

Peripheral venous access using devices over needles with and without extension: costs and outcomes

Acesso venoso periférico utilizando dispositivos sobre agulha com e sem extensão: custos e desfechos

Acceso venoso periférico utilizando dispositivos de aguja con y sin extensión: costos y resultados

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ABSTRACT

Objectives: to analyze the mean direct cost and peripheral venous access length outcomes using devices over needle with and without extension. **Methods:** quantitative, exploratory-descriptive research. Venous punctures and length of the devices were followed. The mean direct cost was calculated by multiplying the time (timed) spent by nursing professionals by the unit cost of labor, adding to the cost of materials. **Results:** the total mean direct cost of using devices “with extension” (US\$ 9.37) was 2.9 times the cost of using devices “without extension” (US\$ 4.50), US\$ 7.71 and US\$ 2.66, respectively. Totaling 96 hours of stay, the “device over needle with extension” showed a lower occurrence of accidental loss. **Conclusions:** the use of the “device over needle with extension”, despite its higher mean direct cost, was more effective in favoring adequate length of peripheral venous access. **Descriptors:** Vascular Access Devices; Medical-Surgical Nursing; Nursing Care; Costs and Cost Analysis; Cost Control.

RESUMO

Objetivos: analisar o custo direto médio e os desfechos de permanência de acesso venoso periférico, utilizando dispositivos sobre agulha com e sem extensão. **Métodos:** pesquisa quantitativa, exploratório-descritiva. Acompanharam-se as punções venosas e o tempo de permanência dos dispositivos. Calculou-se o custo direto médio multiplicando-se o tempo (cronometrado) despendido por profissionais de enfermagem pelo custo unitário da mão de obra, somando-se ao custo dos materiais. **Resultados:** o custo direto médio total do uso de dispositivo “com extensão” (US\$ 9,37) foi 2,9 vezes do que o custo do uso de dispositivo “sem extensão” (US\$ 4,50), destacando-se os custos dos materiais, US\$ 7,71 e US\$ 2,66, respectivamente. Totalizando 96 horas de permanência, o “dispositivo sobre agulha com extensão” apresentou menor ocorrência de perda acidental. **Conclusões:** o uso do “dispositivo sobre agulha com extensão”, apesar do maior custo direto médio, foi mais eficaz para favorecer o adequado tempo de permanência do acesso venoso periférico. **Descritores:** Dispositivos de Acesso Vascular; Enfermagem Médico-Cirúrgica; Cuidados de Enfermagem; Custos e Análise de Custo; Controle de Custos.

RESUMEN

Objetivos: analizar el costo directo promedio y los resultados de permanencia del acceso venoso periférico, utilizando dispositivos de aguja con y sin extensión. **Métodos:** investigación cuantitativa, exploratoria descriptiva. Se siguieron los pinchazos venosos y el tiempo de permanencia de los dispositivos. El costo directo promedio se calculó multiplicando el tiempo (cronometrado) dedicado por los profesionales de enfermería por el costo unitario de la mano de obra, lo que se suma al costo de los materiales. **Resultados:** el costo directo promedio total de usar dispositivos “extendidos” (US\$ 9,37) fue 2,9 veces el costo de usar dispositivos “no extendidos” (US\$ 4,50) de materiales, US\$ 7,71 y US\$ 2,66, respectivamente. Con un total de 96 horas de estadía, el “dispositivo de aguja extendida” mostró una menor ocurrencia de pérdida accidental. **Conclusiones:** a pesar del costo directo promedio más alto, el uso de un “dispositivo de aguja extendida” fue más efectivo para favorecer un tiempo de acceso venoso periférico adecuado. **Descritores:** Dispositivos de Acceso Vascular; Enfermería Médico-Quirúrgica; Cuidado de Enfermería; Costos y Análisis de Costos; Control de Costos.

