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ORIGINAL ARTICLE

Adverse events associated to peripheral venous catheters in people hospitalized in a hospital in Chile

Eventos adversos relacionados a catéter venoso periférico en personas hospitalizadas en un hospital público en Chile

Eventos adversos relacionados a cateteres venosos periféricos em pessoas hospitalizadas em um hospital público no Chile

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ABSTRACT

Introduction: Peripheral venous catheters are widely used to administer intravenous therapy. However, they are associated with a high rate of complications. **Objective:** To describe adverse events related to the use of peripheral venous catheters in hospitalized patients undergoing emergency care. **Methodology:** This descriptive study analyzed information up to 30 days before the data collection date. The population comprised hospitalized patients in a high-complexity public

hospital in Santiago, Chile. Data analysis involved descriptive statistics and logistic regression models. **Results:** A total of 602 catheters were analyzed in 248 patients, with a peripheral venous catheter prevalence of 51.4% among hospitalized patients. The sample consisted of 46.3% women, with a mean age of 52.8 years. The medical-surgical adult unit had the highest proportion of catheters (44.3%). Of the 399 catheters with complete records, 264 (66.2%) were electively removed upon completion of intravenous therapy, whereas 135 (33.8%) were removed due to an adverse event. The most common adverse events were infiltration/extravasation without tissue damage (9.2 per 100 peripheral venous catheters), followed by phlebitis (7.7 per 100 peripheral venous catheters), and patient self-removal (4.0 per 100 peripheral venous catheters). **Conclusions:** There is a need to enhance and disseminate adequate clinical practices to prevent adverse events in patients requiring peripheral venous catheters, focusing on the most prevalent complications.

Keywords: Catheterization, Peripheral; Infusions, Intravenous; Patient Safety; Total Quality Management; Clinical Nursing Research.

RESUMEN

Introducción: El catéter venoso periférico es un dispositivo ampliamente utilizado que permite la administración de terapia intravenosa y con una alta tasa de complicaciones. **Objetivo:** Describir los eventos adversos asociados a catéter venoso periférico en personas hospitalizadas y en proceso de atención de urgencias. **Metodología:** El estudio fue descriptivo, hasta 30 días antes del día de recolección de información, la población de estudio fueron personas hospitalizadas en un hospital público de alta complejidad de Santiago de Chile. Para el análisis de los datos, se utilizó estadística descriptiva y modelos de regresión logística. **Resultados:** Se incluyeron 602 catéteres en 248 personas, con una prevalencia de catéter venoso periférico del 51,4% del total de usuarios hospitalizados. La muestra quedó conformada por 46,3% mujeres, con edad promedio de 52,8 años. El servicio con más dispositivos correspondió a médico-quirúrgico del adulto con un 44,3%. De estos 399 contaron con registro completo, en donde 264 (66,2%) se retiraron en forma electiva por termino de terapia intravenosa y 135 (33,8%) catéteres que presentaron un evento adverso y debió ser retirado. Los principales eventos adversos observados correspondieron a infiltración/extravasación sin daño tisular 9,2 x 100 catéter venoso periférico, seguida de flebitis 7,7 x 100 catéter venoso periférico y auto retiro por el paciente 4,0 x 100 catéter venoso periférico. **Conclusiones:** Los resultados expuestos permiten dirigir los esfuerzos de difusión y fortalecimiento de prácticas clínicas para prevenir eventos adversos en personas con necesidad de un catéter venoso periférico de acuerdo con los eventos adverso más prevalentes.

Palabras claves: Cateterismo Periférico; Infusiones Intravenosas; Seguridad del paciente; Gestión de Calidad en Salud; Investigación en Enfermería Clínica.

