

## Operational definitions of technologies in health and continuous central intravenous therapies to nursing in intensive care

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### Abstract

This study aimed to describe the operational definitions of health technology and continuous central intravenous therapy in the vision of nursing professionals in an Intensive Care Unit. Study of qualitative approach, the descriptive type. We used the Alceste software for operationalising the treatment of data. Thirty two (32) interviews were carried out with active nursing professionals in the Intensive Care Unit. The definition of health technology brought by professionals contemplated relational aspects, however, the hard technologies overlap due to the need of a range of materials that when connected, form the infusion system. Already the continuous central intravenous therapy was presented in segmented form, or with a focus on track of insertion or in how it is conducted and/or its consequences. It was concluded that the majority of nursing professionals of the studied scenario define the technologies in health as hard technologies and define the continuous central intravenous therapies in segmented form.

**Keywords:** biomedical technology, Intensive Care Units, intravenous infusions, nursing.

### INTRODUCTION

The intravenous therapy (VIT) is considered worldwide as an important therapeutic resource, and it is indicated for the majority of hospitalized patients, representing sometimes a basic condition in its treatment (Banton et al., 2005), it is a common practice in the daily life of nursing professionals in the hospital, in the outpatient setting or at home. It is a complex therapy that can be performed in several ways: peripheral, central, continuous or intermittent via, and is used in all age groups of patients are adults, children, infants or elderly, regardless of economic class, social and cultural level.

During the care with the VIT, the nursing professionals deal with a range of technologies that directly interfere with care in itself, as well as, in her eyes to the patient who is dependent on these technologies. Significant changes have

occurred through the incorporation of new technologies to nursing care, especially in the intensive care, because the technology in healthcare is a complex phenomenon that generates reflections and daily discussions among the health professionals involved in the context of experiences of serious customer care from the Intensive Care Unit (ICU) (Silva et al, 2011).

Today, in the 21st century, we have a number of new technologies, since peripheral and central catheters, passing by accessories with safety devices until the infusion pumps of latest generation to facilitate and provide a nursing care of higher quality during the VITs.

The advent of electronic controllers of flow and infusion pumps were fundamental in this context of development in VITs, already allow closer monitoring during this therapy, minimizing the chance of failure (Martins et al., 2003).

With the progressive growth and constant rise in available healthcare technology for the VITs, it is essential that nursing professionals bring with them and enhance each time more the understanding about what are the continuous central VITs, as well as, on the technologies in health. Although the nursing professionals deal all the time with healthcare technology and continuous central VITs during their practice in ICUs, still have difficulty in translating the knowledge about the subject. For the most part, consider technologies in health only the electronic devices, such as for example, infusion pumps, in addition to not translate the continuous central VIT in its entirety, whereas the form, or route of administration, or that is administered.

In this way, it combines with the professional improvement, in obtaining better results in spite of increasing complexity, the increase in the participation of the pharmaceutical industry and of inputs of the area which, by the association of knowledge from a variety of strands, contributes to the range of innovations that transform and develops the skill of VIT (Dopico et al., 2007).

Considering the above, the objectives of this study were: to describe the operational definitions of health technology and continuous central intravenous therapy in the vision of nursing professionals in an intensive care unit.

With more knowledge, nursing professionals have the tools and managerial instruments needed to optimize the care reflecting directly into benefits for the patient. In addition, the management of these technologies to the organization of work by allowing the Nursing professional establishes priorities during their practice, minimizes waste with reduction of costs, prevents the occurrence of rework and mainly strengthens the quality of care as a premise and not as a consequence of the work. All of these issues permeate the security of our greatest asset - the patient.

## METHOD

Study of qualitative approach, the descriptive type. The choice of this type of research took place due to the goal of portraying and describing the situation studied, since it allows the description of a fact or event that occurred in the scenario chosen and thus relate to the practice of nursing staff in the use of technology during the continuous central VITs. To describe the operational definitions of VIT and technologies in health, we chose to use the strategy of concept analysis of referential Analysis of Concept of Walker and Avant (Walker et al., 2004), which was operationalized through the Lexical Analysis of Co-occurrences performed by Alceste software.

The use of the strategy of concept analysis had the purpose to clarify the definitions of VIT and health technology that are predominant in the practice of nursing in the intensive care environment, so that all that the use may be speaking from the same meaning. In this sense, the analysis of the concept results in an operational definition, which leads the researcher to a basic understanding of priority attributes of the concept. This helps to clearly define the phenomenon of interest and allows the construction of hypotheses that reflect the relations between the concepts (Walker et al., 2004; Christovam et al., 2012).