INTRODUCTION

In health institutions, peripheral venipuncture is an invasive procedure commonly performed by nursing professionals⁽¹⁾ to establish a vascular access that enables the recommended intravenous therapy (IVT).

Different types of catheter devices over needle with and without extension are commercially available for peripheral venous access (PVA) installation. According to the Brazilian National Health Surveillance Agency (ANVISA - *Agência Nacional de Vigilância Sanitária*), polyurethane composite devices have a lower complication rate when compared to polyvinyl or polyethylene devices⁽²⁾. Both have a safety system to prevent work accidents.

The catheter device over needle with extension has an integrated two-way vinyl extension. This device without extension must be connected to a two- or four-way vinyl extension or a three-way structure commonly referred to in assistive practice as a "tap". Due to its peculiar characteristics, the device with extension has a higher price, which may interfere with its acquisition and restrict its indication, in different care contexts, especially in public organizations that usually need to manage scarce resources.

Knowing the costs associated with a given procedure contributes to the rational allocation of resources⁽³⁾ to ensure the improvement of safety and quality of care in balance with limited financial resources. In this perspective, the price of the device without extension is lower. However, there is a need to determine, in addition to the unit value of the device, the cost related to the time spent by the nursing professional and the costs of other materials consumed to estimate, more accurately, the cost of installing a PVA associated with the use of one or another type of intravascular device. Such knowledge will provide evidence of financial aspects of the microeconomic dimension and, consequently, subsidize proper cost management. However, it is relevant, besides the financial aspects, also to verify the outcomes associated with the different types of intravascular devices.

Regarding the outcome of a PVA length time, the Center Diseases Control (CDC) recommends between 72 and 96 hours⁽⁴⁾. In Brazil, ANVISA recommends the length of a PVA for up to 96 hours⁽²⁾, which can be extended according to the institution's best practices and if clinically indicated.

PVA may be removed in advance in the presence of any complications^(2,5), such as phlebitis, leakage, infiltration or accidentally. To prevent the occurrence of complications, which can generate tangible costs for health organizations and intangible costs for patients, it is essential that health professionals adopt practices based on the best scientific evidence for the insertion and handling of PVA^(2,4).

When comparing two devices classified as open system (which needed to be connected to an extension) and closed system (which had an integrated extension), a study observed that although there was a better insertion of the open system, since the nursing staff had more experience with this type of device, the closed system presented lower complication rates⁽⁶⁾.

A randomized clinical trial comparing complications associated with a needle-free and vinyl-extension device found complications in 55% of the punctures, of which 18% corresponded to phlebitis, 11% to infiltration, 11% to obstruction and 9% to traction. The

device without extension had a mean length of stay of 3.73 days and the device with extension coupled 3.28 days. There was a significant difference in insertion success that was greater in the device over needle without extension⁽¹⁾.

Considering that PVA installation requires the consumption of human and material resources, generating costs that need to be identified and properly managed, as well as the knowledge of the outcomes related to the devices used, this study was conducted.

OBJECTIVES

To analyze the mean direct cost and peripheral venous access length outcomes using device over needles with and without extension.

METHODS

Ethical aspects

All guidelines and regulatory standards for research involving human subjects have been met. The Research Ethics Committee of *Hospital Público de Ensino e Pesquisa* (HPEP - Public Teaching and Research Hospital) field of study (Opinion 1,889,725) approved the project.

Design, period and place of study

This is a quantitative, exploratory and descriptive study performed in the medical clinic ward of an HPEP, which has 49 beds for hospitalization of adult and elderly patients coming from the Clinical Clinic, Emergency Room or Intensive Care Units. The hospitalization of these patients aims to compensate for underlying diseases such as Diabetes Mellitus (DM) and Hypertension, and/or clinical investigation of signs and symptoms.

During the study, during the typical nine months of hospitalizations in the medical clinic ward, in the morning there were four assisting nurses and ten nursing technicians (7 a.m. to 1 p.m.). In the afternoon there were two nurses and eight technicians (1 p.m. to 7 p.m.), and two nurses and eight technicians in each night shift (even and odd - 7 p.m. to 7 a.m.).

