

EVOLUTION OF THE PROCESS OF PERIPHERAL VENIPUNCTURE AND TECHNOLOGICAL RESOURCES ACCORDING TO NURSING PROFESSIONALS

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ABSTRACT

Peripheral venipuncture has historically outlined as a nursing process, evolving in its processes and materials. The aim of the study was to understand the evolution of the peripheral venipuncture process and its technological resources according to nursing professionals who worked from 1960 to 2015, in a city in Minas Gerais. Research delineated in the oral history that used individual interviews recorded with nursing professionals, based on guiding questions. Ten people participated in the study, identified by flower names, aged between 24 and 76 years old and professional experience from one to 45 years. The contents of the interviews were transcribed for Word for Windows and analyzed in the NVivo® Program. The study complied with all ethical requirements for researches with human beings. Three temporal axes revealed peculiarities and intersubjectivities including the venipuncture process and the technologies. Initially, revolutionary and disruptive technologies were identified, followed by evolutionary ones that affected practices, work processes and professional training.

Keywords: Nursing. History of nursing. Technology. Peripheral catheterization. Intravenous infusions.

INTRODUCTION

The venipuncture process can be contextualized as a complex activity that requires nursing professionals' skills and competencies to subsidize their labour activities in pre-puncture, puncture and post-puncture, as well as in the evaluation of the whole process and in decision-making to eliminate iatrogenesis, treat adverse effects, prevent complications, reduce costs and period of illness⁽¹⁾.

Characterized as a medical procedure since World War II, nurses began to perform it due to few professionals performing it and to care demands arising from its execution. Currently, nursing professionals are responsible for it, representing one of the most performed procedures by the category⁽¹⁻²⁾.

To perform a venipuncture, professionals need to incorporate technologies into their professional practice, light (represented by the relation user-professional), light-hard (knowledge) and hard (equipment, materials and supplies), in order to achieve nursing care, labor safety, treatment

effectiveness/efficiency^(3,4)

Although modifications have occurred in the technologies used by professionals to carry out the peripheral venipuncture process, the literature still lacks information. Furthermore, structured analyses are still scarce, in the perspective of a historical-reflexive approach capable of contemplating the contextual dimension of professional performance and the impact of such changes/impacts on the nursing work process, used technologies, professional training process, workers' safety and implicit ideologies, which justify this investigation.

Therefore, the guiding question of this study is: How did nursing professionals perceive the peripheral venipuncture process during their training and/or professional experience? Which technologies have changed in that time? This research aimed to understand the evolution of the peripheral venipuncture process and its technological resources according to nursing professionals, who worked from 1960 to 2015, in a city in Minas Gerais.

METHODOLOGY

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Qualitative research outlined in oral history about the process of evolution of technological resources and practices related to peripheral venipuncture according to nursing professionals. This method focuses on the historical trajectory of a past fact/event, which allows its understanding in the present from experiences and interpretations reported by people intentionally selected through structured interview by having deep experience in the researched object⁽⁵⁾.

This investigation used the snowball technique, initially recruiting three key participants, members of a public Nursing School, selected intentionally and invited to participate in the research by personal contact. Peers referenced other participants, featuring them due to personal experiences in the research object, for being a specialized population, and the initial contact occurred by phone.

Nursing professionals (nurses, nursing technicians, assistants and attendants) participated in the research, and, in this perspective, the initial research site was a public Nursing School in the state of Minas Gerais.

Inclusion criteria were the nursing professionals that experienced the peripheral venipuncture process in clinical practice and/or teaching in the period from 1960 to 2015. Exclusion criteria were potential participants with disconnected lines and/or constraint to recall their lived facts.

A single researcher collected the data from August 2013 to January 2015, on pre-scheduled day and time, in environments with privacy and absence of interruptions, in order to reduce bias. The study used data collection technique with individual interviews with audio recording, guided by guiding points: vocational training and reality of venipuncture; professional experience in venipuncture; perception about the quality of care; new technologies and adaptation process; technological perspectives and remarkable memories.

The speeches were fully transcribed in Word for Windows, using content analysis, interpretation methods of signifiers and meanings (senses) structured into: exploratory phase; fieldwork, analysis and treatment of the empirical and documentary⁽⁶⁾ material operated from the conciliation between the temporal and semantic structures to categories' structures, using the NVivo® Program.