The scenario was the Intensive Care Unit (ICU) of a large Teaching Hospital located in the city of Niteroi, Rio de Janeiro.

The study subjects were thirty two (32) nursing professionals that comprised the team active in ICU. The criteria for inclusion of subjects were acting in the ICU directly with the critically ill patient in use of central continuous VIT in the period of conducting of the research; with availability to participate in the study; servers of both sexes. Were excluded servers in retirement.

The data collection occurred in the period of April to May 2011 and complied with the legal-ethical principles, with the approval of the research by the Research Ethics Committee under the No CAAE:0250.0.000.258 -10. The techniques used for data collection were the direct observation of the scenario and the semi structured individual interview guided by a roadmap. In an interview two instruments were used, the first consisted of closed questions with the purpose of this study was to characterize the subjects inserted in the search and the second was a roadmap with open-ended questions that allowed the interviewee to talk about the proposed theme without boundaries on the part of the researcher (Peres et al, 2006).

The Alceste was used in this study as a technique for computerized analysis of textual data produced by interviews,

applying sophisticated statistical methods used to identify the basic information contained in the speeches of the subjects. The program was held in the automatic form the lexical analysis of content of texts by means of quantitative techniques for treatment of qualitative data, using the Chi-square test ( $\chi^2$ ).

The software operates on the assumption that, when the corpus of text is produced by different individuals, the discourse is analyzed in different ways, played with the use of an own vocabulary, specific, which brings up different ways of thinking about the phenomenon of interest. Thus, based on an own dictionary of the program, the corpus of data consisting of the interviews was analyzed and subdivided being identified the words full or full. The full words are the words that have meaning and characterize the context units (excerpts from speeches) and reveal the semantic world to be exploited in the search. The analysis of the Alceste is based on reduced forms of these words that form the contextual field. The contextual field is defined as "the specific vocabulary of a class characteristic of certain type of context"(Oliveira et al., 2005). The regularity of a specific vocabulary in a class indicates the existence of a contextual field, i.e., the existence of a specific semantic space.

In this sense, a class in Alceste methodology is understood as a grouping of content with a uniform vocabulary and their relations within a context. Its meaning can only be defined from the relationship established between the content that make it up and the objects and objectives of each search. The Alceste analysis is not proposed to interpret what is said, but yes, to know in what way it is said. Thus, the results of the study were discussed in light of theoretical conceptions about the issues addressed in this study.

For the construction of the categories of analysis resulting from the operationalisation of Alceste methodology the following criteria were used: grouping of similar reduced forms, from the full words or semantic context; the reduced forms of a thematic group were organised from the  $\chi^2$ , in a decreasing manner, to meet a redistribution of reduced forms of each thematic group; and, the affinity of similarity or approximation of each thematic group was revised by the comparison between the ECU and the reduced forms of full words of each thematic group.

Even at this stage was operationalized the strategy of concept analysis, from the following steps: 1) identification of elements in recurrent training of discursive objects: health technology and continuous central intravenous therapy; 2) the identification of attributes of operational definition of the concepts of the study; and, 3) a description of the operational definition of the concepts of continuous central intravenous therapy and health technology.

## RESULTS

The data were collected with thirty two (32) nursing professionals, of which nine (09) were nurses, twenty two (22) technicians and one (01) nursing assistant, being 18 belonging to effective body of the institution and fourteen (14) contractors. The group was predominantly female with twenty four (24) professionals of females and eight (08) males; age ranged from twenty three (23) to forty six (46) years. It was observed heterogeneity in terms of working time of these professionals in intensive care, because ranged from two (02) months to ten (10) years, twenty five (25) professionals working in another institution of health while only seven (07) have exclusive dedication to this institution.

There is a balance in quantity of professionals in the distribution of monthly scale. Only one (01) professional works as day-worker and therefore has a daily working hours of six (06) hours while the others have twelve (12) hours of daily working hours duty regime 12h x 60h. It was evident that the weekly is directly related to the category of effective vocational (30 hours) or hired (40 hours).

