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Information and communication technologies: interfaces the nursing work process

Tecnologias de informação e comunicação: interfaces com o processo de trabalho da enfermagem

Tecnologías de información y comunicación: interfaces con el proceso de trabajo de enfermería

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ABSTRACT

Objectives: to unveil the meanings that nurses attribute Information and Communication Technologies for the nursing work process **Methods**: qualitative research, theoretically and methodologically based on the Complexity Theory and on the Grounded Theory, respectively. Research with 19 participants, being 12 clinical nurses, and 7 resident nurses. Semi-structured interviews were used for data collection. **Results**: the results revealed the meanings that clinical nurses attribute to Information and Communication Technologies and, thus, the motivations and limitations for the use of these technologies, pointing out possibilities and strategies that impact the nursing work process, based on the interactions promoted by the official and non-official use of these resources. **Final Considerations**: the meanings that nurses attribute to Information and Communication Technologies are dependent on their ability to successfully employ those technologies and their importance to the work process developed by the professionals.

Descriptors: Nursing; Information Technology; Medical Informatics; Health Communication; Knowledge Management

RESUMO

Objetivos: desvelar os significados que enfermeiros atribuem às Tecnologias de Informação e Comunicação para o processo de trabalho da enfermagem. **Métodos**: pesquisa qualitativa, cujos referenciais teórico e metodológico foram a Teoria da Complexidade e a Teoria Fundamentada nos Dados, respectivamente. Pesquisa com 19 participantes, sendo 12 enfermeiros assistenciais e 7 enfermeiros residentes. Para a coleta de dados, utilizou-se a entrevista semiestruturada. **Resultados**: os resultados revelaram os significados que enfermeiros assistenciais atribuem às Tecnologias de Informação e Comunicação e, desse modo, as motivações e limitações para a utilização dessas tecnologias, elencando possibilidades e estratégias que influenciam o processo de trabalho da enfermagem com base nas interações fomentadas pela utilização formal e informal desses recursos. **Considerações Finais**: os significados atribuídos por enfermeiros às Tecnologias de Informação e Comunicação estão relacionados à capacidade de aderência e importância dessas tecnologias ao processo de trabalho que desenvolvem.

Descritores: Enfermagem; Tecnologias de Informação; Informática em Enfermagem; Comunicação em Saúde; Gestão do Conhecimento.

RESUMEN

Objetivos: desvelar los significados que enfermeros atribuyen a Tecnologías de Información y Comunicación para el proceso de trabajo de enfermería. **Métodos:** investigación cualitativa, cuyos referenciales teórico y metodológico fueron la Teoría de la Complejidad y la Teoría Fundamentada en los Datos, respectivamente. Investigación con 19 participantes, siendo 12 enfermeros asistenciales y 7 enfermeros residentes. Para la recogida de datos, se utilizó la entrevista semiestructurada. **Resultados:** los resultados revelaron los significados que enfermeros asistenciales atribuyen a Tecnologías de Información y Comunicación y, de esa manera, las motivaciones y limitaciones para la utilización de esas tecnologías, enumerando posibilidades y estrategias que influencian el proceso de trabajo de enfermería basado en las interacciones fomentadas por la utilización formal e informal de esos recursos. **Consideraciones Finales:** los significados atribuidos por enfermeros a Tecnologías de Información y Comunicación están relacionados a capacidad de adherencia e importancia de esas tecnologías al proceso de trabajo que desarrollan.

Descriptores: Enfermería; Tecnologías de Información; Informática en Enfermería; Comunicación en Salud; Gestión del Conocimiento.

INTRODUCTION

The technological developments brought by the scientific progress of the last few years can be compared to the industrial revolutions of the 18th and 19th centuries. They came to establish an interdependent system between individuals, societies, and information mechanisms, forming a complex and dynamic network of interactions[1]. In this respect, taking Complexity Theory[2] as an epistemological basis, according to the hologram Principle in which the part inserted in the whole and whole inserted in the part[3], we can consider that the behavior of an individual is under influence of the whole/society, and this individual influences that whole in return; therefore, the outcomes of scientific and technological development, naturally, influence the work processes of health professionals[4].

