

## Using ultrasound to guide peripheral venipuncture in children: the importance of the technique for nurses\*

*Uso do ultra-som para guiar a punção venosa periférica em crianças: significado para a enfermeira*

*Uso de ultrasonido para guiar la punción venosa periférica en niños: significado para la enfermera*

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### ABSTRACT

**Objective:** To understand the meaning of technological innovations applied in pediatric nurse, such as ultrasound to guide peripheral venipuncture in hospitalized children. **Methods:** It is a descriptive and qualitative research conducted in a pediatric surgery unit of a teaching hospital, in the city of Sao Paulo. Semi-structured interviews were conducted with eight nurses. The qualitative content analysis was utilized to guide the collection and analysis of data. **Results:** The analysis identified that the challenge was the element that motivated the nurse to promote their adaptation to technological innovation in their practice. **Conclusion:** It is necessary to invest in studies to help broaden the understanding of this process to stimulate the development, implementation and use of changes in current professional practice. **Keywords:** Technology; Diffusion of innovations; Ultrasonics; Catheterization, peripheral/nursing

### RESUMO

**Objetivo:** Compreender o significado da aplicação de inovação tecnológica para a enfermeira pediatra, como o ultra-som para guiar a punção venosa periférica em crianças hospitalizadas. **Métodos:** Pesquisa descritiva de abordagem qualitativa realizada em uma unidade de cirurgia pediátrica de um hospital vinculado ao ensino, na cidade de São Paulo. Foram realizadas entrevistas semi-estruturadas com oito enfermeiras. A análise qualitativa de conteúdo foi aplicada para guiar a coleta e análise dos dados. **Resultados:** A análise permitiu identificar que o desafio é o elemento motivador da enfermeira para promover sua adaptação à inovação tecnológica em sua prática. **Conclusão:** É necessário investir em estudos que ajudem a ampliar a compreensão desse processo, de maneira a estimular o desenvolvimento, a aplicação e a utilização das mudanças no cotidiano profissional.

**Descritores:** Difusão de inovação; Tecnologia; Ultrassom; Cateterismo periférico/enfermagem

### RESUMEN

**Objetivo:** Comprender el significado de una aplicación de innovación tecnológica para la enfermera pediatra, como es el caso de ultrasonido utilizado guiar la punción venosa periférica en niños hospitalizados. **Métodos:** Se trata de una investigación descriptiva de abordaje cualitativo, realizada en una unidad de cirugía pediátrica en un hospital vinculado a la enseñanza, en la ciudad de Sao Paulo. Fueron realizadas entrevistas semiestructuradas con ocho enfermeras. El análisis cualitativo de contenido fue aplicado para guiar la recolección y análisis de los datos. **Resultados:** El análisis permitió identificar que el desafío es el elemento que motiva a la enfermera a promover la adaptación a la innovación tecnológica en su práctica. **Conclusión:** Es necesario realizar inversiones en estudios que ayuden a ampliar la comprensión de ese proceso, a fin de estimular el desarrollo, la aplicación y la utilización de las innovaciones en lo cotidiano profesional.

**Descriptores:** Tecnología; Difusión de innovaciones; Ultrasonido; Cateterismo periférico/enfermería

\* Study carried out in the unit of pediatric surgery in a teaching hospital, in the city of São Paulo (SP), Brazil.

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## INTRODUCTION

Human beings seek innovations in all knowledge dimensions to challenge themselves and to better adjust to the modern world. Many innovations occur at each second; leading to a more practical lifestyle and to an improvement in the quality of what is being innovated<sup>(1)</sup>.

In Brazil, the capacity of technological innovation must be expanded to meet not only the immediate needs of the population with appropriate technologies, but also to produce goods and services that trigger economic development<sup>(1)</sup>.

The same thing is true for Nursing Science, since innovation is not a new element. Every day, nurses are attracted by innovative activities geared by the will to improve the developments in care provided to patients and their families together with the need to reduce costs to the health system<sup>(2)</sup>.