As regards the time of training, whether in technical course or graduation, there was a significant variation comprising trained professionals there is only two (2) months until those who have more than twelve (12) years of training. There was a variation in the length of time working at the University Hospital (UH): fifteen (15) professionals working in HU between one (01) to four (04) years, fourteen (14) of four (04) to eight (08) years and three (03) professionals, all effective, with more than eight (08) years working in this institution. The average time of actuation of hired professionals was one (1) year, since the contract consists of one (1) year of duration may be extended by a further year.

Of nine (09) nurses in the sample studied, only one (01) do not have post-graduation, other have post-graduate students, of these, five (05) post-graduate students in cardiology critical patients or general. Two of them are enrolled in the professional master's degree. It is important to note that in the group studied, the total of twenty two (22) technicians, six (06) were nursing undergraduates and nine (09) are nurses, being two (02) with post-graduation.

The data found in the class three called The Operational Dimensions of Technologies in Health in Continuous Central Intravenous Therapies in the universe of the Intensive Care Unit, The Master's Thesis presented at the Program of Professional Master's Degree in Nursing Care of Universidade Federal Fluminense, entitled Technologies in Health: proposition of a time of intravenous therapy in the Intensive Care Unit allowed for the construction of two categories of analysis, namely: one (1) Operational Definition of Health Technology in the Vision of the Nursing Staff; and two (2) Operational Definition of Continuous Central Intravenous Therapy in the Vision of the Nursing Team.

## Operational Definition of health technology in the vision of the nursing team

The definition of thematic context that was this category occurred from the analysis of recurring elements or attributes of a definition of the concepts that characterize it. In this sense, the recurring elements found in each analytical category, ensured the existence of regularity in enunciative field and, therefore, defined as essential for the conceptualisation of health technology.

The recurring elements with greater power of statistical association ( $\chi^2$ ) in the category were: improvement, assistance, health technology, new, simultaneous infusion line, quality, infusion pump, treatment, patient, technology, central monitoring, use, medications, circuitry and professionals. Thus, the content of E.C.U. is constituted by recurring elements and defined the semantic context (enunciative field) of this category.

As regards the definition of health technology, the E.C.U. that follow, indicate in their majority that the professionals understand the technology as equipment / inputs/ medication and knowledge.

*Technologies are the tools that we use to facilitate the treatment of the patient, such as the central monitoring, even the new simultaneous infusion line, infusion line, everything that will facilitate, and everything that is being constantly updated. (E.C.U.: 169 Class: 3  $\chi^2$ : 19)*

*Health Technology is everything that is designed to improve, to research, to improve the quality of care, care, everything. (E.C.U.: 208 Class: 3  $\chi^2$ : 11)*

*Well, technology is systematization of ideas by which I think, by that I'm learning; a systematization of ideas through which is used tools to improve my professional improvement. (E.C.U.: 13 Class: 3  $\chi^2$ : 8)*

*( ... ) the technologies greatly contribute to our walk. Of course, we do not allow these technologies overcome the knowledge that I think each professional brings, but that is very important and greatly facilitates the hour of a closing balance sheet ( ... ) (E.C.U.: 26 Class: 3  $\chi^2$ : 8)*

Another issue observed in professional discourse was the approach of health technology as a mean to improve, qualify both their care practice, as well as care end provided to the patient, i.e. , what can they provide to the patient and/or professional.

*Health Technology I believe they are the equipment created, the advances, the studies also made involving the improvement of the patient in terms of wounds, medications (E.C.U.: 106 Class: 3  $\chi^2$ : 12)*

Through the settings exposed, it was observed that the professionals are able to understand health technology in a comprehensive manner, bringing the definition under various aspects. They realize that technology goes beyond equipment, translate technology as knowledge applied to do so. Define operationally health technology as everything that is developed for research and improvements in patient care, such as for example: advances in equipment, studies, etc.

However, although the definition of health technology brought by the professionals in his speech also covers relational aspects, in the environment of the Intensive Care Unit, where it is common to use the continuous central VITs, the hard technologies overlap due to the need for a range of materials that when connected, form the infusion system.

In the scenario studied, it was observed several technologies available to professionals for the realization of VITs. Although this scenario is full of hard technologies, it has been observed that the professionals working there are sources of light technologies, as for example, the relations of bond, hospitality, management of work processes and yeasts which are the knowledge well-structured that conduct the work process.