Being the nursing work process an indispensable element to health care systems, it is important to consider, therefore, how the interactions between technologies, people, and contexts have an impact on it. By "nursing work process" we mean the set of actions, systematically supported by scientific Knowledge, technical skills, relational skills, and attitudes directed at the object of nursing care. Thus, the nursing work process is a complex, multifaceted phenomenon, which continuously influences and is influenced by the relations between care, management, research, and education within its practice, inserted in a context shaped by the interpersonal relationships of the nursing team and other health care professionals, infrastructure, installed technical capacity, in addition to the cultural and power relations present in the organization of the health service. Within this system of interactions, there are Information and Communication Technologies (ICTs), which constitute technological resources employed in various fields, such as: in industry, for the automation process; in advertising, for the production of simultaneous information; in education, in order to facilitate the learning process; in health care, to access the social demand for care; among others[5].

However, it should be noted that ICTs are technological tools that promote the distribution and access of information, in a network, with varying degrees of personal interaction. Thus, they require resources such as computers, electronic communication networks, and telecommunication infrastructure[6]. Furthermore, in this context, applications that favor ICT-based communications create an environment of remote interaction in the most diverse social situations. Among these resources, there is, for example, the WhatsApp© application, incorporated in the nurse's daily work for activities such as exchanging information, sharing and accessing *guideline*s, in addition to receiving administrative instructions from managers, therefore characterized as a channel for official and non-official communication for the nursing and health care team, making possible the evaluation and management of efforts[7].

In another perspective of the work process, which is not limited to the interactions between professionals themselves, but to the field of care interactions, the influence of ICTs in the adoption and/or maintenance of protective or unhealthy behaviors must also be considered because remote access to information can favor the development of new health practices. In this context, some intervening factors operate, such as: cognitive capability; scientific literacy and technological proficiency; quality and quantity of accessed information; mediators of the knowledge construction process; limitations of ICTs' interactive capacity[8]; in addition to "diseased knowledge", when knowledge is disseminated in a fragmented way, lacking the capability to develop an understanding of the multidimensionality involved in the phenomena that surrounds humanity.

As an important interface, resulting from the connections between ICTs and health, there is also the possibility of using applications that promote knowledge and tracking for healthy lifestyle habits, such as: *PeriodTracker©*, *GlicoCare©*, *SleepTime©*. However, entering another dimension of this system (that of nursing), it is important to understand how nurses connect with these possibilities to guide the use of these resources by patients and their families[9-10], or even to optimize the organization of the work process of nursing.

Furthermore, with the expansion of ICTs, the accelerated dissemination of information for the construction of knowledge has now a major impact on nurses' decision-making process. Therefore, new knowledge, skills, and behaviors started to incorporate the work process of these professionals within their team[11].

These practices can adhere to a perception that motivates the appreciation and interest of nurses in the acquisition and development of skills that favor the use of ICTs in the work process; and these perceptions, in a more in-depth projection, can be translated into meanings. Regarding this scenario, as a multidimensional phenomenon[2], that is, it affects and is affected by different factors, we may consider that the use of ICTs by nurses can also be influenced by the organizational culture of their work environment, as well as by other factors that can affect and be affected by the set of meanings nurses attribute to the use of ICTs[5]. In this sense, it is opportune to ask: What meanings do nurses attribute to Information and Communication Technologies for the nursing work process?

OBJECTIVES

To unveil the meanings that nurses attribute Information and Communication Technologies for the nursing work process.

METHODS

Ethical aspects

The research was approved by the Research Ethics Committee of the institution in which the research took place. Participation was on a voluntary basis, after clarification and signing of the Free and Informed Consent form.

Theoretical-methodological framework

The theoretical and methodological references of the research were, respectively, the Complexity Theory[2] and the Grounded Theory (GT)[12]. The Complexity Theory promotes the understanding of phenomena based on the interactions between the elements that constitute them. In this sense, it reveals the importance of relationships between actors and contexts based on the multidimensionality that exists in these elements so the

complexity of social phenomena can be grasped, even without aiming at the complete understanding[11].