Population or sample; inclusion and exclusion criteria

The sample calculation was performed using the G Power software, using the analysis of variance test (ANOVA) to compare two independent groups, considering $\alpha = 0.05$, $\beta = 0.85$ and an effect size of 0.30. Thus, 128 patients with PVA indication to be observed were established, being 64 group members using "device over needle extension" and 64 group using "device over needle without extension".

Nurses and nursing technicians who had at least one year of professional experience, therefore experienced in PVA establishment, and patients who required PVA for antibiotic therapy, analgesia or electrolyte replacement, and who had no compromised venous network, were included in the study. Patients with generalized edema and indication of central venous catheter or peripherally inserted central catheter were excluded.

Study protocol

Data were collected from January to September 2017. Initially, all nursing professionals were observed while performing peripheral venipuncture procedures and it was found that they adequately met the five standard steps in HPEP: 1) separation of materials; 2) explanation of the procedure to the patient; 3) venous network evaluation; 4) puncture; and 5) nursing notes regarding PVA establishment. All professionals and invited patients agreed to participate in the study by signing the Informed Consent Form.

Subsequently, non-participant observations were carried out for documentation, in an instrument containing fields intended to record the quantity and category of nursing professionals involved. Also, time (timed) spent in the above five steps (considering the start and end of each); materials and quantities used; punctured limb; type of device over needle and daily evaluation of the device insertion site, up to 96 hours of stay, in order to highlight the respective clinical outcomes.

In HPEP, there is no standardization of the type of device to be used, and this decision is the responsibility of the performing professional, based on their clinical experience. It was observed that mid-level professionals, when in doubt regarding the device of choice, reported to the nurse of the medical clinic ward. It was found that by prescribing hemotherapies, which require smaller gauge device and greater lumen due to blood viscosity, professionals opted for the device without extension. Facing elderly patients and/or with a weaker venous network, they opted for the device with extension.

In order to obtain the mean direct cost of the procedure [$\overline{C(P_i)}$] with the use of devices over needles with and without extension, a micro-costing study was used whose reference consisted of the direct costs defined as a monetary expenditure. It can be identified and clearly quantified, applied in the production of a product or service where it can be associated with the product or department⁽⁷⁾. In direct cost studies, the objective measure of consumption is the materials, medicines and/or solutions used and the direct labor (DL) involved in the procedure or process⁽⁸⁾.

DL refers to staff who work directly on a product/service provided as long as it is possible to measure the time spent and identify who performed the work. It consists of salaries, social charges, vacation provisions and 13th month pay⁽⁷⁾.

DL unit cost was calculated from the mean salaries provided by the HPEP Human Resources Service. The amounts, in *reais* (R\$), were converted to the US dollar (US\$) at the conversion rate of US\$ 0.3 R\$, based on the quotation on May 31, 2017 provided by the Central Bank of Brazil. Most professionals worked 30 hours a week. The cost was US\$ 2,142.34 (compensation/120 hours), US\$ 17.85 (compensation/hour) and US\$ 0.30 (compensation/minute) for nurses and US\$ 1,092.26 (compensation/120 hours), US\$ 9.15 (compensation/hour) and US\$ 0.15 (compensation/minute) for nursing technicians.

For the determination of $\overline{C(P_i)}$, mean amount of materials [$\overline{qm_k}$]; mean unit price of each material [$\overline{pmu_k}$]; mean time spent in each professional category [$\overline{t_c}$] and mean unit wage bill of each professional category [$\overline{su_c}$] were identified. The equation was obtained:

$$\overline{C(P_i)} = \sum_{k=1}^n (\overline{q_k} \cdot \overline{pmu_k}) + \sum_{c=1}^n (\overline{t_c} \cdot \overline{su_c})^{(9)}.$$

Analysis of results, and statistics

Continuous variables were described by mean, standard deviation, minimum and maximum values. Mann Whitney test was used to compare continuous data between groups and Pearson's Chi-square test (X^2)/Fisher was used to compare categorical variables. The significance level of $\alpha \leq 0.05$ was considered. SPSS software version 21.0 was used.