In terms of hard technology, evidenced in scenario studied through direct observation of field, which is available for the use of professionals during the continuous central VITs bottles of solutions in presentations of 500ml, 250ml and 100ml bottles and ampoules of medications, devices for dispensing and diluting medications, syringes, needles, gloves, gauze, macro doser drops and micro drops, circuitry for infusion pumps, volumetric infusion pumps, bacteriological filters, mono central catheters and double lumen, needle-free valves with positive pressure, extensors of two (2) or four (4) tracks, dãnulas, transparent films. However, in addition to all this technological apparatus, we still have available the knowledge, the knowledge of each professional that is applied during the continuous central VIT.

The recurring elements with greater power of statistical association ( $\chi^2$ ) in the category were: simultaneous infusion line, quality, infusion pump, central monitoring, medications and infusion line. They emphasized that the recurrent elements present in the discourse of the study subjects and that characterize the semantic context (enunciative field) of this category is in line with the observations of field.

The content of E.C.U. show that the professionals have a basic notion of available technological innovations, recognize the availability of material for use, as well as its function in the context of intravenous therapies and so, understand how technology can help you during the care providing more quality.

*( ... ) by the industry we use infusion pump, we also use new infusion line that arrived, simultaneous infusion line which has a technology, causing you hardly ever open that closed system. (E.C.U.: 192 Class: 3  $\chi^2$ : 30)*

*The own infusion pump is a technology, the own syringes that are very specific, that now has as not to miss that central venous access, have the valves in relation to own simultaneous infusion line (E.C.U.: 14 Class: 3  $\chi^2$ : 5)*



The health products that together form the infusion system if they are from the bottle of solution, catheters and intravenous catheters. The circuitry is designed to mediate intravenous infusion and may be gravitational whose performance is related to the action of gravity.

On the other hand, appeared iatrogenic speeches, i.e., *E.C.U.* that demonstrated ignorance on the subject, using as example other technologies that do not fit in the context of intravenous therapy.

*It is; infusion pump, central monitoring, are examples of equipment and materials that we use. (E.C.U.: 101 Class: 3 x<sup>2</sup>: 16)*

### **Operational Definition of continuous central intravenous therapy in vision of the nursing team**

As far as the operational definition of continuous central intravenous therapy, the professionals gave focus on insertion site and the way that this infusion is performed: intermittent or continuous, that is the case. Although the spot/track of catheter insertion does not appear alone in *E.C.U.*, was the approach most present. The focus for central venous access in *E.C.U.* was given by the principle of the characterization of the type of VIT in the location of the catheter, which is very present in the practice of intensive therapy by associating them with the severity of the patients and the difficulty in acquiring a peripheral venous access (Walker, 2004)(Peres et al, 2006), as shown in the *E.C.U.* below:

*( ... ) administration of intravenous solutions for central venous access. (E.C.U.: 101)*

*( ... ) central intravenous therapy is everything that you administer in central venous access during the twenty-four hours. It is a dripping. (E.C.U.: 208)*

Another important point quite clear was how the continuous central VIT and its consequences. During this type of VIT occurs the drug infusion, TPN, in a continuous manner with the objective of maintaining the constant serum levels, fast results, and in the unlikely cases of sudden interruption of infusion (Harada et al, 2011). This practice is present in the majority of cases of patients hospitalized in ICUs. To confirm this we use the following *E.C.U.*:

*It is the use of medications in central venous access, parenteral route, which makes the medications act more quickly, providing a faster result. (E.C.U.: 38)*

*I believe that it is an infusion of medication by a continuous central venous access, uninterrupted. ( E.C.U.: 106)*

The thematic context of this group represented by the *E.C.U.* evidence that although professionals bring the operational definition of continuous central intravenous therapy with a focus on-the-spot/track of insertion and as the same happens and/or its consequences, they can realize in its entirety, the real contribution of continuous central intravenous therapy for the critically ill patient from the ICU.

## **DISCUSSION**

The term technology is defined as a technological instrument (machinery and equipment), such as knowledge, which allow the application of the resources needed to carry out the purposes specified in advance, for processes of specific work within the institutional spaces of professional performance (Christovam et al., 2012). In this perspective, it is the conceptual scope of the term technology which is directly associated with the concept of technique.

Means technique as any procedure operationalized by means of a set of rules or standards that enable and make effective the activities or professional actions (Christovam et al., 2012). From another point of view, the technique is no longer something only instrumental, is the way to ownership of nature by man, therefore, part of the culture. The human activity and the technique are inseparable because it is not possible to separate the moral spheres that have an end in themselves, from the sphere of instruments that would not own purpose (Pfeffer, 2001).