Each category was exemplified with fragments

of the participants' speeches to demonstrate the apprehension of subjectivity of their experiences. The theoretical density was confirmed by content similarity, using Pearson's correlation as criterion in the intercategory analysis, with values from 0.82 to 0.96.

This study complied with all ethical and legal requirements for researches involving human beings, in accordance with Resolution nº 466/2012 of the National Health Council, and only integrated participants who agreed to participate and signed the Informed Consent Form (ICF), identified by flowers' names. The Ethics Committee of the Universidade Federal de Juiz de Fora (Federal University of Juiz de Fora), Brazil, approved the research, under nº 275,564/2013.

RESULTS AND DISCUSSION

Ten professionals participated in the study, characterized by eight women, age variability between 24 and 76 years and experience in nursing from one 45 years. Five were nurses - four had assistance and teaching experience in nursing graduate courses and one, in nursing technical courses, one was a nursing attendant and the other, nursing assistant, both progressed to nursing technicians in accordance with the class supervising organ's legislation⁽⁷⁾ and three were only nursing technicians, totalling five nursing technicians.

The professionals' work performance contemplated the life cycle (newborns, adolescents, adults and the elderly), in public and private services, in clinical and surgical scenarios, neonatal and adult intensive care, emergency and specialized (oncology and outpatient) services, comprising two Brazilian states (Minas Gerais and Rio de Janeiro) and the period from 1960 to 2015.

Only one interviewed professional was retired, the others were still working until the end of the data collection period, a fact that allowed seizing an average time of professional performance exceeding 45 years and a diversity of scenarios and health institutions justified by the work scale and scheme declared by professionals

The analysis of the empirical material produced resulted in the following categories according to temporal cutouts: 1) The peripheral venipuncture process and its technological resources according to nursing professionals: 1960-1980; 2) The peripheral venipuncture process and its technological resources

according to nursing professionals: 1980 to 2000 and 3) The peripheral venipuncture process and its technological resources according to nursing professionals: 2000 to 2015. Next, we describe these categories, exemplified with excerpts of the interviews and interpreted.

The peripheral venipuncture process and its technological resources according to nursing professionals: 1960-1980

The teaching-learning process about venipuncture was organized through a supervised practice in various clinical scenarios, in which the students could perform it.

The practice field was great; currently, it is scarce. The hospital's morning shift was the school's responsibility from Monday to Saturday. We had the night shift and everything was part of the training curriculum. In those times, we had opportunities, we really learned in practice. (Gerbera daisy - nursing assistant and nurse)

The team's experiences characterized by the various areas of practice in health and teaching services, public and private institutions, with rotation of sectors. Nursing attendants, assistants, technicians and nurses formed the nursing staff.

I graduated in November 1970, started teaching in January 1971 and worked as a nurse from, more or less, 1976 to 1985. I worked in SUS in all sectors. I worked in all clinics. (Violet - Nurse)

I began the technical course 27 years ago, they were going to end with the attendant occupation, so I had to attend the technical course. (Palm - nursing assistant and technician)

The work process was linked to materials and technological resources. Saline solution bottles were made of glass and were hanging from wooden brackets by fabric and drip chamber suppliers were made of rubber with the same color of the tourniquets. The needles were made of metal and could be sharpened, the first scalps were washed, disinfected with sodium hypochlorite and/or Germiquil® and reused, as well as the glass syringes. The skin antisepsis was made with alcohol-iodine solution. For the stabilization of body structures, splints made with waterproof fabric coating or improvised with bandage and cardboard. Common tapes were used to fix the puncture complex. The materials were evaluated as uncomfortable for users, heavy and transfixing the

veins. Nursing professionals carried out this whole process. During this period, there was no hospital garbage selective collection.

When I was studying, the packaging of saline solution were made of glass and we had to saw it to break the tip; we had to be careful not to cut ourselves and let a piece of glass fall into the saline solution. We had a little bottle to see the dripping and little butterflies to open and close the saline solution [...] they [needles] were numbered, we had males and females; and to fit in, we rolled gauze around its parts before putting into the case [...] We had splints in every puncture. They were made of thick cardboard with cotton and covered with bandage or an oiled board for disinfection. (Violet - nurse)

