



Ultrasonography in peripheral intravenous puncturing: Innovating the nursing practice in order to promote patient safety*

Ultra-sonografia na punção intravenosa periférica: inovando a prática de enfermagem para promover a segurança do paciente

Ultra-sonografia na punção intravenosa periférica: inovando a prática de enfermagem para promover a segurança do paciente

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ABSTRACT

This study's goal was to describe the use of ultrasonography as a guiding method for puncturing peripheral veins, a practice which has been described since the early 1990s. This practice has the premise of promoting more effective and efficient care, since peripheral venous puncturing is one of the most frequently performed procedures in healthcare institutions. Thus, the possible improvement of this nursing procedure can increase security and satisfaction of patients and families in relation to the care provided. The development of portable ultrasound equipment for use at bedside makes it possible to study innovations of the nursing practice, contributing for the improvement of the care provided to the population.

Keywords: Catheterization, peripheral/nursing; Ultrasonography; Patient satisfaction

RESUMO

Este estudo teve por finalidade descrever o uso da ultra-sonografia como método para direcionar a punção de veias periféricas, prática que vem sendo descrita na literatura desde os primeiros anos da década de 1990. Esta técnica tem a premissa de promover cuidados mais efetivos e eficazes, pois as punções venosas periféricas destacam-se como um dos procedimentos mais freqüentemente realizados em instituições de saúde. Assim, possibilitar a melhora desta intervenção de enfermagem pode resultar em incremento da segurança e satisfação do paciente e família com o cuidado prestado. O desenvolvimento de equipamentos de ultra-som portáteis, para uso à beira do leito, possibilita a realização de estudos de inovação da prática de enfermagem, contribuindo para a melhora da assistência prestada à população.

Descritores: Cateterismo periférico/enfermagem; Ultra-sonografia; Satisfação do paciente

RESUMEN

En este estudio se tuvo como finalidad describir el uso de la ultrasonografía como método para dirigir la punción de venas periféricas, práctica que viene siendo descrita en la literatura desde los primeros años de la década de 1990. Esta técnica tiene la premisa de promover cuidados más efectivos y eficaces, dado que las punciones venosas periféricas se destacan como uno de los procedimientos que con mayor frecuencia se realizan en instituciones de salud. De este modo, haciendo posible la mejora de esta intervención de enfermería, puede resultar en un incremento de la seguridad y satisfacción del paciente y familia con el cuidado prestado. El desarrollo de equipamientos de ultra-sonido portátiles, para uso al margen de la cama, posibilita la realización de estudios de innovación de la práctica de enfermería, contribuyendo así a la mejora de la asistencia prestada a la población.

Descriptores: Cateterismo periférico/enfermería; Ultrasonografía; Satisfacción del paciente

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INTRODUCTION

Patients place their trust on the nursing team for the necessary measures for reestablishment their health, having the right to demand interventions that will be defined by their needs, based on current scientific knowledge and carried out with proper skill, aiming at reaching the desired clinical results, safety and satisfaction⁽¹⁾.

In this context, science development and the increasing use of technology in all areas of knowledge, including health care, contributed for the evolution of the intervention. These advances are accompanied by paradigm shifts in health awareness, whose main characteristics emphasize health promotion, reduction of risks, cost reduction restructuring and attendance systems integration⁽²⁻³⁾.

One of the most significant challenges for nursing is to improve patient care. Being around 50% of the workforce in health institutions across the nation, carrying out and controlling great part of the direct care received by the patient, nurses come to the forefront in their teams, as far as promoting safety and satisfaction for the patient and family is concerned⁽⁴⁾. Analyzing the quality of administered care and identifying more advantageous intervention methods are essential characteristics for innovation of the practice.

The effective establishment of peripheral intravenous access for various therapies, achieved by using peripheral intravenous catheters (PIC), or central peripheral catheters (PICC - *Peripherally Inserted Central Venous Catheter*), is characterized as one of the most frequent nursing interventions in clinical practice, and consequently the invasive procedure most often executed in care for hospitalized patients. According to *Centers for Disease Control and Prevention*, it is impossible to estimate the number of intravascular punctures carried out annually in the United States of America (USA)⁽⁵⁾.