RESUMO

Introdução: O cateter venoso periférico é um dispositivo amplamente utilizado que permite a administração de terapia intravenosa e apresenta uma alta taxa de complicações. **Objetivo:** Descrever os eventos adversos associados a cateteres venosos periféricos em pacientes hospitalizados e em atendimento de emergência. **Metodologia:** O estudo foi descritivo, até 30 dias antes do dia da coleta de dados. A população do estudo foi de pacientes hospitalizados em um hospital público de alta complexidade em Santiago do Chile. Para a análise dos dados, foram utilizadas estatísticas descritivas e modelos de regressão logística. **Resultados:** Foram incluídos 602 cateteres em 248 pessoas, com uma prevalência de cateteres venosos periféricos de 51,4% de todos os usuários hospitalizados. A amostra consistiu de 46,3% de mulheres, com uma média de idade de 52,8 anos. O serviço com mais dispositivos foi o médico-cirúrgico para adultos, com 44,3%. Desses, 399 tinham registros completos, dos quais 264 (66,2%) foram removidos eletivamente

devido ao término da terapia intravenosa e 135 (33,8%) cateteres apresentaram um evento adverso e tiveram de ser removidos. Os principais eventos adversos observados corresponderam a infiltração/extravasamento sem dano tecidual 9,2 x 100 cateteres venosos periféricos, seguidos por flebite 7,7 x 100 cateteres venosos periféricos e auto-remoção pelo paciente 4,0 x 100 cateteres venosos periféricos. **Conclusões:** Os resultados acima nos permitem direcionar esforços para disseminar e fortalecer as práticas clínicas para prevenir eventos adversos em pessoas que precisam de um cateter venoso periférico de acordo com os eventos adversos mais prevalentes.

Palavras-Chave: Cateterismo Periférico; Infusões Intravenosas; Segurança do Paciente; Gestão da Qualidade Total, Pesquisa em Enfermagem Clínica.

INTRODUCTION

Each year, a large number of patients around the world are harmed or die as a result of unsafe healthcare procedures, leading to a significant burden related to mortality and disability. It is estimated that 1 in 10 patients experiences an adverse event (AE) while receiving care in hospitals in high-income countries.[1]

According to the Health Quality Observatory of the Chilean Ministry of Health (MINSAL), an AE is an "unintentional injury or complication resulting in disability at discharge, death, or an extended hospital stay, caused by healthcare management rather than the patient's underlying disease."[2]

In the United States, evidence indicates that 23.6% of service users experienced an AE among 2,809 patients. The most frequent AEs were related to medication errors (39%), surgical or procedural events (30.4%), nursing care-related events (15%), and healthcare-associated infections (11.9%).[3] Similarly, a scoping review published by Schwendimann et al. found that the most common AEs among hospitalized adult patients (≥18 years old) were related to surgical procedures, medication/fluid errors, and healthcare-associated infections.[4]

Peripheral Venous Catheter (PVC) is a device used to administer short-term infusion therapy to individuals who require it. However, it is associated with a high rate of complications or AEs and a wide variability of contributing factors.[5-8]

Blanco-Mavillard et al. note several recommendations to reduce complications in patients with a PVC. For catheter insertion, these include hand hygiene, aseptic non-touch technique, use of antiseptics for skin preparation before puncture, avoiding PVC use for intravascular therapy with osmolarity above 600 mOsm/L or vesicant or irritant therapy, and appropriate site selection for catheter placement. For maintenance care, recommendations include the use of sterile, transparent, semipermeable polyurethane dressings; changing the dressing every 7 days or sooner if compromised; dressing removal using a stretch technique from the edges toward the center; applying antiseptic at the insertion site during each dressing change; inspecting the insertion site every shift; removal of the PVC if complications arise or if no longer needed; flushing the catheter with saline using a pulsatile flow technique; disinfecting access ports for 15 seconds and allowing them to dry; changing the peripheral parenteral nutrition (PPN) infusion set every 24 hours; and using needleless connectors to maintain a closed system, among other measures.[9]

According to Miliani et al., in a multicenter observational study conducted in France involving 815 peripheral venous catheters (PVCs) in 573 patients from medical-surgical units, the incidence of PVC-related AEs was 52.3 per 100 AEs.[10] The most frequent ones were phlebitis (20.1/100 AEs), hematoma (17.7/100 AEs), fluid/blood leakage (13.1/100 AEs), and obstruction/occlusion (12.4/100

AEs). Similarly, Ghali et al. reported a PVC-related AE incidence of 8.81 per 1,000 PVC days, with pain being the primary symptom in 50% of cases.[11]

In terms of the type of intravenous therapy contributing to PVC-related AEs, a scoping review found that 12% of AEs were associated with norepinephrine administration via PVC.[12] Additionally, administration of amiodarone through PVC has been associated with phlebitis in 44% of patients receiving this medication.[13]