The needles were made of metal, syringes, of glass, drip chamber suppliers were made of tourniquet rubber-type and connected straight to the needle. We had no extender [...] we boiled the needles and syringes for about 15 minutes in the infirmary in pan and stove and took off the excess of water, and then we could apply a medicine [...] To put the bulb into the holder, we had a cloth that we put and hung. [...] We had the mandrel for grinding the needle tip to stay straight until removing the blunt part [...] We threw out the needles in cans or in trash, in case of old scalp. We had no hospital selective waste [...] Let {patients left puncture the vein} with no problem. We had a lot of experience and served well [...] nursing was an art, a donation, today it is professional [...] (Gerbera daisy - nursing assistant and nurse)

The iodine alcohol was used for antisepsis, it stained and burned, right? [...] we soaked the material in hypochlorite. (Palm - nursing attendant and technician)

The glove was sterile and used only in sterile procedure [...] The punctures were archaic and remained the most it could. We had no time to change it and the reason was the infiltration. The scalps came; what did we do with the scalps? We reused it [...] We used {catheter} until it rusted or warped [...] In that time, we also used Germiquil. We washed with saline solution and took off the solution with tweezers; it was very ugly. It stayed about 30 minutes in the solution. (Orchid - nurse)

We tested the needle to see if it was blunt and if the light could pass through it to see if it could be reused [...] I remember discomfort, because they had to keep still, quiet because they were afraid of losing that vein in the impulse and punching another vein with the metal needle. Think about it, the discomfort with 50 grams of material on your arm (Daisy - nurse)

One of the reasons attributed to technological

changes linked to the peripheral venipuncture process is the presence of evidence arising from scientific research and accessibility/knowledge diffusion, exemplified by the Human Immunodeficiency Virus/Human Immunodeficiency Syndrome (HIV/AIDS) and blood diseases. This led to the standardization of the use of disposable gloves, modification of the technique after catheter removal from inside the vein and new concepts of procedures for disinfection/sterilization of materials, although some professionals initially opposed to join the new work process proposal.

The HIV issue was not so widespread. (Daisy - nurse)

After many studies, surveillance, contamination and transmission of diseases, the rules started indeed, because we did not studied that much. (Palm-clerk and nursing technique)

We used to put cotton and tell the patient to fold the arm, which is different from nowadays (Gerbera daisy - nursing assistant and nurse)

Removing the technicians' habits was a horrible thing! They were used to the the pink solution and we found hidden glasses with the solution. The use of glove was an innovation, because we did not even know we needed it. (Orchid - nurse)

When analyzing the period between 1960 and 1980, it shows that material handling was handcrafted and primitive. Furthermore, the use of technologies (theoretical knowledge/conceptions, practices, materials) of that time began to be questioned regarding their effectiveness to face the emergence of the pandemic of AIDS and/or diseases that could reach professionals and to protect people met at health institutions, originating the search for nursing specializations^(8,9).

The emergence of HIV/AIDS prompted questions regarding values, knowledge, practices, and habits used by health professionals for decades for lack of scientific knowledge that based labor practices developed to assure safety for them and patients^(8,9). This fact justifies the search for a new model of care backed by scientific approach, able to support assistance practices previously developed⁽¹⁰⁾. The assumptions that supported care in this period were the charitable approach, the creation of professional action and the exercise of labor as the art of donating to the next⁽¹⁰⁾.

Technological innovations linked to the peripheral venipuncture process in 1980 are characterized by: improvement of working

conditions; rescue of health workers' value; consideration of scientific criteria in decision making; redefinition of social practices and overcoming of biased behavior by the confidence that scientific evidence would be sufficient to ensure a safe practice and motivated professionals' resistance to change professional conduct⁽⁸⁻¹⁰⁾.

The peripheral venipuncture process and its technological resources according to nursing professionals: 1980-2000

The teaching/learning process about venipuncture in this period was dichotomized between theory and practice.

First, we had the theoretical part and then, practice, medicating oranges, lemons and one another. At the beginning, we learned with scalp and cannula only in the hospital. (Silk flower - nursing technician)

The professionals' experiences in this period were characterized by the diversity of the sectors of activity, clientele and customer link.

I have already worked in some public and private hospitals, from category A to D, with pediatrics and geriatrics, emergency, surgery, adult and children ICU. (Silk flower - nursing technician)

Changes in materials and working processes during this period were justified by the presence of nosocomial infections, needlestick accidents and due to phlebitis index arising from venous access installed.