RESULTS

Seventeen nursing professionals were followed during the installation of PVA. Most were nursing technicians (82.35%), aged 27-55 years old, mean 41 (SD=9.27), nursing experience time of four to 30 years, mean 14 (SD=7.84) and mean time in the medical clinic ward of four years (SD=2.17), ranging from one to ten years.

Among the 128 patients observed and evaluated for PVA insertion site, until completing 96 hours of stay in the "device over needle with extension" group (n=64), the mean age was 52 years (SD=18.81). There was a variation of 19-83 years and in the "without extension" group (n=64) the mean age was 54 years (SD=14.66), ranging from 22-90 years. In both groups, female patients equally prevailed (54.67%).

According to Table 1, in both groups, the most prevalent medical diagnostic hypotheses were hypertension and DM. Antibiotics and analgesics administration corresponded to the most frequent reasons for PVA indication. Puncture attempts ranged from one to two in the "device over needle with extension" group and one to three in the "without extension" group, with success in the first puncture in both groups. However, there was a statistically significant difference associated with puncture on the first attempt in the "device over needle with extension" group (p=0.038).

Mostly nursing technicians, corresponding to 92.18% in the "device over needle with extension" group and 79.68% in the "without extension" group, performed the punctures. When correlating the punctures performed by nurses and nursing technicians and their professional experience, there was no statistically significant difference.

Regarding the mean duration of the PVA installation procedure, the group "device over needle with extension" obtained 10 minutes (SD=3.50), with a minimum of four and a maximum of 22 minutes. In the "without extension" group, it corresponded to 10 minutes (SD=3.07), ranging from five to 19 minutes. Considering the constituent steps of the procedure (separation of materials, explanation of the procedure to the patient, venous network evaluation, puncture and nursing annotation), there was a similarity in the mean duration time in both groups. The stage of venipuncture had the longest duration (four minutes - SD=2.40 in the "device over needle with extension" group and four minutes - SD=1.85 in the "without extension" group).

As shown in Table 2, the material cost was US\$ 7.71 (SD=2.28) in the "device over needle with extension" group and US\$ 2.66 (SD=0.74) in the "without extension" group, representing the most significant value for the composition of the mean direct cost of the procedure, US\$ 9.37 (SD=2.79) and US\$ 4.50 (SD=1.29), respectively.

Table 1 - Distribution of medical diagnostic hypotheses, reasons for indicating PVA* and number of puncture attempts in the 128 patients, São Paulo, São Paulo, Brazil, 2017

Variables	Device over needle		p value [†]
	With extension n= 64	Without extension n= 64	
Diagnosis			
Cardiac insufficiency	6	6	1.000
Hypertension	25	23	0.855
Systemic lupus erythematosus	4	6	0.744
Dyslipidemia	4	6	0.744
Diabetes Mellitus	17	20	0.697
Encephalopathy	4	2	0.680
Pneumonia	2	4	0.680
Chronic Kidney Disease	9	12	0.634
Stroke	1	3	0.619
Pleural effusion	2	0	0.496
Infection	8	4	0.364
Anemia	12	7	0.320
Chronic obstructive pulmonary disease	1	5	0.208
Cirrhosis	3	8	0.206
Acute Kidney Failure	4	0	0.119
Indication for PVA installation*			
Painkiller administration	18	22	0.568
Electrolyte replacement	7	11	0.446
Hemotherapy administration	5	2	0.440
Antibiotic administration	22	27	0.467
Diuretic administration	12	7	0.223
Puncture attempt			
01 attempt	54	43	0.038
02 attempt	10	19	0.143
03 attempt	0	2	0.496

Note: *PVA - peripheral venous access; † p value - Chi-square test.