Nurses develop activities in highly technological places and experience situations that are based on and guided by scientific knowledge, to reach increasingly safe, beneficial and efficient outcomes that promote health recovery or relief of patient suffer. Using this reference as a mindset, nurses should, in a dynamic and evolutionary fashion, adopt strategies that promote better health conditions to the population, keeping the essential values and beliefs of Nursing. Thus, to reach the evolvement of the practice, research and care nurses should perform integrated work to produce advances for nursing care provided to families, communities, and populations<sup>(3-4)</sup>.

Nurses have an essential role to create innovative solutions thus making a real difference in the daily lives of patients, communities and in the profession itself<sup>(2)</sup>. However, to introduce innovative ideas is not very easy in practice, especially in the health area, since it demands efforts both from nurses, from the institutions, and the system.

The ability to innovate can increase opportunities to advance and to find new forms of work that are more effective and more interesting. Many of the innovations in care are not similar to revolutionary techniques or a new drug, but rather a change in the performance and in the outcomes obtained<sup>(5)</sup>.

It is essential to publish the outcomes of innovative practices so that they are acknowledged. We also have to know how the community is absorbing this new knowledge, that is, if outcomes are being used in the clinical practice.

Nurses want to introduce technological innovations in their practices, however, only a few studies assess the behavior of these professionals regarding the incorporation of innovations to the practice, the easy and difficult side of carrying out these innovations and the changes in the way they work to benefit care.

In 2005, a research project entitled "Study of interventions and technology applied to nursing care to promotion of safety of patient submitted to intravascular therapy", of the Research Group - SEGTEC - Safety & Technology was conducted with support of National Council of Technological and Scientific Development CNPq. The purpose was to verify if the use of ultrasound to assist peripheral venipuncture procedure in children can improve the efficiency of the procedure and to detect early complications, identifying children and their families' satisfaction with the care provided.

Thinking about the concept of innovation and implementation, it is necessary to understand the meaning nurses give to the process to apply this new technology in their clinical practice since accepting innovations is a challenge that does not come spontaneously as a consequence of new knowledge<sup>(4)</sup>.

Thus, the question was to see how nurses apply this innovation in their clinical practice, how they react to this change and how they perceive this innovation to their profession.

## OBJECTIVE

To understand the meaning of applying technological innovation to pediatric nursing, such as the ultrasound to assist peripheral venipuncture in hospitalized children.

## METHODS

A descriptive, qualitative study was carried out using qualitative content analysis<sup>(6)</sup> to guide data collection and analysis. The study was performed at a pediatric surgery unit of a teaching hospital in the city of São Paulo, Brazil taking care also of children from the neonatal period until adolescence.

The research project was approved by the Institution Ethics Research Committee (Process # 154907). It was also approved by the Hospital Nursing Board and the Head of Nursing of the unit mentioned.

For data collection, semi-structured interviews were conducted with eight nurses previously trained to perform ultrasound (US) assisted peripheral venipuncture, and that were involved in projects connected with SEGTEC in the hospital.

Interviews were carried out by the researcher in a previously agreed place, individually with nurses and recorded in digital media. To guide the interview the following topics were used:

- The use of US in the professional practice;
- Advantage and disadvantage of using US in their practice
- Impact of the US use for the professional and for the team.

Theoretical saturation of the data determined the number of subjects in the study.

Data were collected from November 2007 to January 2008. Mean duration of interviews was 12 minutes.

Data collected in the interviews were analyzed according to the steps of qualitative content analysis<sup>(6)</sup>. This is a process of identification, coding and categorization of the primary patterns in data. First of all, interviews were completely transcribed by the researcher. Next, reading and re-reading of data was carried out to try to understand the meaning given to interviews at the time they describe their experiences. After reading, information was classified into codes, highlighting the most elucidative aspect of the perceptions. Then, codes were grouped according to content similarities and differences into subcategories. Data were compared according to similarities and differences, forming the categories of the study. Next, the categories were assessed, leading to the theme that describes the nurse experience.

## RESULTS

The nurses taking part on the study had finish the undergraduate course for at least ten years and had, on average, two years of experience in the pediatric field. Five are specialists in pediatric nursing; five were on a *strictu sensu* post graduation course, four of them taking a Master Degree and one a Doctorate. Participating nurses gave their written Consent.