It culminated with the advent of materials such as metal three way (three-way rotational device that enables the use of intravascular infusion in alternate venous access), scalp, compulsory use of gloves and disposable and individual syringes initially washed and the emergence of antisepsis with 70% alcohol or chlorhexidine and deadlines for exchanging intravenous devices, motivating the record in chart of the nursing professionals' practices. Professionals reported such changes positively for patients, being able to generate doubts in professionals when introducing new technologies.

[...] in the 80s, there came a tap, which was a metal "three way" [...] We met the metal scalp with a plastic little butterfly that facilitated fixation [...] (Daisy - nurse)

[...] antisepsis was done with 70% alcohol or chlorhexidine and we had gloves we have never used before. (Palm - nursing attendant and technician)

In the beginning, we had no date to exchange drip chamber supplier and puncture, we kept it while it was functioning. I took note as the teacher taught [...] {device exchange} was patterned after many infections, many phlebitis. I think it changed due to needlestick accidents. (Silk flower - nursing technician)

The plastic syringes continued being washed [...] There was more comfort to patients with new materials. (Gerbera daisy - nursing assistant and nurse)

Before I met it, I was in doubt whether it would or not be better. (Harpsichord - nurse)

The acceptance of patients for the procedure relied on established arguments about the importance of treatment, with the refusal of some patients. Patients assessed the skill level when the professional's technical ability to puncture the vein showed up and this evaluation was voiced by the acknowledgement for the success.

It depends on the information you give them because nobody wants to be stuck. And, if we explain the need, he accepts it. [...] One of the good things for venipuncture is when patients thank us [...] that is comforting. (Silk flower - nursing technician)

Analyzing the teaching-learning experiences that occurred in simulation laboratories experienced by professionals during this period reveals that there were not enough resources for the acquisition of technical and psychomotor ability and those experienced in practices of clinical internship considered ideal locus for the acquisition of professional security by providing a closer and contextualized learning for the expected professional performance, being able to consolidate the professional do-act^(11,12).

Nursing professionals' interaction with patients, regarding decision making in relation to peripheral venipuncture process focused on procedure/technique and dependency/appreciation relations, which featured a professional power and hegemony relation at the expense of users' participation⁽¹⁰⁾.

The paradigmatic mark of this occasion was the introduction of disposable materials motivated by the HIV/AIDS pandemic. This fact justified the use of revolutionary and disruptive technologies, characterized by the emergence of great changes in the work process, in knowledge, in materials and in interpersonal relations and that break with the foundations/resources previously used⁽¹³⁾. This

justified the replacement of technical manuals by scientific evidence that may be inferred at each stage of the procedure^(10,11,14).

The peripheral venipuncture process and its technological resources according to nursing professionals: 2000-2015

During this period, the teaching-learning process continued to be organized into theoretical and practical activities with a differentiated structure. The theoretical approach was followed by practices developed in laboratories, with the repetition of the puncture between apprentices and practical activities in health institutions.

I had two moments of learning. Theoretical in the lab with dummies and the students themselves and then in field with the supervisor, with the patients. (Harpsichord - nurse)

In our time, we did not have practice because we were nine students and we had one patient for venipuncture, raffled off among the students. I acquired ability when I was working at hemodynamics. In my training, the ability did not exist. (Licinia - nurse)

The professionals' experiences originated in urgency sectors, primary care, coronary unit, neonatology, medical clinic and teaching in public and private institutions.

I taught nursing in 2000 for nursing technicians. In 2003, I started working in the basic unit and then coronary unit, hemodynamic and emergency sector. I attended cardiac patients, adults, the elderly, and children in coronary and neonatal sector. (Licinia - nurse)

Initially, it was in ICU of private hospital; currently I work with varied profiles, male, female and emergency clinics. (Rose - nurse)

The materials used in that period for peripheral venipuncture process were 70% alcohol or 5% alcohol chlorhexidine digluconate, syringe and cannula with retractable safety device, intermediate extenders from two to four lanes and transparent dressing for catheter fixation, stressing the resistance to use technological innovations, difficulty handling them and user's coparticipation in care. The patient's bond with the institution (UHS/private/health insurance) defined the work process and the quality of the used materials, which began to be dismissed by satellite distribution centers. Needlesticks and medical waste were collected selectively.

