



# Journal of Nursing

Revista de Enfermagem

UFPE On Line

ISSN: 1981-8963

## ORIGINAL ARTICLE

### WELFARE INDICATOR: A COMPARATIVE STUDY BETWEEN PUNCTURE AND FIXATION TECHNOLOGIES FOR PERIPHERAL INTRAVENOUS CATHETER INDICADOR ASSISTENCIAL: ESTUDO COMPARATIVO ENTRE TECNOLOGIAS DE PUNÇÃO E FIXAÇÃO DE CATETER INTRAVENOSO PERIFÉRICO INDICADOR DE BIENESTAR: UN ESTUDIO COMPARATIVO ENTRE LAS TECNOLOGÍAS DE PUNCIÓN Y FIJACIÓN DE CATÉTERES INTRAVENOSOS PERIFÉRICOS

*Cinthia Prates Vigna<sup>1</sup>, Marli de Carvalho Jericó<sup>2</sup>*

#### ABSTRACT

**Objective:** to compare puncture and fixation technologies for peripheral intravenous catheter (PIC) in relation to the permanence time (PT), material consumption and costs. **Method:** comparative, retrospective study, with a quantitative approach, carried out in two hospitals, A and B. Regarding the puncture, A and B implemented, in 2011, the new PIC technology (safety device), whereas only A implemented the new fixation technology (sterile transparent film), B remained conventional. **Results:** reduction of 16% in the PT indicator after the new technologies, 56.2h (2010) for 47.2h (2011-2013), being lower by 2.7% of TP average (47.2h - 2011-2013) compared to B (48.5h - 2011-2013). New technologies have resulted in higher costs with puncture higher in A (27.4%) than in B (22%). **Conclusion:** The new fixation technology did not increase the PT of PIC in A, which showed lower PT compared to the conventional one in B and associated increased costs. **Descriptors:** Peripheral Catheterization; Intravenous Infusions; Quality Indicators, Health Care; Nursing Audit; Comparative Study.

#### RESUMO

**Objetivo:** comparar tecnologias de punção e fixação de cateter intravenoso periférico (CIP) em relação ao tempo de permanência (TP), consumo e custos de materiais. **Método:** estudo comparativo, retrospectivo, de abordagem quantitativa, realizado em dois hospitais, A e B. Com relação à punção, A e B implantaram em 2011 a nova tecnologia de CIP (dispositivo de segurança), enquanto que a fixação apenas A implantou a nova tecnologia (filme transparente estéril), B manteve a convencional. **Resultados:** redução em A de 16% no indicador TP após as novas tecnologias, de 56,2h(2010) para 47,2h(2011-2013), sendo menor em 2,7% da média de TP (47,2h-2011 a 2013) comparada a B (48,5h-2011 a 2013). As novas tecnologias resultaram em aumento com custos da punção maior em A (27,4%) ao comparar com B (22%). **Conclusão:** A nova tecnologia de fixação não aumentou o TP do CIP em A, apresentou menor TP comparada à convencional em B e associou elevação de custo. **Descritores:** Cateterismo Periférico; Infusões Intravenosas; Indicadores de Qualidade em Assistência à saúde; Auditoria de Enfermagem; Estudo Comparativo.

#### RESUMEN

**Objetivo:** comparar las tecnologías de punción y fijación del catéter intravenoso periférico (CIP) en relación con el tiempo de permanencia (TP), el consumo de material y los costes. **Método:** estudio comparativo, retrospectivo, con un enfoque cuantitativo, realizado en dos hospitales, A y B. En cuanto a la punción, A y B implementaron, en 2011, la nueva tecnología CIP (dispositivo de seguridad), mientras que la fijación sólo A implantó nuevas tecnologías (película transparente estéril), B permaneció convencional. **Resultados:** reducción del 16% en el indicador TP después de las nuevas tecnologías, 56,2h (2010) para 47,2h (2011-2013), siendo inferior en 2,7% de la media de TP (47,2h - 2011-2013) en comparación con B (48,5h-2011-2013). Las nuevas tecnologías han dado lugar a mayores costos de punción mayor en A (27,4%) frente a B (22%). **Conclusión:** La nueva tecnología de fijación no aumentó el TP del CIP en A, que mostró menor TP en comparación con B convencional y asoció aumento de los costos. **Descriptores:** Cateterización Periférica; Infusiones Intravenosas; Indicadores de Calidad de la Atención de Salud; Auditoria de Enfermería; Estudio Comparativo.

