

## **DEMOGRAPHIC PROFILE, TRAINING AND PRACTICAL EXPERIENCE OF PROFESSIONALS PERFORMING PERIPHERAL INTRAVENOUS CATHETERIZATION IN BRAZIL**

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### **ABSTRACT**

**Objective:** to describe the demographic profile, training and practical experience of professionals who perform peripheral intravenous catheterization in Brazil.

**Method:** this is a descriptive cross-sectional study, carried out in the five macroregions of Brazil with 2,584 nursing professionals who worked in direct care of patients undergoing peripheral intravenous catheterization, using a questionnaire containing professional demographic characteristics, training and experience. Data collection took place between July 2021 and May 2022. Descriptive statistics, one-way ANOVA test, Pearson's chi-square test for k independent samples and Tukey's multiple comparison test and adjusted residuals were used.

**Results:** most nursing professionals resided in the southeast macro-region and were women. The mean age of nurses was 39.52 ( $\pm 8.74$ ) years, technicians, 39.66 ( $\pm 9.22$ ), and nursing assistants, 40.61 ( $\pm 10.57$ ). The mean training time for nurses was 11.83 ( $\pm 8.18$ ) years, for nursing technicians, 10.81 ( $\pm 7.62$ ), and for nursing assistants, 11.19 ( $\pm 8.33$ ). During the training process, most professionals received lessons in pharmacology, vascular access devices and venous catheterization. The mean number of devices inserted by nurses, in a 12-hour shift, was lower than the mean inserted by technicians and nursing assistants.

**Conclusion:** nurses are not recognized as professionals legally responsible for the peripheral intravenous catheterization procedure, and intravenous therapy implementation is predominantly carried out by technicians and nursing assistants. The training process is incipient.

**DESCRIPTORS:** Catheterization peripheral. Infusions intravenous. Nursing team. Professional competence. Clinical competence.

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# PERFIL DEMOGRÁFICO, FORMAÇÃO E EXPERIÊNCIA PRÁTICA DE PROFISSIONAIS EXECUTANTES DA CATETERIZAÇÃO INTRAVENOSA PERIFÉRICA NO BRASIL

## RESUMO

**Objetivo:** descrever o perfil demográfico, formação e a experiência prática de profissionais que realizam a cateterização intravenosa periférica no Brasil.

**Método:** estudo transversal descritivo, realizado nas cinco macrorregiões do Brasil com 2.584 profissionais de enfermagem que atuavam no cuidado direto de pacientes submetidos à cateterização intravenosa periférica, utilizado um questionário contendo características demográficas, formação e experiência dos profissionais. A coleta ocorreu entre julho de 2021 e maio de 2022. Empregou-se estatística descritiva, Teste de Anova 1 Fator, Teste do Qui Quadrado de Pearson para k amostras independentes e Teste de comparações múltiplas de Tukey e resíduos ajustados.

**Resultados:** a maior parte dos profissionais de enfermagem residiam na macrorregião sudeste, eram mulheres. A média de idade dos enfermeiros foi de 39,52 ( $\pm 8,74$ ) anos, dos técnicos de 39,66 ( $\pm 9,22$ ) anos e dos auxiliares de enfermagem de 40,61 ( $\pm 10,57$ ) anos. O tempo médio de formação dos enfermeiros foi igual a 11,83 ( $\pm 8,18$ ) anos, dos técnicos de enfermagem 10,81 ( $\pm 7,62$ ) anos e auxiliares de enfermagem 11,19 ( $\pm 8,33$ ) anos. Durante o processo formativo a maioria dos profissionais recebeu aulas de farmacologia, dispositivos de acesso vascular e cateterização venosa. O número médio de dispositivos inseridos por enfermeiros, em turno de 12 horas, foi inferior à média inserida por técnicos e auxiliares de enfermagem.

**Conclusão:** enfermeiros não se reconhecem como profissionais legalmente responsáveis pelo procedimento de cateterização intravenosa periférica e a implementação da terapia intravenosa é predominantemente realizada pelos técnicos e auxiliares de enfermagem. O processo formativo é incipiente.

**DESCRITORES:** Cateterismo periférico. Infusões intravenosas. Equipe de enfermagem. Competência profissional. Competência clínica.

# PERFIL DEMOGRÁFICO, FORMACIÓN Y EXPERIENCIA PRÁCTICA DE LOS PROFESIONALES QUE REALIZAN CATETERISMO INTRAVENOSO PERIFÉRICO EN BRASIL

## RESUMEN

**Objetivo:** describir el perfil demográfico, la formación y la experiencia práctica de los profesionales que realizan cateterismo intravenoso periférico en Brasil.

**Método:** estudio transversal descriptivo, realizado en las cinco macrorregiones de Brasil con 2.584 profesionales de enfermería que actuaban en el cuidado directo de pacientes sometidos a cateterismo intravenoso periférico, mediante un cuestionario que contiene las características demográficas, formación y experiencia de los profesionales. La recolección de datos se realizó entre julio de 2021 y mayo de 2022. Se utilizó estadística descriptiva, prueba ANOVA de 1 vía, Chi-Cuadrado T de Pearson para k muestras independientes y prueba de comparación múltiple de Tukey y residuos ajustados.