Regarding GT, it is a method developed based on a set of analytical resources that, systematically conducted, makes it possible to generate a theoretical matrix explaining the researched phenomenon[12]. In this sense, it promotes the understanding of the factors that structure, condition, and/or influence a phenomenon. Therefore, the methodological framework is aligned with the theoretical framework by basing the analysis and interpretation of results at a multidimensional perspective, which considers the need to comprehend contextual, cultural, individual, and social matters to understand the investigated phenomena.

Type of study

Explanatory, qualitative research guided by the COREQ tool (*Consolidated criteria for Reporting Qualitative Research*). The methodological design, based on the objectives outlined, directed us to this type of explanatory research, while the development of the theoretical matrix demands the identification and understanding of the factors that contribute and/or determine the phenomena it deals with, from an in-depth perspective of the relation subject/image/object of knowledge.

Methodological procedures

The collected data were coded following the steps of GT, the first being open coding, in which the concepts were identified through comparisons between properties and dimensions of the data. In this step, preliminary codes emerged based on the titles assigned to each incident, idea, or event (data properties). With the preliminary codes in hand, we performed a comparison to group them into conceptual codes[12].

The next stage of codification was the axial one, in which the conceptual codes were grouped to form the categories and subcategories[12]. At this stage began the process of regrouping the data that was separated in open coding.

Integration, the third step, consisted of comparing and analyzing categories and subcategories, a process that was carried out continuously in order to develop the categories, integrate and refine the theoretical matrix, allowing the emergence of the central phenomenon[12].

Study setting

The scenario of this research was a Brazilian federal university hospital in the city of Rio de Janeiro. As an institution that integrates health care, management, and teaching activities, it provided a rich context for experiences, which favored the development of this research aimed to investigate nurses' meanings for ICTs in the nursing work process.

Data source

Nineteen nurses participated in the research, distributed in two sample groups. The first sample group consisted of twelve clinical nurses, who met the following inclusion criteria: being a nurse in the clinical or surgical field with at least six months of work experience. Exclusion criteria were being on vacation or on leave for any reason

It is worth mentioning that research developed with GT presents, as one of its characteristics, the possibility of the emergence of new sample groups in the analytical course of the data. Thus, at first, this research had only the first sample group defined; however, during data analysis, which occurs simultaneously with the collection process, it was possible to define the following hypothesis: Considering the digital interactions are based on the context in which people are inserted, could the generation of the nurses influence their perceptions and, therefore, their meanings of ICTs for their work process, regardless of the amount of professional training? That being so, the second sample group was created, namely: residents nurses.

The inclusion criteria for this sample group were, therefore: to be a nurse, in residency, working in the clinical or surgical field during data collection. Exclusion criterion: being on leave for any reason. Recruitment was done this way for convenience. This group was comprised of seven participants.

To ensure anonymity of the participants, excerpts of their statements are identified by a letter and a number, according to their sample group of origin and the sequence of the interviews. Thus, the letter "N" designates clinical nurses; and "R", nurses in residency.

Data collection and organization

The semi-structured interview was the chosen technique for data collection. The interviews were conducted between January and July of 2019, with the following guiding question: What do Information and Communication Technologies mean to you in relation to the work process you perform as a nurse? However, to capture those empirical meanings in-depth, therefore, to better understand the investigated phenomenon, circular questions were used. The interviews lasted 30 minutes on average and were performed in a calm environment. No participants withdrew from the research.

Data analysis

Each interview was recorded in digital audio by the main researcher and later transcribed in Microsoft Word for analysis. The data analysis was done through the coding process, which, in the GT proposed by Strauss, consists of comparative analysis on three levels: open, axial, and integrating[12]. This comprises the emergence of codes that are compared with each other, grouped by conceptual similarities for the development of categories. The categories were ordered according to the paradigmatic model[11]. This scheme promotes organization between the categories capable of ordering the explanatory connections for the understanding of the investigated phenomenon, based on the following components: conditions, actions-interactions, and consequences[12].