We used cotton with 70% alcohol for skin disinfection [...] Cannulas and syringes already had safety devices with lock and needle retraction that they did not have when I was studying [...] The material was obtained by pharmacy and kept by the sector's head [...] Some more precarious {health institutions} had no material to fix, security devices and lacked material as gloves and could not puncture. (Harpsichord - nurse)

I have witnessed a case in the hospital infection service that was an attempt to falsify the access exchange [...] as a resistance to exchange. I saw no use of gloves and that puzzled me because we could learn and practice... [...] I realize that most patients did not like the procedure, some even denied the procedure for finding it painful [...] We used two-way and four-way polifix previously used more than four. I do not see much scalp. Intravenous device today is the retractable cannula [...] We have always discarded them in needlestick containers. I noticed discard in rigid gallons in sealed units such as hemodialysis. (Rose - nurse)

We used scalp and we were beginning to use cannula. There came transparent dressing. I already had three way extender and little taps. And half pvc and half silicone devices that were great [...] It {cannula} was for health insurance patient that had everything. There was a lot of difference in patients seen by SUS [...] There was no rule for fixation and we could not use what we saw in books because the health insurance established the use of x cm of tape. Some people who were going to label and put the tape exactly on the puncture site. Obviously, it was wrong! The dressing was exactly transparent for easy viewing of the catheter and you put it on the puncture? [...] A concern [of users] was whether it continued to infuse, the next medication time and not withdrawing the access, but, even knowing the deadline, they hardly accept it. (Licinia - nurse)

The period was marked by the recovery of the nurses' participation in co-responsibility/coparticipation in decision-making and implementation of care (maintenance of venous access), questioning their insertion in the work process.

The nurse should monitor the whole process. We should prioritize things, because there are many things to do but we still have to participate in the care. (Licinia - nurse)

One of the most frequent problems is the condition of the transferred patient's access, it was dirty, poorly secured and without functionality. (Harpsichord - nurse)

The reasons for the changes demonstrate a relation between qualities, care costs with scientific

advances. The changes were evaluated as valid but in need for training when inserted into clinical practice.

I think this is a profitable industry and allied with what scientifically is the best for the patient, result of researches on work accident costs [...] Favorable {change}, understanding the logic of being the best for the patient was the best for me. All I had to do was to break my mind to understand how it worked because we did not learn anything. They improved the devices, but trivialized nurses' care. The transparent dressing was the best! But we did not know how to keep it. Scalp hurt more, cannula was the darling one. (Licinia - nurse)

Today I deal with drip chamber supplier that are not as good as they used to be. (Rose)

The retractable unfortunately came to worsen. We cannot handle them, otherwise, they close, which is difficult. (Violet - nurse)

Anylyzing the period between 2000 and 2015 showed that the puncture process, while an invasive procedure, requires technical skills, combined with cognitive, communication, relational, evaluation and decision making skills, presenting contradictions between the way it is performed, the recommendations of the class council and capitalist ideologies of health institutions^(7,10,11).

The joint of theoretical and practical activities in the professionals' teaching-learning process of the nursing staff based on the curricular guidelines⁽¹¹⁾, although nursing technicians, when performing venipuncture, acquire skills by mistakes and hits, since they do not have theoretical-practical relational foundation in their academic training that are able to subsidize the scientific activities^(10,15,16).

Nurses' training seeks opportunities to experience the practices developed by nursing staff in daily life, considering the internship period an additional opportunity for mirroring professional practices, as well as consolidating professional values and seeking to fill gaps while acquiring skills^(11,12). This practice emerged with a number of students that precluded the provision of sufficient opportunities to consolidate the skills and competencies to ensure the users' safety⁽¹²⁾.

In professional experience, literature justifies the nurses' insertion in "bureaucratic and administrative" activities instead of their engagement in healthcare practice as unpreparedness⁽¹⁷⁾ and/or insecurity or overload of activities to which they are exposed. It stimulates nursing students to search for the

technical team for acquiring the skills to perform procedures⁽¹²⁾.

The existence of (inter)national guidelines⁽¹⁴⁾, guides grounded in scientific evidence, often not adopted in clinical practice, shows a gap between the emerging technology and practice, because there is not always permanent education in the services⁽¹⁸⁾. In this context, the advent of the use of transparent dressing, favored by the nursing assessment of the site of insertion of catheters and adjacent areas, and retractable devices contributed to the workers' safety⁽¹¹⁾.