**Resultados:** la mayoría de los profesionales de enfermería residían en la macrorregión Sudeste y eran mujeres. La edad media de los enfermeros fue de 39,52 ( $\pm 8,74$ ) años, de los técnicos, de 39,66 ( $\pm 9,22$ ) años, y de los auxiliares de enfermería, de 40,61 ( $\pm 10,57$ ) años. El tiempo medio de formación de los enfermeros fue de 11,83 ( $\pm 8,18$ ) años, de los técnicos de enfermería, de 10,81 ( $\pm 7,62$ ) años, y de los auxiliares de enfermería, de 11,19 ( $\pm 8,33$ ) años. Durante el proceso de formación, la mayoría de los profesionales recibieron lecciones de farmacología, dispositivos de acceso vascular y cateterismo venoso. El promedio de dispositivos insertados por enfermeros, en un turno de 12 horas, fue inferior al promedio insertado por técnicos y auxiliares de enfermería.

**Conclusión:** los enfermeros no son reconocidos como profesionales legalmente responsables del procedimiento de cateterismo intravenoso periférico y la implementación de la terapia intravenosa es realizada predominantemente por técnicos y auxiliares de enfermería. El proceso de formación es incipiente.

**DESCRIPTORES:** Cateterismo periférico. Infusiones intravenosas. Grupo de enfermería. Competencia profesional. Competencia clínica.

## INTRODUCTION

Peripheral intravenous catheterization (PIC) is a procedure routinely performed in clinical practice by nursing professionals with different levels of education and training<sup>1</sup>. In developed countries, the rate of patients undergoing PIC during hospitalization is approximately 70%<sup>2</sup>.

PIC represents one of the greatest advances in the health area and is used for infusion of solutions, medications, nutritional support, examinations and transfusion of blood components<sup>3-4</sup>. Despite being considered by many a simple activity, it has a high level of complexity, requiring competence and psychomotor skills from professionals<sup>5</sup>.

The technical competence for performing PIC comes from knowledge in different areas of knowledge, such as anatomy, physiology, pharmacology, among others<sup>6</sup>, and international studies indicate nurses as the main executors of such procedure<sup>7</sup>. However, in the national scenario, the procedure is also performed by technicians and nursing assistants, although it is advocated that nurses are responsible for the decision on the choice of catheterization sites, device gauge and prevention of complications relevant to each case<sup>8</sup>.

Practical experience and expertise are crucial for excellent care, so nursing professionals must experience clinical situations that promote systematic reflections on their own practice in order to become an expert in the field of peripheral intravenous therapy<sup>9</sup>.

To achieve expertise, professionals go through previous stages, namely: novice; advanced beginner; competent; and proficient. Progression from one stage to another depends on successfully reaching the previous stage, but progression to the last level is based on a variety of clinical experiences and good quality education<sup>9</sup>.

Professional technical-scientific training is essential to perform PIC, in order to guarantee safe and effective intravenous access<sup>10-11</sup>. In this way, knowing the general aspects of nursing professional demographic profile and training becomes essential to draw specific and updated portraits of how the category has been processing its insertion in the context of PIC-related practices.

In Brazil, there is a lack of studies that address this issue, which makes this research relevant. Thus, this study aimed to describe the demographic profile, training and practical experience of professionals who perform PIC in the national scenario.

## METHOD

This is a descriptive cross-sectional study guided by the STrengthening the Reporting of Observational studies in Epidemiology (STROBE) tool, carried out in the five macroregions of Brazil.

The population consisted of nurses, technicians and nursing assistants who worked in direct care for patients undergoing PIC. Nursing professionals who had no experience in PIC and recent undergraduate students (up to one year after graduation) were not included in the study. Professionals who did not identify the professional category were excluded.

To identify the sample, the Federal Nursing Council records databases were used, which had numerous duplicates and only 613,987 registered nursing professionals (nurses and nursing technicians).

The only information present was “professional category” and “electronic address”, which made it difficult to identify the professionals who worked in direct care of patients undergoing PIC and made telephone contact unfeasible, as many emails were incorrect. Due to the difficulty in accessing participants through the database, we opted for convenience sampling using the snowball technique<sup>12</sup>.

Initially, individuals belonging to the study's target population were identified through social networks and WhatsApp®, research groups and the researcher's contact professionals. Another strategy adopted was to contact the Regional Nursing Councils (COREN) in all regions of Brazil so that they could carry out disclosure on their internet pages and call for participation in this research.

The data collection instrument was a questionnaire constructed based on Infusion Therapy Standards of Practice<sup>13</sup> recommendations and validated by three expert judges in intravenous therapy. Instrument reliability was verified using Cronbach's alpha with a value equal to 0.82, demonstrating almost perfect internal consistency<sup>14</sup>.

The questionnaire was sent to participants via email, direct mail (Zievo efficient technology), social networks (Instagram® and/or Facebook®), WhatsApp® and COREN websites. The demographic characteristics, experience and academic background of professionals performing PIC were investigated.

Data were collected and managed using the REDCap (Research Electronic Data Capture) tool hosted at a federal educational institution in the state of São Paulo. Data collection took place between July 2021 and May 2022, and were tabulated in Statistical Package for Social Sciences (SPSS) version 26.0 electronic spreadsheets.

Descriptive analysis was performed by calculating absolute and relative frequencies. For quantitative variables, measures of central tendency (mean) and dispersion measures (standard deviation) were calculated. To verify the distribution of quantitative variables, the central limit theorem was used.

The one-way ANOVA test and Tukey's multiple comparison test were used considering a 5% significance level and a 95% Confidence Interval.

To compare the frequencies of qualitative variables according to professional category, the chi-square test was used for k independent samples considering  $p \leq 0.05$  and 95%CI. In polychotomous variables, adjusted residue analysis ( $>1.96$  or  $< -1.96$ ) was applied to identify the categories that presented the greatest difference between expected counts and actual counts in relation to sample size.

The research complied with ethical assumptions in accordance with Resolution 466/12, and all respondents signed the Informed Consent Form.