Shimoni et al. found that the most frequent AE among hospitalized older adults was accidental PVC dislodgement, with an incidence of 21.5 per 1,000 PVC days. Risk factors for this included advanced age, intravenous antibiotic therapy, and disorientation.[14]

A systematic review and meta-analysis including 478,586 PVCs reported complications in more than one-third of patients with this device, with a general incidence rate of 4.4 per 100 catheter days. These complications often require premature catheter removal due to failure or AE, resulting in the suspension of ongoing intravenous therapy and requiring catheter replacement.[15] In this regard, a prospective multicenter study involving 5,345 patients estimated an overall PVC failure rate of 54.05%. The most common causes were phlebitis (16.3%) and infiltration/extravasation (13.8%). Predictive factors for failure included patient age, admission to surgical or emergency units, venipuncture within the past week, catheter insertion site, number of cannulation attempts, administration of irritant intravenous therapy, intravenous therapy volume, and type of flushing solution.[16] Similarly, Marsh et al. reported that the most common complications were occlusion/infiltration (23%), phlebitis (12%), and unintentional PVC dislodgement (7%).[17]

Regarding the anatomical site of insertion, Liu et al. found that the risk of occlusion nearly doubled when the PVC was inserted on the dorsum of the hand, and the risk of infiltration tripled when inserted in the antecubital fossa.[18]

Additionally, it has been reported that infiltration/extravasation is significantly more common in PVCs inserted in emergency departments compared to other clinical settings.[19]

Among older adults, the main cause of PVC removal has been reported as obstruction or malfunction of the vascular device, accounting for 33.3% of cases.[20] In the same age group, a complication rate of 50.5 per 1,000 PVC days has been found, with the most frequent complications associated with dressing replacement, furosemide infusion, vancomycin administration, urinary incontinence, and hematoma at the catheter insertion site.[21]

According to a multicenter prevalence study by Takashima et al., 78% of hospitalized pediatric patients had at least one invasive device, with peripheral venous catheters being the most common (54.1%). One-third of these cases experienced a complication.[22] In the pediatric population, PVC failure has been quantified at 38%, characterized by complications such as infiltration, accidental removal, occlusion, leakage, and phlebitis.[23] Karaoğlan et al. identified continuous intravenous therapy infusion as a significant independent risk factor for infiltration in this population.[24]

In newborns, the complication rate for all types of vascular devices is 62.5 per 1,000 catheter days, with PVCs accounting for the highest number of complications—37% of all catheters. Infiltration and extravasation are the most frequent AEs, often leading to catheter removal.[25] In this area, midline peripheral catheters (MPCs) offer advantages over short peripheral venous catheters (SPVCs), including longer dwell time, fewer replacements, and a lower risk of extravasation in newborns with birth weights ≥1500 g, making them a viable strategy for preserving venous access in this population.[26]

In Chile, there is limited information on AEs associated with the use of PVCs in hospitalized patients despite the global relevance of this issue and the high rates of complications related to the maintenance of these devices. Consequently, this study aims to describe the adverse events associated with peripheral venous catheters in hospitalized patients at a high-complexity public hospital in Santiago, Chile.

METHODOLOGY

This was an observational, cross-sectional point-prevalence study of adverse events related to peripheral venous catheters (PVCs) in hospitalized patients at a high-complexity public healthcare facility. The study followed the recommendations of the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) Statement for observational studies.[27]

The study population consisted of hospitalized patients using PVCs in inpatient clinical units of a high-complexity hospital in Santiago, Chile, with 482 individuals at the time of data collection.

A non-probabilistic convenience sampling approach was used, including all available cases with at least one PVC present on January 30, 2023—the date of the point-prevalence assessment.

Inclusion criteria were patients hospitalized for more than 12 hours on January 30, 2023, in inpatient clinical units of a high-complexity hospital, who had a short peripheral venous catheter in place at the time of the prevalence survey. The clinical units included in this assessment were adult and pediatric medical-surgical wards; adult and child-adolescent psychiatry units; adult, pediatric, and neonatal intensive care units; adult, pediatric, and obstetric emergency departments; and the obstetrics and gynecology department.

Data collection was carried out on the day of the prevalence assessment, considering each patient's hospitalization history. Medical records were reviewed retrospectively for up to 30 days before the date of data collection.