<sup>1</sup>Nurse, MSc Student, Postgraduate Program in Nursing, College of Medicine of São José do Rio Preto/FAMERP. São José do Rio Preto (SP), Brazil. Email: [cinthiavigna@yahoo.com.br](mailto:cinthiavigna@yahoo.com.br); <sup>2</sup>Nurse, PhD Professor, Graduate and Postgraduate Program in Nursing, College of Medicine of São José do Rio Preto/FAMERP. São José do Rio Preto, (SP), Brazil. Email: [Martli@famerp.br](mailto:Martli@famerp.br)

## INTRODUCTION

The Intravenous Therapy (IT) is among the main nursing care indicators. The Commitment with the Hospital Quality Program (CHQ), which aims to assess the quality of services provided to customers in hospitals, has 15 care indicators. Among these, eight relate to IT, representing 53.3% of the total, as the incidence of phlebitis, extravasation, error of medication and accidental loss of catheters.<sup>1</sup> Among the 14 quality indicators of the American Nurses Association (ANA), two relate to IT, such as the infiltration rate of peripheral intravenous catheters in children and bloodstream infection associated with central venous catheter.<sup>2</sup> Thus, IT is considered an important indicator, for it is one of the most performed procedures in hospitalized patients and that exposes the client and the employee to various risks.<sup>3</sup>

Given the importance of IT within health institutions, public and private organizations seek the best practices to provide greater security to the customer and professional.<sup>3</sup> The Safety and Health at Work in Health Care Institutions Regulatory Norm (NR 32) recommends the use of safety devices to prevent occupational accidents.<sup>4</sup> Regarding fixation of the catheter, the National Health Surveillance Agency (ANVISA) and the São Paulo Regional Nursing Council (COREN - SP) indicate sterile coverage of peripheral intravenous catheter, which can be semi-occlusive, using gauze or fastener, or transparent semi-permeable membrane.<sup>5-6</sup> However, in developing countries, the health institutions have not incorporated the new fixation technology and still maintain the nonsterile tape as bandages.<sup>7</sup>

The incorporation of a new technology impacts the clinical and economic indicators, affecting the sustainability of the health system.<sup>8</sup> Thus, to survive, the institutions seek to incorporate new technologies that are proven safe and effective and, therefore, are seeking strategies to monitor and evaluate the care.<sup>9</sup> A study points out that the cost-effectiveness analysis is the most suitable method for the evaluation and decision regarding new technologies, since it analyzes benefits and costs, generating objective result that reflects a tool in decision making.<sup>10</sup>

Study<sup>7</sup> conducted with children aged 0-12 years showed there is a relationship between the incidence of Adverse Event (AE) and the type of bandage, demonstrating that the transparent film showed 78% of infiltration. Research on the type of dressing and the

permanence of the intravenous catheter in children showed dressing with sterile gauze (46.1h), sterile transparent film (29.5h) and hypoallergenic adhesive tape (29.5h).<sup>11</sup>

Given the importance of IT in the work process of nursing and the need to use care indicators for nurses in order to achieve excellence in patient care, this study aims to compare: 1 - in relation to the puncture, the use of peripheral intravenous catheter technologies (PIC) (conventional and safety device) and, in relation to the fixation of the PIC with safety device technologies (conventional and sterile transparent film), regarding the permanence time in hours in two hospitals; 2 - analyze the mounting technologies (conventional and sterile transparent film) in a hospital and; 3 - compare the puncture and fixation technologies regarding the consumption and the cost of the materials between two hospitals.

## METHOD

Comparative, retrospective study, with a quantitative approach, performed in a Health Plan Operator (HPO) located in the Southeast of Brazil. The investigation period was from January 2010 to December 2013 in two hospitals called A and B. These hospitals are small and provide tertiary care to adults in various specialties with an average of 300 (A) and 130 (B) monthly hospitalizations, linked to the HPO. The average length of stay is three (four) days at both hospitals, but A has an average age of 53.7 (21.8) years, whereas B, 52.1 (23.3) years.

The choice was to analyze the periods of hospitalization of 1-4 days (up to 96h) and 5-30 days (above 96h), considering the recommendation of the Center for Disease Control and Prevention<sup>12</sup> (CDC) for peripheral intravenous catheter exchange the period of 72 to 96 hours.

Thus, the question of the research on the use of PIC was: Do the puncture (conventional and safety device) and fixation (conventional and sterile transparent film) technologies influence the permanence time, consumption and cost of the catheter in Hospitals A and B? Did the new fixation technology (sterile transparent film) reach 72 hours of PIC permanence in hospital A?