## RESULTS

The sample initially consisted of 2,960 respondents, of which 1,214 (41%) are nurses, 1,166 (39.4%), nursing technicians, 204 (6.9%), nursing assistants, and 376 (12.7%) did not declare their professional category, which were excluded from the analyses, resulting in a final sample of 2,584 professionals.

It was observed that most of the professionals resided in the southeast macro-region and were women aged between 36 and 50 years. The mean age of nurses was 39.52 ( $\pm 8.74$ ) years, technicians, 39.66 ( $\pm 9.22$ ) years, and nursing assistants, 40.61 ( $\pm 10.57$ ) years. Most worked in adult/elder care and health care (Table 1).

**Table 1** – Demographic characterization and practical experience of nursing professionals performing PIC, macroregions of Brazil, 2022. (n=2,584)

Variable	Nurse (n=1,214)		Nursing technician (n=1,166)		Nursing assistant (n = 204)		p-value
	n	%	n	%	n	%	
Macroregion							
North	10	0.8	13	1.2	-	-	<b>0.000</b> ‡
Northeast	98 <sup>§</sup>	8.9	98 <sup>  </sup>	8.9	1 <sup>  </sup>	0.5	
Midwest	33 <sup>§</sup>	2.8	14 <sup>  </sup>	1.3	-	-	
Southeast	907 <sup>  </sup>	76.3	916 <sup>§</sup>	82.8	197 <sup>§</sup>	99.0	
South	86 <sup>§</sup>	7.2	65	5.9	1 <sup>§</sup>	0.5	
Sex							
Female	1035	85.4	973	83.6	170	84.1	0.223‡
Male	177	14.6	190	16.4	32	15.9	
Age*							
Up to 25 years	37 <sup>  </sup>	3.1	100 <sup>§</sup>	8.7	20 <sup>§</sup>	10.0	<b>0.000</b> ‡
26 to 35 years	388 <sup>§</sup>	32.5	261 <sup>  </sup>	22.8	44 <sup>  </sup>	21.9	
36 to 50 years	625 <sup>  </sup>	52.3	643 <sup>§</sup>	56.3	106	52.7	
51 to 60 years	129	10.8	131	11.5	23	11.4	
≥ 61 years	15	1.3	8	0.7	8	4.0	
Field of action							
Care	946 <sup>  </sup>	78.2	1111 <sup>§</sup>	96.5	199 <sup>§</sup>	97.5	<b>0.000</b> ‡
Management	123 <sup>§</sup>	10.2	9 <sup>  </sup>	0.8	-	-	
Teaching	123 <sup>§</sup>	10.2	18 <sup>  </sup>	1.6	1 <sup>  </sup>	0.5	
Research	17	1.4	13	1.1	2	1.0	
Occupation area†							
Child's health	404	22.1	353	20.8	57	19.8	<b>0.025</b> ‡
Newborn health	265 <sup>§</sup>	14.4	179 <sup>  </sup>	10.5	18 <sup>  </sup>	6.2	
Adult/elder health	918 <sup>  </sup>	50.1	961 <sup>§</sup>	56.6	176 <sup>§</sup>	61.1	
Women's health	246	13.4	204	12.1	37	12.9	
Professional who most performs peripheral intravenous catheterization							
Nurse	102	8.5	20	1.7	7	3.5	<b>0.000</b> ‡
Nursing technician	999	83.0	1069	93.1	38	19.1	
Nursing assistant	102	8.5	59	5.1	154	77.4	
Number of vascular access devices inserted (12-hour shift)							
Mean	5.07 <sup>**</sup> ††	-	9.55 <sup>**</sup>	-	10.9 <sup>††</sup>	-	<b>0.000</b> ¶
Standard deviation	8.08	-	12.8	-	16.5	-	
Professional legally responsible for peripheral intravenous catheterization							
Any professional in the unit	852	70.8	931	81.2	161	81.3	<b>0.000</b> ‡
Who is taking care of the shift	47	3.9	84	7.3	14	7.1	
Nurse	303	25.2	124	10.8	23	11.6	
Physician	2	0.2	7	0.6	-	-	

\*Stratification according to the construct of the sociology of professions<sup>15</sup>; †Professional could check more than one option; ‡Pearson's chi-square test for k independent samples; §Adjusted residual > 1.96; || Adjusted residual < -1.96; ¶ One-way ANOVA test for independent samples; \*\* Tukey test: Mean<sub>nurse</sub> < Mean<sub>nursing</sub> (p=0.000).; †† Tukey test: Mean<sub>nurse</sub> < Mean<sub>nursing assistant</sub> (p=0.000).

Nurses and nursing technicians agree that the professionals who perform PIC the most are the nursing technicians. It should be noted that the mean number of vascular access devices (VAD) inserted by nurses, in a 12-hour shift, was lower than the mean in the groups of technicians and nursing assistants, with this difference being statistically significant (Table 1).

Regarding the PIC procedure legality, the three groups consider that any professional in the unit is legally responsible. A smaller percentage of nursing professionals considers that nurses should be responsible (Table 1).

During the training process, most professionals received lessons in pharmacology, VAD and venous access. However, more than half of nursing technicians and assistants reported not having taken classes on the chemical properties of medications, unlike nurses (Table 2).