A data collection form was developed and validated by consensus with the hospital's vascular access nursing team. This form included sociodemographic variables such as age, sex, clinical unit, hospitalization day at the time of the prevalence assessment, number of PVCs during hospitalization, dwell time of the PVCs (in hours), date and time of insertion, type of intravenous therapy (IVT) flow administered through the PVC, clinical service where the catheter was placed, device gauge, number of insertion attempts until successful placement, anatomical site of the catheter, and reason for PVC removal, which could include adverse events (AEs), completion of therapy, or absence of complications at the time of data collection. During data collection, hospitalized patients were assessed through physical examination and clinical chart review (with a maximum lookback of 30 days for extended hospitalizations).

Data analysis was carried out using descriptive statistics for quantitative variables and frequency distributions and percentages for qualitative variables. A generalized logistic regression model was applied for categorical variables to determine whether the presence or absence of adverse events was statistically associated with characteristics of catheter insertion or maintenance. The incidence rate was determined using the formula (total PVCs with AEs / total PVCs evaluated during the period) × 100.

Data management and storage were completed using Microsoft Excel version 16.75 and the R statistical software. Results were grouped by hospital unit or service and categorized by level of care complexity (critical, intermediate, or basic care) and emergency services.

This research followed the ethical principles proposed by Ezekiel Emanuel.[28] It was approved by the hospital's scientific ethics committee under resolution 04/2024. All data were de-identified and

extracted from an executive report prepared between February and May 2024 in collaboration with the Subdirectorate of Nursing Care Management, the Subdirectorate of Midwifery, the Department of Quality and Patient Safety, and the hospital's vascular access nursing team, as part of the annual continuous improvement plan for inpatient care processes.

RESULTS

The sample included 602 peripheral venous catheters (PVCs) in 248 patients. Patients with at least one catheter in place at the time of the prevalence assessment represented 51.4% of all hospitalized individuals. Of the total sample, 46.3% were women, and the mean age was 52.8 years. The most common hospital units included adult medical-surgical (44.3%, n = 110), obstetrics and gynecology (19.7%, n = 49), and adult emergency services (16.5%, n = 41) (Table N°1).

Table N°1: Characteristics of hospitalized patients with a peripheral venous catheter (n = 248).

Sex	**n**	**%**
Feminine	115	46,3
Masculine	133	53,6
Age		
≤1 year	11	4,4
> 1 y <18 years	20	8,0
≥18 years y <60 years	123	49,5
≥60 years	94	37,9
Hospital Units		
Adult medical-surgical	110	44,3
Pediatric medical-surgical	17	6,8
Adult UCI	13	5,2
Pediatric UCI	5	2,0
Neonatal UCI	6	2,4
Adult emergency services	41	16,5
Infant emergency services	1	0,4
Obstetrics and gynecology unit	49	19,7
Other Hospital Unit	6	2,4
Days of hospitalization		
1 a ≤7 days	174	70,1
8 a ≤ 14 days	42	16,9
≥15 days	32	12,9

*ICU: Intensive Care Unit.

Source: Created by the authors.

The most frequently used devices were 20-gauge PVCs, accounting for 196 (49.1%) of all catheters. A total of 174 PVCs (43.6%) were successfully inserted on the first attempt, 135 PVCs (33.8%) were placed in the arm flexion area, and 195 PVCs (49.8%) were used with mixed-flow IV therapies (Table N°2).

Two hundred and three (33.7%) PVC records were excluded from the AE analysis due to incomplete data on the chart regarding the reason for catheter removal (i.e., completion of IV

therapy, continued need for the device, or presence of an adverse event). Among the PVCs with complete records on catheter removal, 399 devices remained, of which 264 (66.1%) were electively removed after IV therapy completion and 135 (33.8%) due to an AE. The average number of catheters per patient was 3.4, ranging from 1 to 13 PVCs during hospitalization.

Table N°2: Characteristics of PVCs and AE records in hospitalized patients (*n* = 399).