*Technologies related to peripheral intravenous catheter (PIC)*

Hospitals A and B used conventional puncture device and, from January 2011, they implemented the new PIC technology with safety device. This change bases on the NR 32, ANVISA and COREN-SP. In relation to the

catheter permanence time, the CDC recommends, also adopted as the protocol in both hospitals, the period from 72 to 96h.

*Technologies related to the fixation of peripheral intravenous catheter (PIC)*

The hospital A requested to the HPO and deployed, from 2011, the new fixation technology (sterile transparent film). This fixation allows visualization of the insertion point of the peripheral intravenous catheter, providing agility in decision making by the nursing staff, handleless and a catheter permanence with 72-hour of protection, maximum period recommended by the CDC and hospital protocol.

The purpose of the implementation of the new fixation technology by hospital A was achieving effectiveness in IT by maintaining the peripheral intravenous catheter in 72 hours, according to manufacturer's guidance. Therefore, effectiveness, for this hospital, relates to the maintenance of the catheter with quality and safety in 72h. Thus, a period smaller than that was considered ineffective.

Hospital B kept the conventional PIC fixation, considered, in this study, the one performed with nonsterile hypoallergenic adhesive tape, with change every 24 hours.

CPT =

Hospitalization period

Number of used catheters

RESULTS

The analysis of the PIC puncture and fixation technologies was held in relation to the permanence time, consumption and material costs.

In the hospital A (Table 1), hospitalizations for one to four days (up to 96h) represented 85.1%, the catheter consumption was 59.5% and the catheter consumption/hospitalization ranged from 1.0 (2012) to 1.3 (2010). Before the implementation of the protocol with new technologies, the use of catheter/hospitalization was 1.3 (2010) and the average was 1.1 catheter/hospitalization (2011-2013), reducing 15.4%. Within five to 30 days (above 96h), hospitalizations represent

The fixation cost was calculated based on the materials paid as hospital protocol, concerning the daily change, two ml of 70% alcohol, two balls of hydrophilic cotton, a pair of examination gloves, 20 cm of tape or a transparent sterile film (6cm x 7cm). The calculation of the cost was performed as invoice presented by the hospital with an increase of 10% of marketing.

The suppliers of puncture (safety device) and fixation (transparent sterile) technologies provided training to employees of hospitals, but the planning and evaluation were performed by the hospitals.

Preceding data collection, the study was approved by the Research Ethics Committee (Opinion N° 424,895/2013) and conducted in accordance with Resolution 466/12. The data were obtained from the Nursing Audit service through the HPO Information Technology System. For the calculation of the catheter permanence time (CPT), in hours, a formula was created with the variables, hospitalization period (hours) of patients and number of used catheters.

14.9%, catheter consumption, 40.5%, and catheter/hospitalization ranged from 3.9 (2010) to 5.2 (2012). Before the implementation of new technologies, the use of catheter/hospitalization was 3.9 (2010) and the average was 4.8 (2011-2013), increasing the consumption of catheter/hospitalization in 23%. The average consumption of catheter/hospitalization was 1.2 in the historical series of hospitalizations of one to four days (up to 96h), and 4.6, in five to 30 days (above 96h), increasing 283.3%. The PIC permanence time indicator, before the implementation of new technologies, was 56.2h (2010) and the average was 47.2h (2011-2013), reducing 16% the PIC permanence time.

Table 1. Statement of use of puncture and fixation technologies - conventional (2010) and with puncture - security and fixation device - sterile transparent film (2011-2013) of the PIC in hospital A. São José do Rio Preto, SP, Brazil, 2015.