**Table 2** – Academic and professional training of PIC performers, macroregions of Brazil, 2022. (n=2,584)

Variable	Nurse (n=1,214)		Nursing technician (n=1,166)		Nursing assistant (n=204)		p-value
	n	%	n	%	n	%	
Took a class on pharmacology							
Yes	1143	94.2	959	82.2	173	84.8	
No	71	5.8	207	17.8	31	15.2	<b>0.000*</b>
Took a class on the chemical properties of drugs							
Yes	821	67.6	435	37.3	72	35.3	
No	393	32.4	731	62.7	132	64.7	<b>0.000*</b>
Took a class on vascular access device							
Yes	989	81.5	827	70.9	140	68.6	
No	225	18.5	339	29.1	64	31.4	<b>0.000*</b>
Took a class on peripheral venous access							
Yes	1048	86.3	1031	88.4	169	82.8	
No	166	13.7	135	11.6	35	17.2	0.058*
Specialization in the field							
Yes	796	65.9	297	26.0	33	16.6	
No	370	30.7	684	59.9	129	64.8	<b>0.000*</b>
Not applicable	41	3.4	160	14.0	37	18.6	
In-service training on vascular access device (last 12 months)							
Yes	881	73.1	768	66.9	152	74.9	
No	325	26.9	380	33.1	51	25.1	<b>0.002*</b>
Training time							
Mean	11.83‡	-	10.81‡	-	11.19	-	<b>0.008†</b>
Standard deviation	8.18	-	7.62	-	8.33	-	

\*Pearson's chi square test for k independent samples; † One-way ANOVA test for independent samples; ‡ Tukey test: Mean<sub>nurse</sub> > Mean<sub>nursing technician</sub> (p=0.005)

Most of nurses took a graduate course in their field, including nursing technicians and assistants who reported having completed specialization, probably because they had a higher education degree, although they were working as mid-level professionals. In the work environment, all professionals reported having received training in the last 12 months (Table 2).

The mean training time of nurses was 11.83 ( $\pm 8.18$ ) years, nursing technicians, 10.81 ( $\pm 7.62$ ) years, and nursing assistants, 11.19 ( $\pm 8.33$ ) years (Table 2).

## DISCUSSION

The nursing class comprises 2,513,428 professionals, comprising 613,827 (24.42%) nurses, 436,529 (17.37%) assistants and 1,463,072 (58.21%) nursing technicians. Professionals who have more than one registration, either in the same category (secondary registration) or in different categories, are counted more than once. Thus, this amount refers to active registrations<sup>10</sup>.

In the present study, the number of nurses was higher than the number of nursing technicians and assistants, which may be related to increased technical/medium-level nursing professionals who completed their undergraduate degree in nursing.

The arrangement of nursing professionals who participated in the survey was greater in the southeast macro-region, more strongly in São Paulo, Rio de Janeiro and Minas Gerais, followed by the northeast, mainly Bahia. According to data published by the Federal Nursing Council (2022), the state of São Paulo has the highest number of nursing professionals (655,253), followed by Rio de Janeiro (314,748) and Minas Gerais (212,294). In the northeast, Bahia (148,381) and Pernambuco (122,267) are the most expressive states<sup>10</sup>.

On the other hand, the region with the lowest percentage of nursing professionals responding was the north region, with a rate varying between 0.8 and 1.2%.

This may have been due to the fact that in large centers there are greater job opportunities in health services such as hospitals, specialized clinics, pre-hospital care services, among others, in addition to the diversity of public and private institutions, technological progress and clinical scenario/epidemiological of the health-disease process, configuring in the country a greater demand for professionals for care<sup>11</sup>.

There is a lack of research on the demographic profile of professionals performing PIC. Thus, based on the construct of the sociology of professions, it is possible to characterize professional life stages in this category, since nursing professionals' age is related to the time since graduation and entry into the labor market<sup>15</sup>.

According to the competence acquisition model developed by Patrícia Benner, professional progress goes through five stages, namely: novice; advanced beginner; competent; proficient; and expert<sup>9</sup>.

In the 1<sup>st</sup> phase, called "Novice to expert", are newly graduated professionals up to 25 years old, whether they are assistants, technicians or nurses<sup>13</sup>. This phase coincides with Benner's "Novice" level, where nurses have strict compliance with rules or plans taught, little situational awareness, and no discretionary judgment<sup>9</sup>.

At this level, the novice of professional activities is marked by many difficulties with regard to prejudice related to young age, lack of experience to face different situations and deficiency in technical skills<sup>9</sup>.

Furthermore, most undergraduate students have a greater insertion in hospital institutions in their first, second and third jobs (56.7%, 43%, 48%, respectively), as shown by a study by Püschel *et al.* carried out with nurses who graduated from the *Universidade de São Paulo* School of Nursing (EEUSP). This is also the reality of technical professionals and nursing assistants<sup>16</sup>.

In hospital environments, intravenous catheter insertion is widely performed, and the literature indicates that 58.7% to 86.7% of hospitalized patients have a venous device inserted<sup>17</sup>. Thus, the lack of experience and deficiency in technical skills of recent undergraduate students will automatically impact PIC practice, as these professionals feel insecure and unprepared to perform the procedure.

However, the first year of PIC practice enables trial and error learning, which will help them in future care practices<sup>9</sup>. Training deficiencies can be resolved in the 2<sup>nd</sup> phase, called “Professional training”, which includes people between 26 and 35 years of age.

At this stage, Benner classifies as an “advanced beginner”. Here, work experience and guidance from more experienced colleagues improve professionals’ cognitive, psychomotor and emotional skills<sup>9</sup>. Internship, residency, guidance and assisted practice programs also allow theoretical learning consolidation, acquisition of skills and clinical judgment capable of meeting patients’ needs using VAD<sup>18</sup>.

Nurse (graduate degree) and technician/assistant (after graduation) qualification is directly related to the prospect of entering the job market in more complex functions that require cognitive skills. Often, this training takes place early, at the beginning of professional life. Undergraduate students seek to qualify in areas of affinity, but always with an eye on the job market<sup>15</sup>.