PVC gauge	**Total**	**%**	**PVC with AE**	**PVC without EA**
26 gauge	2	0,5	1	1
24 gauge	20	5,0	4	16
22 gauge	74	18,5	27	47
20 gauge	196	49,1	74	122
18 gauge	102	25,5	26	76
16 gauge	5	1,2	3	2
Number of attempts for successful installation	**n**	**%**	**with AE**	**without AE**
First attempt	174	43,6	54	120
Second attempt	24	6.0	5	19
Third or more attempts	13	3,2	4	9
No record of the number of attempts	188	47,1	72	116
Anatomical area	**n**	**%**	**with AE**	**without AE**
Back of hand	67	16,7	14	53
Arm flexion	151	37,8	61	90
Forearm	135	33,8	40	95
Wrist flexion	9	2,2	1	8
Back of foot	16	4,0	10	6
Another anatomical area	5	1,2	2	3
without registration of the anatomical area	16	4,0	7	9
Type of flow used	**n**	**%**	**with AE**	**without AE**
Continuo	70	17,5	18	52
Intermittent	112	28,0	41	71
In bolus	22	5,5	3	19
Mixed (continuo and intermittent)	195	49,8	73	122

Source: Created by the authors.

Of the inserted PVCs, 225 (56.3%) were associated with Difficult Intravenous Access (DIVA). Among them, 81 patients experienced an AE, representing 56.3% of those identified with DIVA.

Of the 399 PVCs analyzed, 85 lacked sufficient data to calculate dwell time (i.e., missing date and/or time of insertion). The average dwell time among the PVCs with complete records was 53.1 hours.

The overall rate of AEs associated with PVCs was 33.8 per 100 catheters. The most frequently reported AEs were infiltration/extravasation without tissue damage (9.2 per 100 PVCs), followed by phlebitis (7.7 per 100 PVCs), and accidental removal by the patient (4.0 per 100 PVCs). When analyzed by major clinical service groups, the rate of infiltration/extravasation without tissue damage was 11.1 per 100 PVCs in adult services, 5.2 per 100 PVCs in pediatric/neonatal services, and the highest rate of obstruction/occlusion was found in the gynecology-obstetrics service (7.6 per 100 PVCs) (Table 3).

Al comparar los EA asociados a CVP de acuerdo a complejidad de cuidados en el cual estaba hospitalizado el paciente, el EA más registrado en unidades críticas corresponde a flebitis con una tasa de 16,6 x 100 CVP, mientras que para cuidados medios se objetivó en infiltración/extravasación sin daño tisular calculado en 12,9 x 100 CVP, por otra parte para cuidados básicos correspondió a oclusión/obstrucción del catéter y auto retiro del dispositivo por el paciente con una tasa para ambos EA de 7,6 x 100 CVP, en tanto que para servicios de urgencias el principal EA concernió al auto retiro del CVP por el paciente correspondiente a 9,0 x 100 CVP (Tabla N°4).

Table 3: Rate of adverse events associated with PVCs by clinical service block per 100 PVCs

Type of adverse events	N° of events	Rate x 100 PVC	Blocks		
			Adult (n=304)	Pediatric-neonatal (n=38)	Gyneco-obstetrics (n=52)
Infiltration without tissue damage	37	**9,2**	**34 (11,1)**	**2 (5,2)**	1 (1,9)
Phlebitis	31	7,7	27 (8,8)	1 (2,6)	3 (5,7)
Self-removal by patient	16	4,0	16 (5,2)	0 (0)	0 (0)
Obstruction / Occlusion	14	3,5	9 (2,9)	1 (2,6)	**4 (7,6)**
Pain	12	3	11 (3,6)	1 (2,6)	0 (0)
Other cause	7	1,7	7 (2,3)	0 (0)	0 (0)
Accidental withdrawal	6	1,5	6 (1,9)	0 (0)	0 (0)
Local heat	4	1	3 (0,9)	1 (2,6)	0 (0)
Ecchymosis / Hematoma	3	0,7	3 (0,9)	0 (0)	0 (0)
No use for more than 24 hours	2	0,5	1 (0,3)	0 (0)	1 (1,9)
Redness at insertion site	1	0,2	1 (0,3)	0 (0)	0 (0)
Insertion site discharge	1	0,2	0 (0)	0 (0)	1 (1,9)
MARSI*	1	0,2	1 (0,3)	0 (0)	0 (0)

* Medical Adhesive Related Skin Injury (MARSI)
Source: Created by the authors.