In the “with extension” group, the unit costs of the devices predominated (gauges # 20 and # 24 - US\$ 5.89; # 22 - US\$ 5.91). They impacted the composition of total costs (33 units of gauge # 20/ US\$ 194.37; 23 gauge # 24/US\$ 135.47 units and 19 gauge #22/\$ 112.29 units), besides the mean cost of the transparent film mean US\$ 0.41 (63 units/US\$ 26.17). In the “without extension” group, the most costly materials were clear film with reinforced edges (unit - US\$ 1.65/33 units/US\$ 54.33); polyvinyl two-way extension (unit - US\$ 0.67/65 units - US\$ 37.47) and devices without extension (gauges # 20 and # 22 unit value US\$ 0.48/82 units - US\$ 39.36).

In the “device over needle with extension” and “without extension” groups, a single device was used to ensure successful PVA puncture in most patients (84.38% and 67.18%). In the first group, two devices were used in ten patients. In the second, two devices were used in 14 patients and three devices in the “without extension” group in two patients.

Table 2 - Distribution of observations of PVA installation procedure* (n=128), devices over needle “with extension” (n=64) and “without extension” (n=64) groups, according to DL cost of nursing professionals, material cost and total mean direct cost, São Paulo, São Paulo, Brazil, 2017

Groups	Device over needle with extension				Device over needle without extension				p value [‡]
	Mean US\$ [†]	Standard Deviation US\$ [†]	Minimum US\$ [†]	Maximum US\$ [†]	Mean US\$ [†]	Standard Deviation US\$ [†]	Minimum US\$ [†]	Maximum US\$ [†]	
Cost of direct labor of nursing professionals (US\$ †)	1.66	0.82	0.71	5.32	1.84	0.92	0.92	5.23	0.31
Material cost (US\$ †)	7.71	2.28	6.67	13.80	2.66	0.74	1.71	4.29	<0.001
Total mean direct cost (US\$ †)	9.37	2.79	7.38	19.12	4.50	1.29	2.74	8.99	<0.001

Note: * PVA - peripheral venous access; † US\$ - US\$ conversion rate corresponding to US\$ 0.31/R\$, based on the quotation of July 29, 2016, provided by the Central Bank of Brazil; ‡ p value - Mann-Whitney test, p <0.005.

Table 3 - Outcome distribution, up to 96 h PVA stay*, in the “device over needle with extension” and “device over needle without extension” groups, São Paulo, São Paulo, Brazil, 2017

Clinical outcomes	Device over needles		p value [†]
	With extension	Without extension	
First day	n=64	n=64	
Absence of phlogistic signs	63	56	0.03
Pain	0	4	0.11
Accidental loss	1	4	0.36
Second day	n=63	n=56	
Absence of phlogistic signs	50	51	0.82
Pain	5	0	0.05
Extravasation	1	1	1.00
Phlebitis	0	1	1.00
Accidental loss	1	2	1.00
End of therapy	6	1	0.20
Third day	n=50	n=51	
Absence of phlogistic signs	45	41	0.57
Phlebitis	0	2	0.49
Accidental loss	0	4	0.11
End of therapy	5	4	0.71
Fourth day	n=45	n=41	
Absence of phlogistic signs	43	36	0.27
Pain	1	1	1.00
Accidental loss	1	3	0.61
End of therapy	0	1	1.00
Everyday (96 hours)	n=64	n=64	
Absence of phlogistic signs	43	36	0.27
Pain	6	5	1.00
Extravasation	1	1	1.00
Phlebitis	0	3	0.24
Accidental loss	3	13	0.01
End of therapy	11	6	0.27

Note: * PVA - peripheral venous access; † p value - Chi-square test.

Regarding outcomes (Table 3), in both groups, the absence of phlogistic signs predominated on the first day, and this outcome was more prevalent in the “with extension” group, with a statistically significant difference (p=0.033).