RESULTS

The resulting data of this research reveal the construction of three categories that, by employing the paradigmatic model, shape the generating and intervening conditions of the investigated

phenomenon, being such conditions: the actions and interactions involved in the phenomenon development and the possible consequences resulting from these interactions.

The categories that integrated these components were, respectively: 1) Perceptions and motivations for using the Information and Communication Technologies in the nursing work process; 2) Resources, dynamics, and purposes for ICTs in the nursing work process; 3) Anticipation of consequences from the use of ICTs in the nursing work process. Each category is supported by subcategories that give them explanatory capacity through the concepts present in each of them. Therefore, the first category is presented.

Perceptions and motivations for using the Information and Communication Technologies in the nursing work process

This category involves the perceptions that nurses attribute to ICTs and their interfaces with the nursing work process, especially in the health care context that incorporates the set of technical skills, relational skills, knowledge, and attitudes for nursing care.

In this perspective, we highlight the influence of information and communication for the understanding and the organization of the nursing work process. Such perceptions are related, therefore, to how the implications of ICTs in assisting the management of patient care are conceived, in addition to the specific management activities of the health unit. These elements are further detailed in two subcategories, in which the first consists of *Nurses' Perceptions about Information and Communication Technologies: interactions with the work process.*

To reach knowledge, in its multidimensionality, through any system or set of factors that influence the behavioral dynamics of people for the adoption or not of a certain work process, it is pertinent, before, to understand the meanings they attribute to the phenomenon that characterizes the process in question. From this understanding, we can view the axis that guides this subcategory, that is, the interactive mechanisms that connect perception to the construction of meanings for a possible behavioral change in the face of the perceived/meant/valued phenomenon.

Therefore, it was possible to identify that the participants perceive the phenomenon of technological resources in an expanded perspective, since, for them, it involves information and communication, as well as all technologies that enable the communicative processes, including hard technologies such as computer hardware and cell phones (smartphones), in addition to the internet and resources such as e-mail, as shown in the following translated excerpts:

> *I understand that these are technologies that facilitate our communication and, besides communication, information as well* [...]. (N2)

> *They are technologies. I can't explain it very well, it's the computer. These are technologies that give us access to information, that's basically it.* (R1)

> [...] *they are these new technological devices that transmit information. Be it virtual, or even practical as reports and presentations. And virtual, e-mails, the tools for accessing information.* (N9)

Participants signaled that ICTs are phenomena not yet properly discussed or approached in nursing as they should be. However, they demonstrated enjoying their use in the daily work, in which, in the perspective of these professionals, it is already a reality in the post-modern logic that reaches the organizational process of work.

> *It is a different, innovative subject in nursing, but, also, it is necessary because, nowadays, these tools are part of our daily lives.* (R4)

> *I think that ICTs are a very new phenomenon for the nursing area, but nowadays, due to the market, it is necessary to know how to work with them.* (N1)

Furthermore, they realize that ICTs facilitate communication between nursing professionals. They are characterized as tools that bring agility and ease to the access of information.

> *Nowadays, it is faster, it is easier. ICTs allow us to get connected to any information we can think of and communicate instantaneously, within seconds.* (N3)

> *Through technology, you can speed up your entire work process, from communicating with different parts and even from different, distant places, right?!* (N10)

While the previous subcategory highlighted the perceptions that nurses attribute to ICTs, the subcategory *Information and Communication Technologies: why use them in the nursing work process?* revealed the factors that influence the use of these technologies in the nursing work process. The research revealed that this reality, as a non-linear relationship of a complex phenomenon, can influence the nurses' perceptions about ICTs based on the purposes listed for such technologies in the context of nursing work.

In this sense, the interviewees understand ICTs as one of their main work tools, because, among other functions, these technologies facilitate communication between professionals in different sectors, both in nursing and in the multidisciplinary health care team, directly affecting the work process they exercise.

