidence. This reality aligns with the 60-30-10 challenge in healthcare, where approximately 60% of care adheres to evidence- or consensus-based guidelines, while approximately 30% represents waste or has low value, with an additional 10% resulting in harm (Braithwaite et al., 2020).

While some authors have developed care bundles for implementation in local Portuguese care settings, these intervention sets are usually developed to address local challenges with existing resources. Furthermore, the development of care bundles is time consuming and requires the combined efforts of a group of professionals with expertise in vascular access and bundle development. These experts may not be available in a significant number of wards and departments across the Portuguese healthcare system.

The lack of a common standard leads to care fragmentation (Morrow et al., 2022), with a significant impact on patients' vascular health and care experience. The delivery of patient-centered vascular access care will be undermined, from the initial assessment of a patient's vessel health to the selection of an appropriate vascular access device that will remain patent and without complications during therapy.

Optimal device selection involves a rational assessment of the patient's previous care experiences and needs, vein anatomy and health, and medical history, as well as consideration of the characteristics of the prescribed therapy, in combination with proper knowledge of the proposed treatment (Moureau, 2019). However, this step is often overlooked in Portuguese acute care settings, with unnecessary insertion of a short PIVC when other more suitable options (e.g., long PIVC, midline catheter, or peripherally inserted central catheter [PICC]) should have been considered by health professionals.

Only recently have validated instruments emerged to guide Portuguese healthcare professionals in their clinical assessment of patients who may encounter difficulty with intravenous access (Santos-Costa et al., 2020). The lack of risk assessment explains the high incidence of first-attempt failures reported in national studies (ranging from 11% to 33%), the significant number of successive attempts required to establish peripheral vascular access (up to eight attempts), and the underutilization of vein-locating technologies such as ultrasound and near-infrared imaging (Santos-Costa et al., 2023). These factors, whether isolated or combined, lead to the depletion of patients' peripheral veins over time. This depletion necessitates the use of central access options, which are known to involve higher risks and increased care costs compared to peripheral options.

Similarly, the lack of a common standard often results in low-evidence maintenance care, such as regular dressing changes, protocolized catheter replacement every 72-96 hours, the omission of catheter flushing and locking, as well as the persistence of idle catheters, among other issues described in national studies (Santos-Costa et al., 2023). Furthermore, the lack of a national standard hampers the use of common terminology when documenting care and diagnosing potential post-insertion complications such as catheter-related bloodstream infections, phlebitis, infiltration/extravasation, and catheter dislodgement.

Therefore, as a short-term goal, we believe that the Portuguese Directorate-General of Health (*Direção-Geral da Saúde*) should take the initiative to develop a single care standard in this field for both pediatric and adult patients and make it accessible to all healthcare facilities and professionals, as has already been done for other procedures such as central venous catheter (CVC) or urinary catheter insertion and maintenance. As with other existing standards, audit checklists should be available to inform professionals of current compliance rates, identify areas for improvement, and develop/implement specific interventions to tackle local challenges. These instruments will also enable benchmarking of sensitive outcomes related to nursing care in this field, taking into account structural and procedural differences between care settings (such as nurse-patient ratios, available resources, and skill mix of nursing staff).

Recognizing enhanced competencies

In Portugal, since 2017, the Nursing Board has recognized the progression of the professional activities and the gradation of complexity of nursing interventions required for the health care of citizens in different contexts, assuming the potential to define and recognize enhanced competencies (*competências acrescidas*). Enhanced competencies result from the ongoing complexity of knowledge, practices, and contexts acquired throughout a nurse's professional journey. According to the Portuguese Nursing Board, these competencies allow for a dynamic response to the healthcare needs of the population by progressively enhancing new areas of autonomous professional practice for both the nurse and the specialist nurse in order to improve and develop nursing care.

The recognition and promotion of enhanced competencies in vascular access nursing in Portugal is essential to improve the quality of care in this field, similar to what has already been legislated for other areas such as stomatherapy, infection control, or oncology nursing. As a medium-term goal, the introduction of a role for vascular access nurses, as seen in other international healthcare systems, is a crucial step to ensure efficiency, safety, and sustainability of care in this field (Chopra et al., 2017; Marsh, Larsen, et al., 2020). These professionals are highly trained in all aspects of vascular access, including the selection of the most appropriate access sites and devices, which can enhance device indwelling times and reduce discomfort during procedures. The ability of vascular access nurses to work quickly and effectively ensures that patients receive timely access to the care they need, which can lead to faster diagnosis and treatment, ultimately improving patient outcomes (Chopra et al., 2017; Marsh, Larsen, et al., 2020).

Vascular access nurses can play a pivotal role in the education and training of healthcare providers, including other nurses, physicians, pharmacists, and physical therapists (Cortés Rey et al., 2021). This enhances the overall competency of the healthcare team in caring for patients requiring vascular access. This role is particularly critical because insufficient education and training in vascular access theory and techniques can expose patients to avoidable iatrogenic complications (Chopra et al., 2017; Marsh, Larsen, et al., 2020).