VARIABLES	2010		2011		2012		2013	
	N(%)	M(Sd)	N(%)	M(Sd)	N(%)	M(Sd)	N(%)	M(Sd)
1 to 4 days								
Hospitalization	3.252(84.8)	282(69.8)	3.093(83.2)	259(13.9)	3.300(87.5)	275(70.1)	3.077(84.8)	256.42(18.8)
Used catheter	4.296(65.5)	324(98.8)	3.691(58.2)	265.2(79.7)	3.403(57.8)	339.6(106.8)	3.430(55.7)	285.83(80.4)
Catheter/Hospitalization	1.3	1.3(0.4)	1.2	1.2(0.4)	1.0	1.2(0.2)	1.1	1.1(0.3)
5 to 30 days								
Hospitalization	579(15.1)	48.2(11.7)	625(16.8)	52.1(309.8)	472(12.5)	39.3(6.4)	554(15.2)	46.2(17.9)
Hospitalization hours	126.700.47	203.1(110.1)	129.403.7	216.3(143.7)	111.527	219.4(166.0)	130.212.2	223.0(125.9)
Used catheter	2.256(34.4)	130.6(27.8)	2.643(41.7)	113.7(42.7)	2.474(42.2)	206.2(33.1)	2.726(44.3)	227.2(72.2)
Catheter/Hospitalization	3.9	3.5(0.7)	4.2	4.2(1.0)	5.2	5.3(0.7)	4.9	5.0(0.6)
CPT	56.2	56.2(10.8)	49.0	48.9(9.7)	45.1	45.1(4.1)	47.8	47.8(6.9)
Total								
Hospitalization	3.831	332.5(79.6)	3.718	314(16.2)	3.772	314.3(69.0)	3.631	302.6(22.6)
Used catheter	6.552	465.7(68.5)	6.334	496.3(59.9)	5.877	489.8(115.6)	6.156	513(45.7)
Catheter/Hospitalization	1.7	1.7(0.2)	1.7	1.7(0.3)	1.6	1.6(0.2)	1.7	1.7(0.1)

U: measurement unit; CPT: Catheter Permanence Time.

In hospital B (Table 2), hospitalizations for one to four days (up to 96h) represented 86.3%, catheter consumption, 50.3%, and catheter consumption/hospitalization ranged from 1.1 (2010 and 2013) to 1.4 (2011). Before the protocol implementation with new puncture technology, the average consumption of catheter/hospitalization was 1.1 (2010) and, after, 1.2 catheter/hospitalization (2011-2013), increasing 9.1%. Within five to 30 days (above 96h), hospitalizations represent 18.1%, the catheter consumption, 49.6%, and

catheter/hospitalization ranged from 4.4 (2012) to 6.3 (2011). Before the new technology deployment, the average use of catheter/hospitalization was 5.3 (2010) and 5.4 (2011-2013), increasing 1.9%. The average consumption of catheter/hospitalization was 1.2 in the historical series of hospitalizations of one to four days (up to 96h) and 5.4, in five to 30 days (above 96h), increasing 350%. The PIC permanence time indicator, before the implementation of new technologies, was 45.7h (2010) and the average was 48.5h (2011-2013), increasing 6.1%.



Table 2. Statement of the use of conventional puncture technology (2010) and safety device (2010-2013) and conventional fixation (2010-2013) of the PIC in the hospital B. São José do Rio Preto, SP, Brazil, 2015

VARIABLES	2010		2011		2012		2013	
	N(%)	M(Sd)	N(%)	M(Sd)	N(%)	M(Sd)	N(%)	M(Sd)
Up to 96h								
Hospitalization	1.178(80.4)	98(11.0)	1.213(82.4)	98(11.0)	1.373(86.1)	116.8(11.5)	1.228(81.3)	102.3(14.9)
Used catheter	1.307(46.1)	112(48.9)	1.487(47.4)	143(51.8)	1.690(63.0)	173(50.9)	1.365(46.0)	113.7(59.8)
Catheter/Hospitalization	1.1	1.1(0.8)	1.2	1.5(0.6)	1.2	1.3(0.4)	1.1	1.1(0.5)
Above 96h								
Hospitalization	287(19.6)	33(7.0)	259(17.6)	33(6.9)	222(13.9)	18.5(3.5)	281(18.6)	23.4(9.9)
Hospitalization hours	69.683.3	45.2(135.2)	72.750.4	45.2(135.3)	52.870.2	40.8(123.8)	76.512.4	46.0(196.8)
Used catheter	1.529(53.9)	143(24)	1.645(52.5)	158.2(54.6)	992(37.0)	70.5(26.1)	1.602(54.0)	133.5(65.6)
Catheter/Hospitalization	5.3	5.3(1.3)	6.3	6.2(1.9)	4.4	4.4(1.1)	5.7	5.7(1.4)
CP	45.5	45.7(5.0)	44.2	44.2(5.6)	53.3	53.3(6.0)	48.2	48.2(5.5)
Total								
Hospitalization	1.465	131(8.2)	1.472	132(8.2)	1.595	132.9(12.0)	1.509	125.7(7.6)
Used catheter	2.836	265(31.6)	3.132	287.4(29.6)	2.682	223.5(26.0)	2.967	247.2(27.7)
Catheter/Hospitalization	1.9	1.9(0.3)	2.1	1.9(0.8)	1.7	1.1(0.3)	1.9	1.5(0.5)

U: measurement unit; CP: Catheter Permanence.