Another feature of this period is the preservation of the autonomy, co-responsibility of users with their treatment, negotiating the therapy to be implemented and the design of explicit humanization of care by public policies⁽¹⁹⁾.

The impacts of developments identified during this period depict the existence of an evolutionary technology, improving products/services⁽¹³⁾, although the impact of the gap generated by its application can make the use/maintenance of these technologies generate difficulties in handling them when not linked to training and permanent education⁽¹⁸⁾.

FINAL CONSIDERATIONS

Analyzing the evolution of the nursing staff's labor activity in the venipuncture process, the path traveled by nursing in the construction of its professional identity, showed that it passed through charitable models (1960-1980), hegemonic models (1980-2000) and cost-benefit based models (2000-2015).

The technological resources used to achieve user's care in the venipuncture process evolved initially from disruptive and revolutionary forms followed by evolutionary, affecting practices, work process and professionals training considering humanization and scientific knowledge. These changes based on concerns about professional safety, controlling blood-borne diseases driven by HIV/AIDS pandemic.

We expect that understanding the evolution of the peripheral venipuncture process have contributed to subsidize a rereading of the nursing professionals' work in a complex procedure that requires realigning activities of occupational categories and nurses' critical reflection. This research alerts the nurse to the possibilities of transforming the limitations/inadequacies identified in the used technologies into opportunities to perform entrepreneurial proposals. Its limitation is the methodology applied in a uniquely comprehensive approach.

EVOLUÇÃO DO PROCESSO DE PUNÇÃO VENOSA PERIFÉRICA E DOS RECURSOS TECNOLÓGICOS SEGUNDO PROFISSIONAIS DE ENFERMAGEM

RESUMO

A punção venosa periférica historicamente se delineou como procedimento de atribuição da enfermagem, evoluindo em seus processos e materiais. O objetivo do estudo foi compreender a evolução do processo de punção venosa periférica e de seus recursos tecnológicos sob a percepção de profissionais de enfermagem que atuaram de 1960 a 2015, numa cidade mineira. Pesquisa delineada na história oral que utilizou entrevistas individuais gravadas com profissionais de enfermagem, a partir de questões norteadoras. Participaram dez pessoas identificadas por codinomes de flores, com idade entre 24 e 76 anos e experiência profissional de um a 45 anos. Os conteúdos das entrevistas foram transcritos para Word for Windows e analisados no Programa NVivo®. Foram atendidos todos os requisitos éticos de pesquisa envolvendo seres humanos. Apontaram-se três eixos temporais que desvelaram peculiaridades e intersubjetividades envolvendo o processo de punção venosa e as tecnologias. Foram identificadas tecnologias inicialmente disruptivas e revolucionárias seguidas das evolucionárias que causaram impactos nas práticas, nos processos de trabalho e na formação profissional.

Palavras-chave: Enfermagem. História da enfermagem. Tecnologia. Cateterismo periférico. Infusões intravenosas.

EVOLUCIÓN DEL PROCESO DE VENOPUNCIÓN Y DE LOS RECURSOS TECNOLÓGICOS SEGÚN PROFESIONALES DE ENFERMERÍA

RESUMEN

La venopunción periférica históricamente se planteó como procedimiento de atribución de la enfermería, evolucionando en sus procesos y materiales. El objetivo del estudio fue comprender la evolución del proceso de venopunción periférica y de sus recursos tecnológicos bajo la percepción de profesionales de enfermería que actuaron de 1960 a 2015, en una ciudad de Minas Gerais-Brasil. Investigación basada en la historia oral que utilizó entrevistas individuales grabadas con profesionales de enfermería, a partir de cuestiones orientadoras. Participaron diez personas identificadas por pseudónimos de flores, con edad entre 24 y 76 años y experiencia profesional de uno a 45 años. Los contenidos de las entrevistas fueron transcritos para

Word for Windows y analizados en el Programa NVivo®. Fueron cumplidos todos los requisitos éticos de investigación involucrando a seres humanos. Fueron señalados tres ejes temporales que revelaron peculiaridades e intersubjetividades envolviendo el proceso de venopunción y las tecnologías. Se identificaron tecnologías inicialmente disruptivas y revolucionarias seguidas de las evolucionarias que causaron impactos en las prácticas, en los procedimientos de trabajo y en la formación profesional.

Palabras clave: Enfermería. Historia de la enfermería. Tecnología. Cateterismo periférico. Infusiones intravenosas.

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