Moreover, these nurses play a crucial part in disseminating knowledge and best practices to patients and their fami-

lies, especially those undergoing long-term intravenous treatments through devices such as PICC lines or central catheters in ambulatory care settings, as well as patients receiving care at home. These experienced nurses can support patients and their families through the transitions brough about by vascular access and infusion care challenges by understanding patients' experiences, the nature of change itself, and how individuals respond to it. They offer their support to enhance their well-being, preserving their self-care agency, and ability to adapt to change during and after their treatment. Adequate education and training in vascular access will require higher education institutions to develop comprehensive postgraduate courses that focus on the autonomous and interdependent role of nurses within the multidisciplinary team.

Vascular Access Specialist Teams for Streamlined Care

As a long-term goal, implementing dedicated transdisciplinary care teams is crucial for addressing vascular access challenges (Carr & Moureau, 2019; Cortés Rey et al., 2021; Morrow et al., 2022). These teams bring together experts in the field, including nurses, physicians, pharmacists, and other relevant specialists, to collectively improve care delivery. However, there is considerable international variation in the recruitment practices and criteria for VASTs (Morrow et al., 2022).

By creating multidisciplinary teams focused on vascular access, healthcare organizations can streamline care, stay updated with the latest research and technology, and proactively address complications (Ricou Ríos et al., 2023). Many VASTs are involved in research and quality improvement initiatives to advance the field and develop best practices for vascular access care (e.g., systematic monitoring of complications) (Morrow et al., 2022). Their dedication to ongoing research helps drive innovation and improvements in patient care, making them an indispensable part of the healthcare landscape (Morrow et al., 2022).

With more nurses in the frontline of healthcare than any other profession, nurse-led vascular access research is increasingly recognized as a critical pathway to practical and cost-effective ways of reducing hospital errors, cutting down on unnecessary costs, and improving patient outcomes. Additionally, VASTs can play a significant role in device procurement within their institution, ensuring that new medical device acquisitions effectively address local practical challenges and align with the latest evidence-based practices (Ricou Ríos et al., 2023).

Nonetheless, while VASTs are promising, their status may rely on anecdotal support. Obstacles to widespread implementation include a limited evidence base, insufficient investment and resources, inadequate training, and a general lack of awareness of the advantages of VASTs (Cortés Rey et al., 2021; Mussa et al., 2021). The availability of multidisciplinary teams dedicated to vascular access varies depending on institution size and type, as noted by Cortés Rey et al. (2021). Some countries, such as the United Kingdom, Italy, and Spain, exhibit stronger support for these teams in their clinical institutions compared to other countries like the Netherlands, Germany, and France (Cortés Rey et al., 2021). In Ireland, the implementation of VASTs stemmed from a broader antimicrobial resistance and infection control strategy plan outlined by the Health Service Executive (HSE) for the period 2022 -2025. The HSE implemented VASTs across tertiary referral and general hospitals with the primary objective of standardizing vascular access care and reducing the incidence of catheter-related Staphylococcus aureus bloodstream infections.

In Portugal, to the best of our knowledge, only recently has a national hospital, specifically the *Instituto Português de Oncologia de Lisboa Francisco Gentil*, formally implemented an interdisciplinary team of specialists dedicated to vascular access care who are available on-call. While this is a promising development, Portugal still lags behind other European countries with a similar population and health profile.

Conclusion

Vascular access is one of the fastest growing fields in modern healthcare, with rapid technological developments and continuous dissemination of new evidence on a wide range of clinical challenges. While obtaining peripheral vascular access is an essential intervention in various clinical settings in Portugal, from hospital wards to home hospitalization, recent evidence suggests that current care delivery is not always timely, sustainable, efficient, and safe, for patients or nurses.

In this paper, we have identified key challenges in Portugal that must be addressed to improve the overall quality of care in this field, following a path similar to that taken in other European countries. Our proposed vision for change includes the adoption of an expanded role for nurses in vascular access, with the formal definition of a set of specific competencies for their role. The establishment of these roles will enable healthcare institutions, in the context of primary or hospital care, to attract professionals with expertise in this area of intervention.

Similarly, we are confident that healthcare professionals are likely to lead institutional initiatives aimed at formalizing permanent VASTs. Healthcare professionals must be able to present comprehensive business cases and outline essential steps for successful implementation. The responsibility lies with the institution's management to implement pilot studies focused on the cost-effectiveness of these teams. This not only includes advancing safer and more sustainable healthcare practices but also recognizing the enhanced value these teams bring, acquiring technologies and devices, providing professional training, and attracting external funding for research and innovation projects in this domain.

Finally, in Portugal, the standardization of this intervention is of paramount importance to guide nurses' actions according to the latest scientific evidence available in vascular access. To this end, we believe it is essential to develop and implement a national care standard, accompanied by a specific audit tool that will alllow the standardization of terminology, the alignment of profes-

sional practices, and the benchmarking of nurse-sensitive indicators. We believe that this standard will also support undergraduate and postgraduate nursing education and training in Portugal, as well as allow research studies to be conducted based on a minimum dataset, which is lacking in most studies published by national authors to date.

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