When comparing PVC-associated AEs by level of care complexity, the most frequently reported AE in critical care units was phlebitis, with a rate of 16.6 per 100 PVCs. In intermediate care units, infiltration/extravasation without tissue damage was most prevalent (12.9 per 100 PVCs). In basic care units, the most common AEs were catheter occlusion/obstruction and accidental removal by the patient, both with rates of 7.6 per 100 PVCs. In emergency services, the predominant AE was accidental removal by the patient, at a rate of 9.0 per 100 PVCs (Table 4).

Additionally, logistic regression using a generalized linear model revealed statistically significant associations between specific categorical variables and the occurrence of AEs. These included

length of hospital stays between 8 and 14 days ($p < 0.005$), hospital stay of 15 days or more ($p < 0.005$), having 4 to 6 PVCs recorded during hospitalization ($p < 0.02$), having 7 or more PVCs ($p < 0.01$), and dwell times between 49–72 hours ($p < 0.02$).

Further analysis of PVC-related variables—such as catheter gauge, number of insertion attempts, anatomical insertion site, and type of intravenous flow—showed statistically significant associations ($p < 0.05$) with the occurrence of AEs. These included the use of 20- and 22-gauge catheters, lack of documentation regarding the number of insertion attempts, the anatomical site at the forearm or arm flexion, and the use of PVCs for mixed intravenous flow therapy.

Table 4: Rate of adverse events per 100 PVCs according to level of care complexity

Type of adverse events	N° of events	Overall Rate x 100 PVC	Critical Care* (n=54)	Medium Care** (n=232)	Basic Care*** (n=52)	Emergencies♦ (n=55)
Overall Rate AE	**135**	**33,8**	**44,4**	**38,3**	**26,9**	**21,8**
Infiltration without tissue damage	37	9,2	5 (9,2)	**30 (12,9)**	1 (1,9)	1 (1,8)
Phlebitis	31	7,7	**9 (16,6)**	16 (6,8)	3 (5,7)	3 (5,4)
Self-removal by patient	16	4,0	4 (7,4)	7 (3,0)	**4 (7,6)**	**5 (9,0)**
Obstruction / Occlusion	14	3,5	1 (1,8)	7 (3,0)	**4 (7,6)**	2 (3,6)
Pain	12	3	1 (1,8)	10 (4,3)	0 (0)	1 (1,8)
Other cause	7	1,7	0 (0)	7 (3,0)	0 (0)	0 (0)
Accidental withdrawal	6	1,5	2 (3,7)	4 (1,7)	0 (0)	0 (0)
Local heat	4	1	0 (0)	4 (1,7)	0 (0)	0 (0)
Ecchymosis / Hematoma	3	0,7	0 (0)	3 (1,2)	0 (0)	0 (0)
No use for more than 24 hours	2	0,5	1 (1,8)	0 (0)	1 (1,9)	0 (0)
Redness at insertion site	1	0,2	0 (0)	1 (0,4)	0 (0)	0 (0)
Insertion site discharge	1	0,2	0 (0)	0 (0)	1 (1,9)	0 (0)
MARSI	1	0,2	1 (1,8)	0 (0)	0 (0)	0 (0)

* Critical care: Adult, pediatric and neonatal intensive critical care units.
** Medium care: Adult and pediatric medical and surgical.
*** Basic Care: psychiatric, gynecoobstetrics units (childcare, high obstetric risk and childbirths).
♦ Emergencies: Adult, pediatric and obstetric.
Source: Created by the authors.

DISCUSSION

Marsh et al. reported a 36.4% PVC failure for any reason before completion of therapy,[15] which is consistent with the findings of this study, where AEs or PVC failure occurred in 33.8% of cases. These results highlight the importance of implementing evidence-based practices, which require additional efforts from clinical teams to monitor and improve adherence. This would contribute to the safety of care for hospitalized patients requiring intravenous therapy via a PVC.

Armenteros-Yeguas et al. reported that among 224 PVCs in 135 patients, 59.3% had a history of DIVA. Patients with this history required two or more attempts for catheter placement in 23% of cases, compared to only 2.5% among those without it.[29] The data presented in this study indicate that 53.6% of the PVC insertion records involved patients with a documented history of difficult venous access, and more than one-third of these patients experienced an adverse event related to the PVC.