In the daily evaluation, the device losses were subtracted. Counting at 96 hours, the group “device over needle with extension” presented lower occurrence of accidental loss with significant statistical difference (p=0.014).

DISCUSSION

In the present study, similarly to what was found in recent research^(1,10-11), PVA installation by predominant mid-level professionals, properly trained and experienced in performing this

procedure, predominated. In the Brazilian reality, this result was expected considering that mid-level professionals represent the largest quantity in the composition of the nursing team. In addition, considering the particularities of work processes, nurses often perform indirect patient care interventions, managing resources to enable the provision of health services. They prioritize the execution of direct care interventions in cases of patients with higher complexity/severity profiles.

The mean age and the most prevalent medical diagnostic hypotheses among the observed patients also presented similarities with results obtained in other national and international studies. The mean showed that they were patients near the end of adulthood^(1,10,12-13), with chronic diseases, especially hypertension and DM^(1,10). The most frequent indication for PVA establishment was for antibiotic administration, which is in agreement with the literature^(6,14-15).

Regarding the successful PVA establishment in the first puncture, a statistically significant difference was found in the "device over needle with extension" group compared to the "device over needle without extension" group.

There were randomized controlled trial conducted in clinical and surgical units of a large university hospital⁽¹⁾, two prospective randomized controlled trials, one conducted in clinical and surgical units of a university hospital⁽⁶⁾ and another in an emergency room of a university-affiliated urban community hospital⁽¹¹⁾. These studies found favorable results regarding the use of the needle with extension in the first puncture attempt.

The importance of establishing PVA in the first puncture attempt is emphasized in order to make the procedure less painful for the patient⁽¹⁶⁾, to avoid damage to the venous network due to multiple punctures, to prevent interruption of intravenous therapy⁽¹⁷⁾ and direct the rational consumption of resources preventing the increase of costs.

Regarding the size of the devices, there was a predominance of gauges # 20, # 22 and # 24, due to difficult access venous network, as also verified in other studies^(1,10,12,18). The choice of using a smaller gauge device, through careful prior evaluation of the venous network, is a decisive factor for the successful PVA establishment in the first puncture attempt. However, success in the first puncture attempt is more related to the lower level of pain referred by the patient, by numerical scale, than to the device gauge⁽¹⁶⁾.

In this study, the mean duration of the PVA installation procedure in the "with extension" and "without extension" groups was similar. Venous puncture was the stage that presented the longest duration in both groups. Despite recurring searches in different databases, no research was found to indicate the timed PVA establishment time.

Only one study was found reporting estimated duration⁽⁶⁾. However, the authors used a mean puncture time, without indicating the procedure steps that were included, to calculate labor cost and data from another hypothetical cohort study that estimated the cost-effectiveness of devices with and without stabilization platform⁽¹⁹⁾.

The mean direct cost of installing PVA was significantly higher in the "device over needle with extension" group compared to the "device over needle without extension" group. Similar results to

research conducted in Japan⁽¹⁷⁾ and Spain⁽⁶⁾ evaluated the costs of puncture with and without extension devices. In both groups, similar to another Brazilian study⁽¹⁹⁾, the cost of materials corresponded to the variable with the greatest financial repercussion.

In the group "device over needle with extension", the unit costs of the devices were the most important for the composition of the mean direct cost. In the "device over needle without extension" group, the reinforced edge transparent film whose indication, in the teaching and research hospital field of study, has been for central catheters with weekly exchange routine, corresponding to the item with the highest unit cost.

Intentional use of an institutionally non-standardized material for the fixation of the intravascular device indicates the influence of clinical experience and nursing professionals' experience as a support for the decision-making process regarding the choice and rational use of available resources. Transparent film is a protective factor to prevent the occurrence of PVA-related adverse events⁽²⁰⁾. There is evidence that the effectiveness of the reinforced transparent film is superior to that of traditional film (without reinforced edges)⁽²¹⁾.