In the health area, usually there is a close relationship of technology with the equipment for the health. However, the concept of health technology is much more than just the equipment, should be understood as a set of tools and job actions that move them, i.e., the knowledge and procedures also fall within the concept of technology in health (Schraiber et al., 2003).

In Brazil, the 2510/GM Ordinance of December 19, 2005 defines how technology in health medications, materials, equipment and procedures, organizational systems, education, information and support, as well as programs and care protocols, by means of which the attention and health care are provided to the population (Brasil, 2005).

For the nursing team studied, technologies in health are represented by the equipment and the knowledge having the same degree of importance. They are able to understand that both are dependent and need to be worked in an equal manner. In this perspective, the technology is defined more broadly, producing it as something more than equipment and machines, because it includes knowledge that constitute the production of natural products with the purpose of organizing the human actions in the productive processes, including from the point of view of size inter-human (Merhy, 2007).

In this way the technologies involved in health work are classified as: mild (technologies of relations of production type

of bond, empowerment, hospitality, management as a way to govern work processes), yeasts (knowledge well structured that operate in the process of work) and harsh that are the technological equipment of the type machines, standards, organizational structures (Merhy, 2007).

With this same line of thought, in hospital scenario, the major differential to be conquered is the human capital and not the technical, because the technological superiority alone is not enough, need at the same time the creativity and flexibility of the professionals, hence the continuing need for training (Arone et al., 2011)

The types of catheters vary as the manufacturers and may be different for the type of dripping, but all have basic components. In the case of continuous central VIT, the use of infusion pumps assists in the control of flow of infusion and to do that, they need to specific catheters that depend on the mechanism of action of the product, be it by linear peristalsis, or roller clamp (Silva et al, 2011).

But for the formation of the infusion system, we have available on the market in addition to the infusion pumps and catheters, central venous catheters with and without antibiotics, filters, connectors, long extenders, short, multipath, needle-free valves (valve for injection of medications and/or aspirations without the use of needles) with positive pressure. These technologies are designed to help professionals to offer quality and safety during the VIT.

The technologies in health when used appropriately in continuous central VIT may encourage a practice increasingly better, providing facilities to professional and greater security to binomial professional/patient. However, if used improperly can bring serious damage, as for example, the infection related to devices found throughout the infusion system (filters, circuitry, connectors, valves), which help prevent blood reflux, decreasing the formation of clots, preventing thrombosis (Jesus et al., 2007).

Therefore, it is crucial that the nursing staff manage, plan and learn about the technologies available to work in VITs and is well-trained on the handling of them according to the DRC no. 2 of 2010 of the National Health Surveillance Agency (ANVISA), which establishes the minimum criteria, to be followed by health care establishments, for the management of healthcare technology used in the provision of health services, in order to ensure their traceability, quality, efficiency, effectiveness and safety, and on that fit, performance, since the entry into health establishment to its final destination, including the planning of physical, material and human resources, as well as, the training of professionals involved in the process.

The VIT involves several steps of professional knowledge, since the reading and interpretation of the prescription, inspection and obtaining venous access; knowledge about the nature of the medicinal products and/or solutions; care in infusion and possible adverse events (Dopico et al., 2007).

In this sense, it is important that the professionals are able to structure their knowledge about the VIT in order to understand this therapy as an integrated system of technologies that must operate in constant harmony for three objectives or important functions: Maintenance therapy daily needs of bodily fluids, replacement therapy for losses detected and therapy of correction for recurring losses or continuous (Melo, 2010).

The construction of a critical and reflective thinking can be translated into safe and effective clinical practice during the VIT that is one of the most important areas and challenging for the staff of the nursing, because decisions must be fast and accurate, and the procedures should be adopted and practiced with safety and competence (Harada et al., 2011).

In this sense, the professionals have brought as operational definition of continuous central intravenous therapy, the administration of intravenous solutions through a central venous access continuously, uninterrupted by making use of catheters, dedicated infusion line, connectors, solutions and infusion pumps.

## CONCLUSION

This study has identified that the majority of Nursing professionals of the scenario studied define operationally technologies in health as the hard technologies. Only the professionals who attended the graduate reported technologies in health with relational and intellectual focus.

From the acquired knowledge about what it is and how the Nursing team builds direct care to the patient in the Intensive Care Unit, the study points to the need for future research that will articulate the technologies in health with the technologies in nursing, understanding the latter as the whole process of management of technologies in health, since the critical reasoning until the application of hard technologies.

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