After implementing the puncture and fixation technologies, the PIC permanence time decreased in hospital A (16.0%), and increased in hospital B (6.1%) in hospitalizations for five to 30 days. Given the CDC recommendation of the catheter - 72h, the longest time reached by hospital A was 48.9h (2011), that is, 50.9% to 67.9% of the maximum time that is proposed by the manufacturer, 72 to 96h .

Table 3 presents data on the analysis of new technologies of puncture and fixation of PIC through the variables consumption and cost at both hospitals.

In the hospital A, there was a decrease of 5.2% (2010-2013) of admissions. The average consumption of catheter/year was 6,229.7 (2010-2013), and ranged from 5,877 (2012) to 6,552 (2010). The cost of the catheter ranged from R\$12,841.92 (2010) to R\$15,835.00 (2011), and the fixation, R\$4,191.78 (2010) to R\$6,849.80 (2013) for the HPO. Before the implementation of new technologies, the average consumption of catheter/year was 6,552 (2010) and fixation, 11,031 (2010), and after, 6,122.3 (2011-2013) and 5,513.3 (2011-2013), respectively, reducing the consumption in 6.5% (catheter) and 50% (fixation), but there was an increase in cost of 19%

(catheter) and 52.5% (fixation). After the implementation of new technologies, there has been a reduction in the fixation consumption due to the exchange rate, initially performed every 24 hours and, with new technology, has longer period, resulting in a reduction of up to 54.4% (2011). However, the cost increased, in the whole period, up to 63.4% in 2013.

In hospital B, the hospitalizations increased 4.1% (2010-2013). The average consumption of catheter/year was 2,904.2 (2010-2013), ranging from 2,967 (2013) to 3,132 (2011). The cost of the PIC ranged from R\$5,558.56 (2010) to R\$7,830.00 (2011), while the conventional fixation ranged from R\$2,032.62 (2012) to R\$2,279.62 (2011) for the HPO. Prior to the deployment of new technology, the average consumption of catheter/year was 2.836 (2010), and fixation, 5.814 (2010), and after, 2,927 (2011-2013) and 5,696.3 (2011-2013), respectively, increasing the consumption in 3.2% (catheter) and 2% (fixation). Nevertheless, there was a reduction in the cost related to fixation of 2%, and 31.6% regarding the catheter.

After the implementation of new technologies, the costs with intravenous

puncture in hospital A increased 27.4% and, in hospital B, 22%.

Table 3. Statement of the use of PIC puncture and fixation technology according to the consumption and cost (R\$) of devices in hospitals A and B (2010-2013). São José do Rio Preto, SP, Brazil 2015.

Year	Hospitalization	Catheter	Fixation	C/H	Catheter	Fixation	Total	
	N (%)	N (%)	N (%)	N	R\$ (%)	R\$ (%)	R\$ (%)	
Hospital A	2010	3,831(25.7)	6,552(26.3)	11,031(40.0)	1.7	12,841.92(21.8)	4,191.78(17.9)	17,033.70(20.7)
	2011	3,718(24.9)	6,334(25.4)	5,031(18.2)	1.7	15,835.00(2.9)	5,835.96(24.9)	21,670.96(26.4)
	2012	3,772(25.3)	5,877(23.6)	5,604(20.3)	1.6	14,629.50(25.0)	6,500.64(27.8)	21,193.14(25.8)
	2013	3,631(24.3)	6,156(24.7)	5,905(21.4)	1.7	15,390.00(26.2)	6,849.80(29.3)	22,239.80(27.1)
	Total	14,912	24,919	27,571	1.6	58,759.42	23,378.18	82,137.60
Hospital B	2010	1,465(24.2)	2,836(24.4)	5,814(25.4)	1.9	5,558.56(20.2)	2,209.32(25.4)	7,767.88(21.4)
	2011	1,472(26.4)	3,132(26.9)	5,999(26.2)	2.1	7,830.00(28.4)	2,279.62(26.2)	10,109.62(27.9)
	2012	1,595(26.4)	2,682(23.1)	5,349(23.3)	1.7	6,705.00(24.3)	2,032.62(23.3)	8,737.62(24.1)
	2013	1,509(25.0)	2,967(25.5)	5,741(25.0)	1.9	7,417.50(26.9)	2,181.58(25.0)	9,599.08(26.5)
	Total	6,041	11,617	22,903	1.9	27,511.06	8,703.14	36,214.20

C/H = Catheter per Hospitalization.