Regarding PIC, nursing professionals’ training process is still incipient. In most institutions, there is no specific discipline on intravenous therapy (IVT), the content is taught superficially and focused on the technique of venous catheterization<sup>8</sup>, in which students have practical classes to perform the procedure in laboratories. Thus, the lack of preparation during academic training can have a direct impact on professional practice.

Over time, professionals develop their technical cognitive skills and nursing practices, configuring the 3<sup>rd</sup> phase, called “Professional maturity”, in which individuals aged between 36 and 50 years are found. Preparation and qualification allow the domain of cognitive abilities and skills. It is common, in the case of technicians and/or assistants, to take a higher course simultaneously, with a view to changing areas or even moving up nursing career<sup>15</sup>.

With one to two years of experience, nursing professionals become “competent” and experience less anxiety when they learn, especially VAD insertion, which is now performed with more skill, less anxiety and error-free. Moreover, professionals begin to take responsibilities on their own and effectively in the clinical area, identifying possible complications related to VAD use<sup>9</sup>.

After three years of experience, it is already possible to become “proficient”. At this stage, professionals already have a repertoire of clinical skills acquired through accumulated experience and daily coping with the same clinical situations that involve PIC. They are more analytical and spontaneously perceive situations as a whole, being able to identify and make decisions more efficiently<sup>9,19</sup>.

By advancing in their level of clinical competence, proficient practitioners become “experts”. These have critical thinking skills and can solve problems intuitively and with global knowledge of the situation. They no longer need an analytical principle<sup>9</sup>. Thus, here would fit the professionals who make up the peripheral IVT teams identified in some hospital institutions.

Professionals’ expertise in IVT brings benefits to patients using VAD, as there is a reduction in infectious and mechanical complications related to intravascular devices, and meeting patients’ needs in terms of efficacy, safety and high-quality care, ensuring their satisfaction<sup>20</sup>.

For the institution, the benefits correspond to reduction in the mean patient length of hospital stay with a consequent reduction in hospital costs associated with complications and consumption of materials, in addition to contributing to standardization of materials, equipment and IVT-related technologies<sup>20</sup>.

Nursing professionals should continue refining their knowledge based on evidence-based reading on care practices, as at a certain point in professional life, it is common for “Professional deceleration” (or 4<sup>th</sup> phase) to occur. This stage includes people aged between 51 and 60 who seek to remain in activities, jobs and jobs that ensure their retirement<sup>15</sup>.

In this phase, professionals no longer venture into new activities and it is a more complicated phase for carrying out permanent education, because there is resistance from professionals because

they consider themselves to have the necessary knowledge to carry out their practices. Thus, the nursing team imposes their knowledge as something already learned and which does not require updates<sup>21</sup>.

Finally, in the 5<sup>th</sup> phase, “Retirement”, are people aged over 61 who have already withdrawn from the market or who are in the process of leaving. This is the moment of gradual cessation of professional life and the world of work<sup>15</sup>. In the present study, the rate of professionals in this phase varied between 0.7% and 4%, accounting for the minority of respondents.

Regarding the field of action, most professionals carry out care activities, assisting the most varied groups (newborns, children, adults and older adults). In order to guarantee a quality standard in provision of care, it is necessary for professionals to invest in a specialization or post-training course to obtain a solid theoretical part and skill in the practical field.

A study shows that most nurses (80.1%) interviewed took graduate courses, which reaffirms professionals’ desire to improve their condition in the labor market through qualification<sup>22</sup>. In the present study, approximately 65.9% of nurses reported having specialized in their area of expertise.

A curious fact is that technicians and assistants reported having specialization, and this corroborates what the literature has been signaling as “overqualification phenomenon of workers”, a growing process from the 2000s and associated with the expansion of access to higher education<sup>15</sup>.

The study “Profile of Nursing”, carried out by Fiocruz, on COFEN’s initiative, revealed that, among professionals who occupy mid-level jobs, 30% are studying or have already completed graduation, and the majority reported being studying graduation in nursing (64.8%), which reveals workers’ preference for continuing in the profession<sup>15</sup>.

Investing in professionals’ permanent education is a way of guaranteeing safe and harm-free care for patients, as VAD is a device that is widely used in hospital services and, when handled improperly, can lead to the development of complications such as infiltrations, phlebitis, obstruction, mechanical injury and accidental removal<sup>13</sup>.

A worrying fact concerns professionals performing PIC. International studies indicate that 71% of VAD are inserted by nurses, as shown by the global cross-sectional study carried out in 278 hospitals in 47 countries. In that study, VAD were inserted, predominantly, by nurses from different geographic regions of the world, such as Africa, Asia, Europe, Middle East, South Pacific, North America and South America. The proportion ranged from 49.9% to 96.4%. In contrast, in Australia and New Zealand, physicians were the main performers of PIC (62.7%)<sup>7</sup>.

This data differs from the Brazilian reality, in which IVT implementation is predominantly carried out by technical professionals and nursing assistants<sup>23</sup>. This can be proven with data from the present study, which showed that nurses are the professionals who insert fewer VAD in their shifts.

Nursing technicians and assistants have a technical/medium-level training and, despite the PIC technique being addressed in their training processes, they do not have in-depth knowledge on the subject, since the procedure is complex and requires knowledge from anatomy, physiology, microbiology, pharmacology, psychology, among others, in addition to manual dexterity<sup>6</sup>.

Law 7,498/86 and Decree 94.406/87 do not explain the PIC procedure, but define that technical/medium-level professionals should only perform nursing actions under nurses’ supervision<sup>24</sup>. Thus, it is understood that the care related to peripheral VAD insertion, maintenance and removal should be exclusive to nurses or be carried out by nursing technicians and/or assistants only when under their direct supervision<sup>8</sup>. In the study carried out by Araújo *et al.*, which analyzed 364 resolutions that guide professional nursing technicians’ practice, available online and published from 1975 to 2018, showed that there is no reference to the PIC procedure<sup>25</sup>.