> *It is almost a requirement for residents to know how to use these tools. It is our work material.* (R3)

> *Our main work tool. So, for us, today, it is fundamental, it speeds up the work process, shortens our evolution in hours.* (N6)

> *They facilitate interdisciplinarity, streamlining communication with other professionals and also between the sectors where there is a need to transfer someone.* (N12)

ICTs positively influence the nursing work process through their contributions to the organization of activities, as well as bringing agility to the communication process within the team. In addition, they are revealed as time-saver resources in the nurse's work process, useful to capture information to inform actions in real-time and even to disseminate information among the other members of the work team.

> *Nowadays, it is faster, it is easier. ICTs allow us to get connected to any information we can think of and communicate instantaneously, within seconds.* (N3)

> *I believe that it helps people to solve problems in a more practical way in certain situations, both to communicate and to search for information, for prescription, diagnosis. I think it speeds things up and makes the process easier.* (R3)

The next category presents a procedural perspective on the use of ICTs by nursing professionals, that is, from the resources listed by nurses, the dynamics of its use, to its purposes for the nursing work process. This category is called Resources, dynamics, and purposes of Information and Communication Technologies in the nursing work process.

Its first subcategory lists *ICTs available for the nursing work process* and is based on examples of technologies used or mentioned by nurses for their work process. Participants indicated the use of the internet, electronic medical records, messaging applications, and other technological resources, as means to speed up the dynamic process of disseminating and consuming information in the workplace.

Among the resources pointed out by the participants, it is important to highlight the procedure and product relationship of the mentioned ICTs, that is, on the one hand, the need for mobile resources, such as computers; and, on the other hand, flexible technological resources to support work dynamics, such as the use of groups in the WhatsApp communication application.

> […] *These technologies would be the cell phone, the use of the internet on the cell phone, some application focused on health or some other application for our communication, institutional and even outside.* (N2)

> […] *Even more here at the university hospital, we use prontHU©, the information comes really quickly* […] (N3)

> *We use WhatsApp, most of the time, with workgroups.* (N4)

> *We also use other means, for example, e-mail, the internet to search for articles.* (N11)

> *So there are several ways to use it. One of them, for example, is a WhatsApp group with other residents.* (R5)

WhatsApp groups, organized by chief nurses and residents, are one of the main tools used as a resource for communication between nurses and other professionals. This subcategory revealed, therefore, possibilities for the use of ICTs in the nursing work process. The subcategory *Establishing ways to use ICTs in the nursing work process,* in its turn, is intended to describe the multiple ways in which such technologies can be used in the context of nursing care work.

The use of e-mail represents a milestone for the progress of formal virtual interactions in the work process. The speed of this phenomenon was driven not only by the improvement of the internet but also by the ICTs used in this process. In this logic, cell phones and tablets were the prevalent devices mentioned by the participants. Regarding information searched on the internet, the participants indicated the Google website as the main resource for browsing on the network. The meanings associated with this process are the speed, ease, and variety of the available information, which, according to the participants, make them tend to use that site as a source of information for their work.

The interactivity and variety of resources that can be accessed and disseminated, facilitated through ICTs, are also associated with the use of the WhatsApp messaging application by nurses.

> [...] *I use WhatsApp a lot, which is a technological resource for talking. There we have the possibility to form groups. So I have groups from my field, I have a group from my research group, and there we exchange information regarding events, about what we're working on, we exchange specific information, updates on what I work on.* (N7)

The subcategory *Recognizing the multifaceted dimensions for the use of ICTs in the nursing work process* presents the purposes for the use of ICTs based on the nurses' tendencies of use, as well as the possibilities found in the health service for this to occur.

In this sense, nurses considered that ICTs can be used for research development; as a resource for communication within the team; to search for information to develop knowledge, to access work platforms remotely; to clarify doubts; as well as to manage nursing care, among other purposes. They also reveal reasons for using ICTs resulting from the need for specific knowledge, for specific activities that demand immediate information for decision making.