Intravenous catheters are used for many therapeutical procedures. Nursing studies about the subject contributed significantly to improving intravenous therapy efficiency, reducing infectious and non-infectious complications, relieving pain, as well as the development of materials and equipment to adapt the patient's needs for the planned therapeutical aims. However, regarding the insertion technique of PIC or PICC, aiming to promote puncture effectiveness, small research-based advancements can be identified. The introduction of these catheters is usually guided by inspecting the anatomy of the patient's peripheral veins. Many factors can make visualization or palpation of the venous network difficult and result on punctures oriented subjectively by correspondence points or anatomic reference. Sometimes, such interventions can be effective; however, mistakes may happen, which result, among others, in new or multiple punctures, therapy delays, adverse events, discomfort, pain and stress for

the patient, the family and the healthcare team⁽⁶⁻⁸⁾.

Research has shown that the use of ultrasonography (US) could contribute for more effective intravenous puncturing. New portable ultrasound equipment can be used at bedside by trained nurses, improving their performance during the procedure and, consequently, the care provided to the patient. In the USA, nurses have used US for PICC routing since the early 1990s⁽⁸⁻¹²⁾.

ULTRASONOGRAPHY

In the medical sciences field, US is highly regarded among the most efficient and non-invasive modern diagnostic methods. Fundamentally, sound is known to be a mechanical wave, of longitudinal shape, with a circumcentric propagation on solids, liquids and gases, which have mass and elasticity. Thus, these waves do not propagate in vacuum. Based on the fact that sound waves aren't ionizing and, thus, innocuous for living beings, they have been largely used for diagnostic and therapeutic needs⁽¹³⁻¹⁴⁾.

The frequency or speed of sound oscillation is measured in hertz (Hz) and the amplitude or energy is measured in decibels. The human ear's audible frequency range is between 20 Hz and 20 kHz. Frequencies over or under that range are defined as ultrasound or infrasound, respectively⁽¹³⁻¹⁴⁾.

Ultrasound equipment operates on a higher frequency than the human ear can perceive, approximately 20 kHz. This property is useful when using ultrasound as a clinical instrument, since the sound generated doesn't bother the patient. When these sound waves hit an obstruction, they are reflected and return to their point of origin. That return is called an echo⁽¹³⁻¹⁴⁾.

Modern US equipment with digital echographic signal converters make the return images increasingly better defined, with spectral analysis being possible with the application of the Doppler method. In 1842 the Austrian physicist Johan Christian Andreas Doppler became famous after describing that the sound frequency emitted by or reflected from a moving object varied according to the velocity of the object. Vascular ultrasound equipment with Doppler can demonstrate the speed of the blood stream produced by the ultrasound that incides on a vessel. Such waves are formed by variations in the frequency of the ultrasound reflected by the erythrocytes in the moving blood⁽¹³⁻¹⁴⁾.

The application of US for routing peripheral venous puncturing can contribute for the improvement of these nursing interventions performed routinely.

ULTRASONOGRAPHY IN PERIPHERAL INTRAVENOUS PUNCTURING

Several publications about the use of US for PIC and

PICC insertion can be identified in various scientific information search databases. A large part of these studies describes greater success and lower number of trials in US guided catheter insertions in patients whose venous access is considered difficult^(9-12,14).

When evaluating the use of US for puncturing the deep brachial or basilic vein in 101 patients with difficult venous access, researchers identified a success rate of 91%⁽¹¹⁾.

An observational study, which aimed to describe the success rate of nurse-performed US guided peripheral venous access demonstrated that 87% of the punctures were successful in the first image-directed trial, in comparison to 52% of the patients who were not treated with US⁽¹⁰⁾.

In a randomized study about this theme, greater effectiveness (97%) was verified in image-directed peripheral venous puncturing with US when compared to the conventional method (33%), a shorter period for performing the procedure (US four minutes, conventional

15 minutes), a smaller average amount of attempts (US 1.7, conventional 3.7) and greater patient satisfaction (US 8.7 points in satisfaction scale, conventional 5.7)⁽¹²⁾.

FINAL CONSIDERATIONS

The use of US for routing peripheral intravenous puncturing is a promising innovation for reaching better intravenous therapy results, especially when performing peripheral puncturing in patients with difficult venous access.

Studies on this theme have been being made by our research group, aiming to introduce this innovation to the Brazilian pediatric nursing practice. We hope to contribute with evidence for the practice, through implementation of research-based nursing care, offering a service that is increasingly more effective, efficient, safe, opportunistic, equalitarian and focused on the needs of patient and family.

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