In the present study, nurses and nursing technicians agreed that the professionals who most performs PIC are the nursing technicians. However, more than half of nursing assistants consider

that their category is the one that performs the most PIC (77.4%). It is known that PIC is a nursing professionals' competence, but when asked about this item, the three groups stated that the responsibility lies with any professional who is on duty.

Thus, it is perceived that nurses do not recognize themselves as professionals legally responsible for the PIC procedure, possibly associated with the socially constructed idea that it is a low complexity procedure, in addition to the high workload and inadequate sizing. In the work environment, the catheterization technique is valued to the detriment of clinical reasoning and theoretical knowledge of the process itself, which determines a hierarchization in the nursing team, in which professionals "good at heart" take a prominent position, becoming reference when the topic is difficult venous catheterization<sup>26</sup>.

There is no consensus regarding the legal responsibility for implementing PIC and official documents, as nursing professionals' specific attributions in relation to PIC practice are not clear. More complex nursing care that requires adequate scientific knowledge and technical capacity to make immediate decisions are exclusive to nurses, according to article 8 of the Professional Practice Law<sup>24</sup>.

According to Opinion Coren-SC 028/AT/2005, which deals with professionals' competence to perform nursing procedures, it is made clear that nursing care can be considered simple or complex depending on patients' circumstances and severity<sup>27</sup>. In this way, it is up to nurses to decide whether they will provide the care themselves or delegate it to a nursing technician or assistant.

However, delegating care does not exempt nurses from responsibility, i.e., both professionals will be responsible for execution, the one who delegated and the one to whom care was delegated. Considering the above, the Regional Nursing Council of Santa Catarina considers that catheterization with a non-needled peripheral intravenous device is a complex procedure and should preferably be performed by a nurse, the legal guardian<sup>27</sup>.

In this respect, to ensure safe and quality care, nursing needs to develop technical skills and competences to avoid harm to patients related to unsuccessful venous catheterizations. The framework of knowledge necessary for PIC implementation is initially acquired during graduation and/or technical training course.

These professionals' training process should include proximity to the real issues of practice and provide the necessary tools for developing the PIC procedure. Therefore, the inclusion of topics such as pharmacology, chemical property of drugs (osmolarity and pH), VAD and peripheral venous access (PVA) will ensure the effectiveness in the treatment of patients who need IVT<sup>7</sup>.

In this research, most nursing professionals reported having taken pharmacology, VAD and PVA classes. However, in relation to the chemical properties of medications, a significant number of nurses reported not having taken this class during training (32.4%), and in the group of technicians and assistants, this percentage was even higher, 62.7% and 64.7%, respectively.

Knowing the nature of medications is relevant, particularly for nurses, to be able to assess the best way to administer medications and monitor their effects. Thus, contents related to pharmacology during the training process will allow a harm-free professional practice<sup>27</sup>. Thus, inadequate management of drug therapy can cause local (infusion failures) and systemic complications as well as reduce patient safety and therapy effectiveness<sup>13</sup>.

In addition to this, it is also necessary to address nursing practices related to peripheral VAD and peripheral intravenous access, considering that nurses are responsible for VAD selection, insertion and maintenance in patients who need IVT<sup>28</sup>.

In the work environment, permanent education is an important factor for quality health care for hospitalized patients, but in practice, nursing professional training is still low, as demonstrated in research carried out in the medical clinic at a university hospital in Minas Gerais, where 33.3% of professionals did not receive or did not participate in training on PIC-related infection<sup>29</sup>.

In the present research, 26.9% of nurses, 33.1% of technicians and 25.1% of nursing assistants reported that they had not received training on VAD in the last 12 months in their work environments.

To create a reflective health team, updated and aware of their role in the prevention and control of complications associated with PIC procedures, it is necessary to intensify educational activities and professional training that promote behavior change with a view to the quality of health professionals' work.

This research presents as a limitation its cross-sectional methodological design, considering the lower level of evidence of this type of design in generation of robust evidence. Moreover, the type of sample for convenience and memory bias, as nursing professionals over the age of 51 and with a long training period may not accurately remember previous experiences.

## CONCLUSION

It is observed that most nursing professionals are women aged between 36 and 50 years, residing in the southeast macro-region and working mainly in care.

Nursing technicians and assistants are the professionals who most often perform the PIC procedure. Not to mention that nursing professionals' training process, in general, is incipient and, in most institutions, there is no specific discipline on IVT. Nurses do not routinely insert VAD and do not recognize themselves as professionals legally responsible for the PIC procedure.

The results presented can strengthen scientific literature on the subject with regard to nursing team academic and professional training regarding the best practices for PIC. In the practical field, it is thought that the nursing team's adequate training process may allow safe decision-making based on scientific evidence, since PIC insertion and maintenance involves a high level of technical-scientific knowledge in several areas of knowledge.