Using qualitative content analysis<sup>(6)</sup> we could understand the meaning given by nurses to the use of a technological innovation in their clinical practice. The theme *being motivated by the challenge to incorporate technological innovations to the practice* emerged from the data analysis and represents a movement of nursing to adjust to the new, encouraged by the challenge of improving nursing care in a safe and efficient manner. With the guidance of the ultrasound the catheter inserted on the blood vessel can be visualized, offering the possibility to carry out the procedure with greater safety.

This theme is formed by the categories: Motivation; Unpreparedness; Encouraging factors; Search for adjustment; Development of new skills; Barriers to introduce it to the practice; Positive experiences with ultrasound use; Sharing the experience.

Next, the analytical category and subcategory are presented.

### Motivation

The nurse says that she was always opened up to the new in her clinical practice. She remembers that since the undergraduate course she was attracted to find technological innovations especially those related

with peripheral venipuncture in children because it is a stressful situation for children, their families and for professionals. She acknowledges that this procedure is always difficult to be carried out and that the use of a machine to help visualizing the venous network could be useful to minimize the time and the difficulty to perform it.

*"... before we though, wondered if there was something to make it easier, especially in the work with children. When I studied, I used to say 'gosh, this is so hard'... if there was something that helped us see how it is inside, see where the vessels pass through, which one has a larger caliber, those with smaller calibers..."* (E3)

The opportunity to take part on a research project where ultrasound would be used to assist peripheral venipuncture stimulates nurses to the idea of technological innovation, making it a motivation to practice what they believe to be relevant. When they have access to studies presenting ultrasound as a resource for venipuncture, they expect to use it in the routine of their practice.

*"... when I saw it was a machine that enabled, at least according to the studies, that would help venipuncture, then it was very interesting..."* (E1)

### Unpreparedness

Initially, nurses face their lack of prepare, they feel inexperienced, because it is difficult to capture an image using ultrasound, since they have to use an equipment that they are not used to, because it is not part of their professional practice. They also consider little skilled to use the technology in their practice, because they don't have enough theoretical knowledge to understand how the equipment works and because they did not receive guidance to help US assisted puncture during the undergraduate course, or during specialization.

*"... It was difficult in the beginning because I was not used to the machine, it is not part of my professional practice I had never used it on my practice..."* (E8)

Because they have little theoretical knowledge and practical skill, they wonder about the need to replace a technique that was working for another technique they do not master, because they fear they will hurt the child. There is also fear of the unknown, of not being able to carry out the procedure in a new way. In addition to that, they say they are not sure about the benefits of applying this innovation to their routine.

*"... well, at first, with all the new technology, as everything is new, we were a bit afraid; it is the fear of not knowing, not being*

able to handle it, not being able to carry out the procedure...” (E7)

They also consider the introduction of a technological innovation difficult, because they don't feel confident to carry out the procedure in a different manner, with new equipment. They define ultrasound as a complex technology, which involves acquiring new skills to use it, presenting a level of difficulty in the beginning to understand how it works and later to visualize the image on the monitor. This makes them resist using the technology because they realize they have to adjust to the new, get involved with it to be encouraged to incorporate technological innovation to the practice.

“... it would be difficult to implement it on the routine, because it is an extremely complex technology, developed and advanced, involving many skills. Right now, it is not easy, it involves a lot of stress...” (E1)

### Encouraging factors

During the use of the technology, nurses found factors that encouraged the use. Among these factors, they remember the positive influence received by professors in the undergraduate course, when they were encouraged to be opened to new possibilities. There is also influence of the work environment, a school hospital that offers greater opportunities to see new technologies and studies, contributing to a better acceptance of innovations.

Another encouragement comes from the characteristics they believe they have and that make them more available to the use of innovations, such as: have finished the undergraduate course recently, to be under the influence of the scholar environment; to have an ethical behavior and to be committed with the search for improvement in care to guarantee patients' safety.