Decision-making regarding the use of both intravascular device and other materials used for safe PVA establishment and maintenance need to be based on both the clinical experience of professionals and the best available evidence. In this perspective, a study⁽¹⁷⁾ showed that although the cost of the first puncture is higher as the use of the device with extension, costs are significantly higher when using devices without extension that presented higher frequency of new punctures resulting from unplanned replacements.

Regarding length of stay, a statistically significant difference was observed between punctures with absence of phlogistic signs in the "device over needle with extension" group compared to the "without extension" group. It is reiterated that, as recommended by the CDC, venous access should last up to 96 hours⁽⁴⁾. Removal of the device, due to any complication, causes some harm to the patient, which may range from performing a new procedure to prolonging the hospitalization time for phlebitis treatment.

According to the Infusion Nurses Society⁽⁵⁾, phlebitis is a frequent complication due to an inflammatory process that affects the intimate layer of the vein and may cause pain, edema, local erythema and heat, in addition to the appearance of a palpable fibrous cord. It may be mechanical, related to size of gauge; chemistry related to infusion of irritant/vesicant solution; or infectious when there is contamination due to failure of the puncture technique. When the patient needs an intervention beyond the therapeutic plan due to his clinical situation, and his hospitalization is prolonged due to phlebitis, there is an adverse event considered serious⁽²⁰⁾.

Studies that analyzed the occurrences associated with PVA residence time indicated, as the most relevant, the presence of phlebitis^(1,10,14-15,18,20,22), as well as pain⁽¹⁸⁾, resulting in withdrawal early access, and accidental removal^(1,20).

In this study, the phlebitis scale⁽⁵⁾ was used to classify the outcomes, and it was found that pain reports, without the presence of other phlogistic signs, were associated with catheter positioning in joint sites, thus causing greater discomfort to the patient. Pain, extravasation, phlebitis and accidental loss generated early

withdrawal in 16% of cases in the “device over needle with extension” group. In 34% in the “without extension” group, there was no statistically significant difference regarding the occurrence of phlebitis between the cases of these groups. This favorable result was also obtained in a recent study in Japan⁽¹⁷⁾. This research, when evaluating the outcomes related to PVA with the use of devices with and without extension, associated the decrease of the need for new puncture, caused by accidental loss, when using the device with extension.

In care practice, as previously mentioned, nursing professionals are responsible for the insertion and maintenance of PVA to enable IVT safely and efficiently. However, the successful completion of venipuncture and adequate access maintenance, in addition to being directly related to the technical and scientific competence of nursing professionals, depends on the material resources provided by the health institution.

In this sense, available resources, in adequate quantity and quality, may result in favorable outcomes (absence of adverse events, end of intravenous therapy within the recommended time, among others). Otherwise, there will be increased costs related to resources consumed for the management of an adverse event and risks. They could be minimized/avoided, the occurrence of intangible costs for the patient that will affect the evolution of his clinical condition and the trust he placed in the professionals and the health institution.

Study limitations

Limitations of this study in a single unit and the fact that care associated with PVA maintenance.

Contributions to nursing, health or public policy

The timing of the total time of PVA establishment, using devices with needle with and without extension, represents an advance in the knowledge about the subject. This is particularly true when demonstrating that the type of device was not associated with a significant statistical difference in the DL cost composition of the professionals involved in the procedure. Statistical tests showed that the use of the “device over needle with extension”, despite its higher mean direct cost, was more effective in favoring adequate PVA residence time.

CONCLUSIONS

PVA establishment in patients in the “device over needle with extension” group had a total mean direct cost 2.9 times higher than the “device over needle without extension” group, and the material cost in both groups was the variable with most significant value for its composition. In the first 24 hours, absence of phlogistic signs predominated in both groups and was statistically significant in the “device over needle with extension” group. Considering the 96 hours of stay, the group “device over needle with extension” presented lower occurrence of accidental loss.

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