## REFERENCES

1. Ullman AJ, Bernstein SJ, Brown E, Aiyagari R, Faustino DEVS, Gore B, et al. The Michigan Appropriateness Guide for Intravenous Catheters in Pediatrics: miniMAGIC. *Pediatrics* [Internet]. 2020 [cited 2021 Aug 17];145(Suppl 3):S269-S84. Available from: <https://doi.org/10.1542/peds.2019-34741>
2. Buetti N, Abbas M, Pittet D, de Kraker M, Teixeira D, Chraiti M, et al. Comparison of routine replacement with clinically indicated replacement of peripheral intravenous catheters. *JAMA Intern Med* [Internet]. 2021 [cited 2022 Sep 10];181:1471-8. Available from: <https://doi.org/10.1001/jamainternmed.2021.5345>
3. Alexandrou E, Ray-Barruel G, Carr P, Frost S, Inwood S, Higgins N, et al. Use of short peripheral intravenous catheters: Characteristics, management, and outcomes worldwide. *J Hosp Med* [Internet]. 2018 [cited 2022 Jul 8];13(5):E1-7. Available from: <https://doi.org/10.12788/jhm.3039>
4. Schults J, Rikard C, Keidon T, Paterson R, Macfarlane F, Ulmann A. Difficult peripheral venous access in children: An international survey and critical appraisal of assessment tools and escalation pathways. *J Nurs Scholarsh* [Internet]. 2019 [cited 2021 Dec 2]; 51(5):537-46. Available from: <https://doi.org/10.1111/jnu.12505>
5. Conselho Regional de Enfermagem da Bahia (BR). Câmara Técnica de Atenção à Saúde. Parecer Coren-BA n. 008/2018. Coleta de material para exames laboratoriais, inclusive sangue, pela equipe de Enfermagem [Internet]. Salvador, BA(BR); 2018 [cited 2022 Jul 10]. Available from: [http://ba.corens.portalcofen.gov.br/parecer-coren-ba-n%E2%81%B0-008-2018\\_46479.html](http://ba.corens.portalcofen.gov.br/parecer-coren-ba-n%E2%81%B0-008-2018_46479.html)
6. Ben Abdelaziz R, Hafsi H, Hajji H, Boudabous H, Ben Chehida A, Mrabet A, et al. Peripheral venous catheter complications in children: Predisposing factors in a multicenter prospective

- cohort study. *BMC Pediatr* [Internet]. 2017 [cited 2021 Nov 8];17(1):208. Available from: <https://doi.org/10.1186/s12887-017-0965-y>
7. Ullman AJ, Takashima M, Kleidon T, Ray-Barruel G, Alexandrou E, Rickard CM. Global pediatric peripheral intravenous catheter practice and performance: A secondary analysis of 4206 catheters. *J Pediatr Nurs* [Internet]. 2020 [cited 2021 Apr 26];50:e18-e25. Available from: <https://doi.org/10.1016/j.pedn.2019.09.023>
  8. Santos LM, Conceição TB, Silva CSG, Tavares SS, Rocha PK, Avelar AFM. Cuidados relacionados ao cateterismo intravenoso periférico em pediatria realizados por técnicos de enfermagem. *Rev Bras Enferm* [Internet]. 2022 [cited 2023 Mar 28];75(2):e20200611. Available from: <https://doi.org/10.1590/0034-7167-2020-0611>
  9. Benner P, Tanner C, Chesla C. *Expertise in nursing practice: Caring, clinical judgment and ethics*. 2nd ed. New York, NY(US): Springer; 2009.
  10. Conselho Federal de Enfermagem (BR). A enfermagem em números [Internet]. 2022 [cited 2023 Feb 14]. Available from: <http://www.cofen.gov.br/enfermagem-em-numeros>
  11. Conselho Federal de Enfermagem (BR). Mercado de trabalho para Enfermagem amplia áreas de atuação [Internet]. 2018 [cited 2022 Jun 30]. Available from: [http://www.cofen.gov.br/mercado-de-trabalho-para-enfermagem-amplia-areas-de-atuacao\\_65154.html/print/](http://www.cofen.gov.br/mercado-de-trabalho-para-enfermagem-amplia-areas-de-atuacao_65154.html/print/)
  12. Bockorni BRS, Gomes AF. A amostragem em snowball (bola de neve) em uma pesquisa qualitativa no campo da administração. *Rev Ciênc Empresariais UNIPAR* [Internet]. 2021 [cited 2022 Sep 18];22(1):105-17. Available from: <https://doi.org/10.25110/receu.v22i.8346>
  13. Gorski LA, Hadaway L, Hagle ME, Broadhurst D, Clare S, Kleidon T, et al. Infusion therapy standards of practice. *J Infus Nurs* [Internet]. 2021 [cited 2023 May 13];44(1 Suppl 1):S1-S224. Available from: <https://doi.org/10.1097/NAN.0000000000000396>
  14. Streiner DL. Being inconsistent about consistency: When coefficient alpha does and doesn't matter. *J Pers Assess* [Internet]. 2003 [cited 2023 Mar 21];80(3):217-22. Available from: [https://doi.org/10.1207/S15327752JPA8003\\_01](https://doi.org/10.1207/S15327752JPA8003_01)
  15. Machado WAF, Lacerda WF de, Oliveira E de, Lemos W, Wermelinger M, Vieira M, et al. Características gerais da enfermagem: o perfil sócio demográfico. *Enferm Foco* [Internet]. 2015 [cited 2022 Aug 15];6(1/4):11-7. Available from: <https://doi.org/10.21675/2357-707X.2016.v7.nESP.686>
  16. Püschel VAA, Costa D, Reis PP, Oliveira LB, Carbogim FC. Nurses in the labor market: Professional insertion, competencies and skills. *Rev Bras Enferm* [Internet]. 2017 [cited 2022 Nov 25];70(6):1220-6. Available from: <https://doi.org/10.1590/0034-7167-2016-0061>
  17. Zingg W, Pittet D. peripheral venous catheters: An under-evaluated problem. *Int J Antimicrob Agents* [Internet]. 2009 [cited 2023 Mar 27];34 Suppl 4:S38-42. Available from: [https://doi.org/10.1016/S0924-8579\(09\)70565-5](https://doi.org/10.1016/S0924-8579(09)70565-5)
  18. Hussein R, Everett B, Ramjan LM, Hu W, Salamonson Y. New graduate nurses' experiences in a clinical specialty: A follow up study of newcomer perceptions of transitional support. *BMC Nurs* [Internet]. 2017 [cited 2022 Aug 29];16(1):42. Available from: <https://doi.org/10.1186/s12912-017-0236-0>
  19. Brykczynski KA. *Caring, clinical wisdom, and ethics in nursing practice*. In: Alligood MR, editor. *Nursing theorists and their work*. 8th ed. United States of America, (US): Elsevier Health Sciences; 2017.
  20. Polastrini RTV, Carrara D. *Diretrizes práticas para a terapia intravenosa (INS Brasil)*. 3rd ed. São Paulo, SP(BR); 2018.