The study by Miliani et al., which included 815 central venous catheters (CVC) in 573 patients, found an incidence of AEs associated with CVC of 52.3 per 100 adverse events. The most recurrent AEs were phlebitis (20.1/100 AEs), hematoma (17.7/100 AEs), and fluid/blood leakage (13.1/100 AEs).[10] In contrast, Ghali et al. reported an incidence of CVC-related AEs of 8.81/1000 CVC days, with pain being the most frequent one.[11] Chen et al.[16] quantified the overall failure rate of CVC at 54.05%, with the most frequent causes being phlebitis (16.3%) and infiltration/extravasation (13.8%). Our findings at the organizational level identified infiltration without tissue damage as the most frequent AE associated with CVC, followed by phlebitis and accidental removal by the patient. These results align with those reported by these studies, where the characteristics of intravenous therapy contribute to phlebitis, infiltration, and pain.

Shimoni et al. found that, in medical services, the main AE was related to accidental CVC removal, quantified at 21.5 per 1000 CVC days.[14] In our research, for the medium-care services (adult and pediatric medical-surgical), the primary AE was infiltration without tissue damage, which may be related to the significant amount of intravenous therapy required by these patients, typically administered via peripheral venous catheters.

Meanwhile, in emergency services, Urbina et al. identified dysfunction, extravasation, and accidental removal as the main AEs, quantifying the failure rate at 1% of the total catheters.[30] In this study, AEs in adult, pediatric, and gynecological-obstetric emergency services were associated with 5.6% of the total CVCs. This difference may be due to the saturation of these services, which have a high demand and a large number of patients awaiting hospital bed assignment.

Resnick et al.[31] reported complications in 40.9% of 132 CVC in 113 children, with catheter dislodgement being the most common AE. Meanwhile, Indarwati et al. quantified CVC failure at 38%.[23] In this study, pediatric patients accounted for 15.7% of the registered devices with complications, with infiltration/extravasation without tissue damage being the most frequent AE. This difference may be related to protocols for continuous monitoring of invasive devices, the presence of parents around the clock, and adequate nurse-patient ratios.

Bahl et al. found that documentation of care for individuals with CVCs had moderate compliance. Central venous catheter removal evaluation had the least compliance, with only 49.4% of CVCs documented.[32] These findings align with our results, where 33.7% of peripheral catheter records lacked information on the cause of device removal. This outcome may be explained by the lack of clarity around the magnitude of AEs associated with CVCs despite their widespread use across all clinical services. They are often treated as a routine practice, undervaluing the need for evidence-based clinical practices for patients requiring this invasive device.

One limitation of this study is its point-prevalence nature. Additionally, the lack of patient records, particularly regarding the cause of PVC removal, may have led to some AEs being underreported. Another limitation concerns the data collection period, as it was conducted at a specific time, and does not reflect a representative sample of the entire year.

CONCLUSIONS

This study contributes to care management for safer treatment of hospitalized patients requiring intravenous therapy through PVC, as it provides a reference rate for adverse events associated with these devices in hospitalized people, one-third of whom experienced a failure or AE related to this device. Furthermore, the research highlights that the distribution of AEs varies depending on the complexity of care and according to clinical service groups. These findings allow efforts to be directed towards disseminating clinical practices to prevent AEs associated with PVC, focusing on the most prevalent AEs such as infiltration without tissue damage, phlebitis, and accidental removal

by the patient. The percentage of AEs related to peripheral venous catheters aligns with international studies.

These AEs can impact hospitalization length, patient satisfaction, and organizational costs and contribute to vascular exhaustion in patients requiring intravenous therapy.

A key element is the lack of documentation regarding the cause of PVC removal, which was absent in 33.7% of total devices. This may directly influence patient care safety, as it could mean AEs are underreported. Therefore, it is suggested that this be considered a risk factor for complications associated with these devices.

To improve clinical practice in caring for patients who require PVC, it is recommended to standardize records for patients requiring this device who have a history of DIVA. This could include using various metric scales to assess service users with difficult venous access, thus improving decision-making in selecting the appropriate venous catheter for IV therapy. Additionally, formal training on the care of patients requiring PVCs should be incorporated into continuing education programs and the orientation of new nursing professionals, given the significant percentage of patients requiring this device and the need to reduce the risk of future adverse events.

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PVM: Conceptualization, Investigation, Validation, Visualization, Writing – Original Draft Preparation, Writing - review y editing.
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