“... I think a recently undergraduate person, it depends on the education, we see that there is a favorable influence, in a university hospital, a school hospital, to learn about innovations, to be willing to learn, to be willing to... not to learn in itself, but to be in contact with knowledge...” (E2)

### Search for adjustment

To be able to incorporate the technological innovation, nurses need to try to adjust to the new. They see the need to change beliefs, values and behaviors looking at US as a helper in the practice, rather than something that makes it difficult. It is not just to take ultrasound to the practice and start using it; they need to adjust, to incorporate the technology in the easiest manner. Therefore, they have to change the technique of peripheral venipuncture to use a new equipment, and

carry out the procedure in a new way: an equipment comes in, with a gray image displayed on the screen of a monitor that decreases the work space. This is all very stressful because they were used to and mastered the traditional puncture technique and they are not comfortable with the change, wondering if they could be hurting the child.

“... oh, I think that the adjustment is the most difficult part, to get used to looking at the monitor, at the time puncture is made, to see if the catheter is getting in the right place, to see if it is going to the wrong place. I think the most difficult part is to look, because you are used to the conventional method, where you just fix on that spot, but just when you start looking at the monitor to see if you are going the right way, I think that is the most difficult part...” (E3)

After taking part on a training program to use the US, they start to get into the habit and the skill to handle the equipment. Through classes and the help of more experienced people, they can, little by little, develop new skills. They acquire knowledge through articles, texts and books, requiring time and effort to understand the theory and the principle of ultrasound.

“... I believe that as you take training courses, you are guided, you see that there are more experienced people, that helps also with the images because it is not easy to recognize it at first, you incorporate this practice on your every day practice...” (E4)

### Developing new skills

As nurses use ultrasound as an adjuvant in the procedure of peripheral venipuncture, they develop skills and adjust to this technological innovation.

“... and as punctures are performed, the procedure was becoming easier, the machine got easier to handle every day...” (E6)

This encourages them to use the equipment more often, in a safe and proper manner, and they are no longer afraid of it. They realized they are evolving, adjusting, and little by little they become faster and have more practice with the use of the machine, as the more they use, the easier the procedure gets.

“... today I feel different from the beginning, also because in the beginning I did not completely understand what ultrasound was and today I can understand...” (E1)

### Barriers to introduce the practice

Introducing the technological innovation in their routine presents barriers to nurses that hinder the use of this technology in their clinical practice. The lack of employees in the unit, together with an overload of

activities, and the use of a new piece of equipment, which demands greater time because you have to recognize the image and be more available to the procedure. Thus, it is difficult to introduce US in their routine, considering that it requires an increase in the number of professionals in the unit to perform the procedure properly.

*"... we struggle for more nurses because here, nurses are in charge of venipuncture, so we really should have more personnel to carry out the procedure properly..."* (E6)

### **Positive experiences with the use of ultrasound**

At the same time nurses find barriers to introduce US in their practice, they have positive experiences. The use of a technological innovation produces satisfactory results to nurses since they feel privileged to know and handle a technological innovation, and they notice results with the other hospital staff. They acknowledge US as something that brings benefits to children since when the procedure is carried out without the use of the equipment, they have difficulties. Thus, with the application, there is a return in their professional and personal investment. They consider their practice has improved a lot and they believe the introduction of the technological innovation was great in their routine, especially for patients and their families. Thus, they follow the positive results of the use of this technology for patients and their families. They notice that children interact with nurses in this process and that mothers are comfortable because they see children are well taken care of. Thus, this innovation in addition to make the work easier provides quality and comfort in care and in the service provided to patients.

*"... I believe so, nurses end up being even more of a leader to the team, passing on more knowledge. The team feels safer because knowledge is being constantly updated, either with US or any other technology and I think the team is more united this way, because we know we are always getting updated, growing, we are not standing still..."* (E7)

There are also results with the other hospital teams, with demonstrations of respect as they are seen as a team that is always studying and getting involved. This result validates the effort of incorporating US to the practice and, thus, they feel valued. However, they acknowledge that other technological innovations should be associated with US, including children's preparation, the chosen of the dressing, and the catheter.

*"... we are seen as a team that is always studying, always involved, and trying to get better..."* (E6)

At first, some problems hindered the acceptance of US, such as the increase in time spent to carry out the procedure; however, the introduction of changes and the adjustments performed made US incorporated in the routine of the unit. And, also, little by little, nurses are convinced by the benefits of this new technology and by the need of it becoming a permanent practice.