21. Brasil; Ministério da Saúde; Secretaria de Gestão do Trabalho e da Educação na Saúde, Departamento de Gestão da Educação em Saúde. Política Nacional de Educação Permanente em Saúde [Internet]. Brasília, DF(BR): Ministério da Saúde; 2009 [cited 2022 Jul 7]. 65 p. Available from: [https://bvsmis.saude.gov.br/bvs/publicacoes/pacto\\_saude\\_volume9.pdf](https://bvsmis.saude.gov.br/bvs/publicacoes/pacto_saude_volume9.pdf)
22. Sousa MF de. Práticas de enfermagem no contexto da Atenção Primária à Saúde (APS): Estudo Nacional de Métodos Mistos (Relatório final) [Internet]. Brasília, DF(BR): Editora ECoS; 2022 [cited 2022 Jun 2]. Available from: <http://www.cofen.gov.br/aps/index.html>
23. Melo EM, Aragão AL, Pessoa CMP, Lima FET, Barbosa IV, Studart RMB, et al. Cuidados dispensados pela equipe de enfermagem durante o procedimento de punção venosa periférica. Rev Enferm UFPE [Internet]. 2015 [cited 2022 Aug 12];9(3):1022-30. Available from: <https://doi.org/10.5205/1981-8963-v9i3a10430p1022-1030-2015>
24. Brasil. Lei nº 7.498, de 25 de junho de 1986. Dispõe sobre a regulamentação do exercício da Enfermagem e dá outras providências [Internet]. Brasília, DF(BR): Diário Oficial [da] República Federativa do Brasil, 26 jun. 1986 [cited 2022 May 17]. Available from: [https://www.planalto.gov.br/ccivil\\_03/leis/l7498.htm#:~:text=Disp%C3%B5e%20sobre%20a%20regulamenta%C3%A7%C3%A3o%20do,observadas%20as%20disposi%C3%A7%C3%B5es%20desta%20lei](https://www.planalto.gov.br/ccivil_03/leis/l7498.htm#:~:text=Disp%C3%B5e%20sobre%20a%20regulamenta%C3%A7%C3%A3o%20do,observadas%20as%20disposi%C3%A7%C3%B5es%20desta%20lei)
25. Araújo MS de, Medeiros SM de, Costa E de O, Oliveira JSA de, Costa RR de O, Sousa YG de. Análise das normativas orientadoras da prática do técnico de enfermagem no Brasil. Rev Bras Enferm [Internet]. 2020 [cited 2022 May 17];73(3):e20180322. Available from: <http://doi.org/10.1590/0034-7167-2018-0322>
26. Nascimento MA de L, Cruz RG da, Santos TS dos. Os caminhos venosos percorridos pela enfermagem. Esc Anna Nery Rev Enferm [Internet]. 2000 [cited 2021 Dec 15];4(1):31-6. Available from: <https://cdn.publisher.gn1.link/eean.edu.br/pdf/v4n1a06.pdf>
27. Conselho Regional de Enfermagem de Santa Catarina. Resposta técnica Coren/SC Nº 02/CT/2016. Atribuições da equipe de Enfermagem na punção com dispositivo intravenoso não agulhado periférico [Internet]. 2016 [cited 2019 Dec 1]. 4 p. Available from: <https://transparencia.corensc.gov.br/wp-content/uploads/2016/05/RT-02-2016-Dispositivo-intravenoso-n%C3%A3o-agulhado-perif%C3%A9rico-.pdf>
28. Braga LM, Salgueiro-Oliveira AS, Henriques MAP, Arreguy-Sena C, Albergaria VMP, Parreira PMSD. Cateterismo venoso periférico: compreensão e avaliação das práticas de enfermagem. Texto Contexto Enferm [Internet]. 2019 [cited 2022 Aug 23];28:e20180018. Available from: <https://doi.org/10.1590/1980-265X-TCE-2018-0018>
29. Machado AF, Pedreira MLG, Chaud MN. Adverse events related to the use of peripheral intravenous catheters in children according to dressing regimens. Rev Lat Am Enfermagem [Internet]. 2008 [cited 2023 Jan 29];16(3):362-7. Available from: <https://doi.org/10.1590/S0104-11692008000300005>

## NOTES

### ORIGIN OF THE ARTICLE

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### CONTRIBUTION OF AUTHORITY

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Data analysis and interpretation: Silva BSM, Santos LM, Avelar AFM, Kusahara DM.

Discussion of results: Silva BSM, Santos LM, Avelar AFM, Kusahara DM, Rocha PK, Silva AVS.

Writing and/or critical review of content: Silva BSM, Santos LM, Avelar AFM, Kusahara DM, Rocha PK, Silva AVS.

Review and final approval of the final version: Silva BSM, Santos LM, Avelar AFM, Kusahara DM, Rocha PK, Silva AVS.

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### CONFLICT OF INTEREST

There is no conflict of interest.

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