DISCUSSION

In both hospitals, about 85% of hospitalization lasted from one to four days (up to 96h) and effectively used the peripheral intravenous catheter (PIC), with a mean of catheter/hospitalization of 1.2. However, when analyzing the longest PIC permanence time in hospitalizations from five to 30 days (up to 96h), the result in hospital A (48.9h - 2011) was less effective compared to B (53.3h - 2012), considering that the main advantage of implementing new fixation technology (sterile transparent film) is the exchange at longer intervals compared to conventional fixation and achieving the maximum exchange recommended by the CDC (72 h). Although the PIC exchange period is within the recommended period, there is a result lower than the maximum exchange limit (72-96h), causing puncture exchange at shorter intervals compared to conventional fixation, creating greater discomfort to the client due to the new puncture and, therefore, increased consumption of resources and cost.

When deploying the new technology, the professional must develop skills to perform the procedure, which takes time. Hospital A,

after implementing the new fixation technology, maintained an average of PIC permanence time of 47.3h (2011-2013), lower than the conventional fixation, 48.6h (2011-2013), in the hospital B. This result may be also multifactorial and associated with the incidence of phlebitis, infiltration and device shifting, putting at risk the customer safety and the quality of care.<sup>11</sup> The nursing staff is responsible for actions to avoid the risk factors related to infections, occupational accidents, loss or failure to maintain peripheral venipuncture.<sup>13</sup> Still, those results may be related to effectiveness in the training of nursing professionals in hospital B, regarding the new catheter with safety device and also the effectiveness of the new catheter fixation technology deployed by the hospital A.

With respect to the catheter permanence time, hospital B had a higher value compared to the hospital A (53.3h - 2012) and (48.2h - 2013), respectively, using conventional fixation and demonstrating a possible IT-related practice safer to client and with low cost. Another research with fixation using adhesive tape and sticking plaster showed a mean permanence time of 49 hours.<sup>14</sup>

As for the permanence time of catheters related to the use of new technologies, there was a survey relating the use of vascular ultrasonography (VUS) to achieve success in venipuncture. This study aimed to verify if the VUS increases assertiveness in the use of PIC and the permanence time when compared to the conventional method of puncture, and the conclusion was that the use of VUS did not influence on the catheter permanence time.<sup>15</sup> These findings are important for the use of IT indicators in managerial decision making regarding the effectiveness to the customer and financial viability of the hospital.

Research carried out in an emergency unit of a hospital in India revealed the device permanence time (2.6 days), administration of antibiotics and electrolytes relate to the higher incidence of phlebitis and consequent loss of the catheter. Regarding the type of bandage used for fixation, there was no relevant relationship.<sup>16</sup> It is possible that the catheter time and the frequent exchange also relate to increased rates of phlebitis, thus the recommendation of exchange in the period of 72-96 hours to reduce risks.<sup>16</sup> However, a literature review regarding the PIC permanence time and its complications found no conclusive studies on the benefits of exchange between 72 and 96 hours as recommended by the CDC.<sup>17</sup>

A randomized clinical trial showed similar results regarding the benefits of the exchange in the recommended period. They evaluated 362 patients into two different groups: in the first one, there was the exchange in 72h and, in the second, only when indicated. Results showed no difference between groups in the incidence of phlebitis, infiltration and accidental removal. Furthermore, in group 2, the catheter remained beneficial to the patient between five (96h) and six days (144h). This result questions the need and benefits of routine replacement and more studies on this topic.<sup>18</sup>

Those studies reinforce the importance of nurses to identify risk factors and the conditions to achieve better results in the practice of IT. Regarding the participation of nurses in IT, a study<sup>13</sup> shows that they performed only 6.6% of the venous punctures and none evolved with phlebitis, while technicians and assistants performed 93.4% of the punctures and 24 evolved with phlebitis. Regarding the perception of nurses in the practice of IT, a study<sup>19</sup> sought to describe nursing care experienced by nurses in the peripheral venous catheterization in Pediatric Intensive Care Unit in Fortaleza/CE, and noticed that the report concerning the

insufficient number of professionals and the need to develop different actions have caused the nurses to delegate functions of their technical competence relating to IT for assistants and technicians. Therefore, the nurses are not managing their daily practice, possibly creating numerous complications to the customer.<sup>19</sup>