*"...I believe so, nurses end up being even more of a leader to that team, passing on more knowledge. The team feels safer because knowledge is being constantly updated, either with US or any other technology and I think the team is more united this way, because we know we are always getting updated, growing, we are not standing still..."* (E7)

### **Sharing the experience**

Nurses are willing to share the experience with the others. This is a technology that they had never used before however, as they learn and introduce it, they feel privileged to be part of a team that uses this resource in care. To be able to share the knowledge acquired with other people in meetings and conferences where they can publish the results encourages them even more.

*"... they are willing to learn and to spread the knowledge... I think we are willing to give back, to give it to other people, to other professionals..."* (E2)

## **DISCUSSION**

A few studies describe how the incorporation of a technological innovation occurs in the nursing practice, this is very relevant since technology is improved every day worldwide and it is increasingly necessary to the development of safe practices.

Just as other service areas, health is becoming more competitive and nursing is strongly influenced both by the number of people involved and by the importance and participation in the processes developed. To follow these new demands, professionals should incorporate technological innovations and new ways to think and perform their work<sup>(7)</sup>.

With the technological advance and globalization, also in the health area, nurses need to change their line of action, searching for quick renovation, adjustment, transformation and adaptation, to be able to follow the advances, providing excellent care to patients and competing in the job market<sup>(8)</sup>.

Nurses should be properly prepared to use technological innovations in their practice. Encouragement is what mobilizes them to overcome the challenge of this introduction. This justifies the need to stimulate nurses since the undergraduate course to

search for knowledge, update, analysis and critical reflection of the situations and the desire to perform a safe practice to clients. In the specialization courses, they should be encouraged to search for professional development and to apply the results of research in the clinical care practice.

Professional and personal satisfaction encourages people to look for new ways of care. This reality corroborates the aspects observed in the present study, shown in the personal fulfillment of nurses when they see they are recognized by the nursing team and by the other teams at the hospital. Nurses' high self-esteem and personal appreciation validate their work, giving them satisfaction and a positive feedback of their effort to adjust to the new.

So that professionals are more encouraged, the aspects regarding the human resources and the organizational structure should change<sup>(9)</sup>.

Nursing professionals should follow these changes of the globalized world, following a line of thought where learning is part of the routine. To be updated, one should undertake efforts to develop a culture of continuous learning, with innovative education as the main tool. This enables to intervene, build and change the practice, adjusting the thoughts and the actions to the current needs and demands<sup>(10)</sup>.

Studies bring a new way of learning to make the incorporation of technological innovation easier. To follow the era of technological innovation, we should develop intuitive and creative minds that can find different strategies to think and act. These strategies can have a starting point in the integration of technological innovation with education that can be reached through the introduction and implementation of incubators of learning<sup>(10)</sup>.

These incubators create, test and launch in the market new products and innovative services. Different areas already develop technological incubators, management and information technology among them. In Nursing, this innovation is still not part of the teaching /learning

modality. In the nursing practice we still cannot find entrepreneurs that research, test and develop products and innovative services in learning incubators to launch them in the market<sup>(11)</sup>.

Nurses who use innovations in their clinical practice are encouraged, especially when they assess the benefits to them and their patients. US is a resource for nurses and a promising innovation to reach better outcomes in intravenous therapy, especially in patients with difficult venous access<sup>(12)</sup>.

The will to "offer an increasingly effective, efficient, safe, timely and equal care focused on patients and families' needs mobilizes nurses in their professional routine"<sup>(12)</sup>.

## FINAL CONSIDERATIONS

In the present study, the challenge of promoting a safe and beneficial practice to children and their families, minimizing the stress and anxiety caused by peripheral venipuncture is relevant in nurses' encouragement to use technological innovation in their practice. To introduce it, they need to face the lack of prepare and to change beliefs and personal values that favor their adjustment.

The involvement of professionals in research and study groups showed that the environment is a source of encouragement to the development and use of innovations. We believe that as this technology was introduced in a university hospital, the innovation was more easily accepted. We wonder how the introduction of a technological innovation would be in a little encouraging environment.

Additionally, data analysis presented issues connected and influenced by individual factors such as motivation, lack of experience, insecurity, and fear that should be further studied to assess them thoroughly. We must invest in studies that help understand the adjustment of nurses to a new technology to encourage the development, application and use of changes in the professional routine.

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