When analyzing the consumption and cost that include the PIC used during hospitalizations over seven days in a pediatric unit of a university hospital linked to the Unified Health System (SUS), the study<sup>20</sup> found that, in 84.2%, there was an average use of 27.3 catheters/hospitalization, exceeding, in some cases, the number of days of hospitalization. With respect to cost, the research showed it is relatively low, between R\$25.00 and R\$100.00; however, the main infusion failures such as phlebitis, infiltration and leakage prevent the continuity of the intravenous therapy, probably increasing the period of hospitalization and, consequently, increasing the cost in addition to customer's stress.<sup>20</sup>

When addressing this issue from the perspective of Supplementary Health, this study shows higher average consumption of catheter in hospitalizations from five to 30 days: in the hospital A, it was 5.3 in 2012 and, in hospital B, 5.7 catheters/hospitalization in 2013, resulting in a maximum average cost that ranged from R\$13.25 (A - 2012) to R\$14.25 (B - 2013). The consumption of catheter/hospitalization and the cost of the device in this investigation in adult patients was smaller when compared to study<sup>20</sup> conducted in pediatric unit that handles most difficult puncture, maintenance and high cost of the catheter.

The researches on this theme, in the clinical area, are present in the literature, but few focuses the management of material costs. It is important to develop new researches, in order to obtain parameters that allow comparison with the findings. According to COREN<sup>6</sup>, the success or failure of intravenous puncture procedure, even in the presence of many related factors, is an indicator of nursing care quality.

## CONCLUSION

This study showed that, after implementing new puncture and fixation technologies in hospitalizations above 96h, the PIC permanence time decreased in hospital A, and consequently, the cost of the devices increased. Moreover, there was shorter permanence time when compared with conventional fixation at hospital B. The

fixation technology with sterile transparent film proved ineffective regarding the maximum proposed permanence time (72h).

This study has unprecedented data regarding the use of quality indicators for the audit of nursing for decision making related to the incorporation of new technologies, resource management and subsidizes in negotiations with hospitals or suppliers. It also contributes to the nurse to assume their responsibility in the practice of IT and to be protagonist in the management indicators that help in decision making regarding the care performance.

## REFERENCES

1. Compromisso com a Qualidade Hospitalar (CQH). Manual de indicadores de enfermagem NAGEH. 2ª ed. São Paulo: APM/CREMESP; 2012.
2. Montalvo I. The National Database of Nursing Quality Indicators (NDNQI). Online J Issues Nurs [Internet]. 2007 [cited 2014 June 20];12(3):1-8. Available from: <http://www.nursingworld.org/MainMenuCategories/ANAMarketplace/ANAPeriodicals/OJIN/TaleofContents/Volume122007/No3Sept07/NursingQualityIndicators.aspx>.
3. Harada MJCS, Pedreira MLG. Terapia intravenosa e infusões. São Caetano do Sul: Yendis; 2011.
4. Ministério do Trabalho e Emprego. Portaria n. 485, de 11 de novembro de 2005. Aprova a norma regulamentadora n. 32 (segurança e saúde no trabalho em estabelecimentos de saúde). Brasília: Ministério do Trabalho e Emprego; 2005.
5. Agência Nacional de Vigilância Sanitária. Orientações para prevenção de infecção primária de corrente sanguínea. Brasília: ANVISA; 2010.
6. Conselho Regional de Enfermagem de São Paulo. Parecer COREN-SP nº 020/2010. Brasília: Conselho Regional de Enfermagem de São Paulo; 2010.
7. Machado AF, Pedreira MLG, Chaud MN. Eventos adversos relacionados ao uso de cateteres intravenosos periféricos em crianças de acordo com tipos de curativos. Rev Latinoam Enferm. [Internet]. 2008 [cited 2015 June 07];16(3):362-7. Available from: [http://www.scielo.br/pdf/rlae/v16n3/pt\\_05.pdf](http://www.scielo.br/pdf/rlae/v16n3/pt_05.pdf)
8. Secoli SR, Padilha KG, Litvoc J, Maeda ST. Farmacoeconomia: perspectiva emergente no processo de tomada de decisão. Ciênc Saúde Coletiva [Internet]. 2005 [cited 2015 June 12];10(Supl):287-96. Available from: <http://www.scielo.br/pdf/csc/v10s0/a29v10s0.pdf>
9. Nita ME, Secoli SR, Nobre M, Ono-Nita SK. Métodos de pesquisa em avaliação de tecnologia em saúde. Arq Bras Gastroenterol [Internet]. 2009 [cited 2015 June 21];46(4):252-5. Available from: <http://www.scielo.br/pdf/ag/v46n4/02.pdf>
10. Secoli SR, Nita ME, Ono-Nita SK, Nobre M. Avaliação de tecnologia em saúde. Análise de custo-efetividade. Arq Bras Gastroenterol [Internet]. 2010 [cited 2015 June 01];47(4):329-33. Available from: <http://www.scielo.br/pdf/ag/v47n4/v47n4a02.pdf>
11. Machado AF, Pedreira MLG, Chaud MN. Estudo prospectivo, randomizado e controlado sobre o tempo de permanência de cateteres venosos periféricos em crianças, segundo três tipos de curativos. Rev Latinoam Enferm [Internet]. 2005 [cited 2015 June 12];13(3):291-8. Available from: <http://www.scielo.br/pdf/rlae/v13n3/v13n3a02.pdf>
12. Centers for Disease Control and Prevention. Guidelines for the prevention of intravascular catheter-related infections [Internet]. Atlanta: CDC; 2002 [cited 2015 Apr 20]. Available from: <http://www.cdc.gov/hicpac/pdf/guidelines/b-si-guidelines-2011.pdf>
13. Batalha LMC, Costa LPS, Almeida DMG, Lourenço PAA, Gonçalves AMFM, Teixeira ACG. Fixação de cateteres venosos periféricos em crianças: estudo comparativo. Esc Anna Nery Rev Enferm [Internet]. 2010 [cited 2015 Apr 30];14(3):511-8. Available from: <http://www.scielo.br/pdf/ean/v14n3/v14n3a12.pdf>
14. Tertuliano AC, Borges JLS, Fortunato RAS, Oliveira AL, Poveda VB. Flebite em acessos venosos periféricos de pacientes de um hospital do vale do Paraíba. REME Rev Min Enferm [Internet]. 2014 [cited 2015 Apr 15];18(2):334-9. Available from: [file:///C:/Users/Meus%20Documentos/Downloads/v18n2a07%20\(2\).pdf](file:///C:/Users/Meus%20Documentos/Downloads/v18n2a07%20(2).pdf)
15. Avelar AFM, Peterlini MAS, Pedreira MLG. Assertividade e tempo de permanência de cateteres intravenosos periféricos com inserção guiada por ultrassonografia em crianças e adolescentes. Rev Esc Enferm USP [Internet]. 2013 [cited 2015 Apr 10];47(3):539-46. Available from: <http://www.scielo.br/pdf/reeusp/v47n3/0080-6234-reeusp-47-3-00539.pdf>
16. Kaur P, Thakur R, Kaur S, Bhalla A. Assessment of risk factors of phlebitis amongst intravenous cannulated patients. Nurs



Midwifery Res J [Internet]. 2011 [cited 2015 Apr 21];7(3):106-14. Available from: <http://medind.nic.in/nad/t11/i3/nadt11i3p106.pdf>

17. Webster J, Osborne S, Rickard CM, Hall J. Clinically-indicated replacement versus routine replacement of peripheral venous catheters. Cochrane Database Syst Rev [Internet]. 2010 [cited 2015 Feb 12];17(3):CD007798. Available from: <http://www.update-software.com/BCP/WileyPDF/EN/CD007798.pdf>

18. Rickard CM, McCann D, Munnings J, McGrail MR. Routine resite of peripheral intravenous device every 3 days did not reduce complications compared with clinically indicated resite: a randomised controlled trial. BMC Med [Internet]. 2010 [cited 2011 Apr 9];8(53):1-10. Available from: <http://www.biomedcentral.com/1741-7015/8/53>

19. Oliveira MIV, Bezerra MGA, Pereira VR. Cateterização venosa: assistência de enfermagem - UTI pediátrica. Rev RENE [Internet]. 2008 [cited 2015 Apr 30];9(2):90-7. Available from: <http://www.revistarene.ufc.br/revista/index.php/revista/article/view/563/pdf>

20. Martins TS, Silvino ZR. Os custos do dispositivo intravascular periférico nos valores da internação em uma unidade pediátrica. J Nurs UFPE on line [Internet]. 2010 [cited 2015 June 30];4(2):557-567. Available from: [http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/735/pdf\\_45](http://www.ufpe.br/revistaenfermagem/index.php/revista/article/view/735/pdf_45)

Submission: 2015/12/28

Accepted: 2016/07/21

Publishing: 2016/09/01

#### Corresponding Address

Cinthia Prates Vigna  
Faculdade de Medicina de São José do Rio Preto/FAMERP  
Programa de Pós Graduação em Enfermagem  
Avenida Brigadeiro Faria Lima, 5416  
Bairro Vila São Pedro  
CEP 15090-000 – São José do Rio Preto (SP),  
Brazil