> *We had a huge improvement with direct access to Google, to search for information about drugs, rare diseases. We get the definition almost immediately when we don't know it.* (N5)

> [...] *I search, sometimes, because it has been a while since I read about some specific subject, or it has usually been due to the demands of my everyday work, my profession. For example, I am on duty, and then, during my duty, a situation comes up, some procedure, some case that I did not read about.* (N7)

> *So, for example, here we receive a lot of patients with rare diseases, so we go on the internet and try to find out more about that disease. So it's the fastest way to find it.* (R2)

Furthermore, we perceive that the management of care has been affected by advances in information, with the emergence of a new paradigm of care and health. In this sense, this subcategory makes evident the dichotomy in the use of ICTs by clinical nurses and by nursing management, thus highlighting the way in which each professional profile uses Information and Communication Technologies in the management of care. Moreover, it points out the implications of this for the practice of patient care.

> *For care nurses, ICTs help the patient care; for managers, it is more used to organize the sector.* (N12)

> *But when it comes to improving the service, the management, the leadership, I don't normally use a social network, this is restricted to nursing management.* (N8)

> […] *You can organize tables, organize a better management service. And deal with the nursing staff.* (R6)

> *I realize that the practice of care has changed a lot with ICTs. Everything is updated, all patient information, all exams, x-rays, everything they did during the day, vital signs, medications, schedules.* (N11)

We present the potential consequences of the interactions permeating the linear cause-and-effect relationship between the phenomena involved in the use of ICTs in the nursing work process, which, as indicated by the data, can be positive or negative depending on the quality of the established interactions. It is in this sense that the third category was developed, namely: Anticipation of consequences from the use of ICTs in the nursing work process.

Its first subcategory, *Identifying needs to improve the use of ICTs for knowledge in the midst of ethical dilemmas in the nursing work process*, points to these implications by including the discussion of ethics in the digital context, which sets up a space for interactions in the nursing work.

> *I think your work can help to observe where we are evolving and where we should pay more attention to the use of these technologies in the work environment.* (R4)

> […] *What most intrigues me, nowadays, in relation to technologies is how to use them without violating ethics. Because, as much as it is a tool that can help us, it should not be used in a harmful way, hence the need for discussion with the regulatory bodies.* (R3)

The participants understand that the ethical implications are also of interest to the regional nursing councils, with emphasis on the need for knowledge and vigilance based on official documents that provide an understanding of the possibilities and limits for the use of ICTs in the nursing work process.

> *These technologies, because they are new, we are still adapting to use them in a better way, what we can and cannot do with it,* [...] *perhaps Coren (the denomination of Brazilian regional nursing councils) itself will establish rules and regulations to be used in the workspaces.* (N11)

> *Despite never having a problem with those technologies before, I think it is necessary to regulate these tools* […]. (N9)

Among the main consequences of this objective reality, there may be the very quality of patient care.

> […] *And sometimes this failure, this fragility of communication is what causes a lot of damage to ethical concerns, especially in our care, in our work.* (N1)

The subcategory Recognizing plural transformations for health, care and knowledge in nursing based on the use of ICTs highlights the transformations reflected in the area of health, care, and knowledge in nursing.

> [...] *these advances have brought benefits to us, making things more practical, but also empowering the patient, giving them some autonomy, making them participants of their own care.* (N2)

> *To operate SUS* [Brazilian unified health care system] *without those technologies would be chaos; even if the system gets compromised, SISREG* [SUS regulation system] *still guarantees integral attention to the users.* (R4)

Nurses perceive, in a multidimensional perspective, that the implications of ICTs have an impact on the work process insofar as those technologies establish their influence on the behavior of users of the health system, which, due to the remote access to information facilitated by ICTs, produce on the nurses a need to update themselves on the good practices of the use of these technologies in their work process.

DISCUSSION

With the scientific and technological evolution, still ongoing in the history of mankind, we are experiencing the construction of new societies, developed by new cultures, new economies, new social dimensions, which allow technologies to act on information to shape a social structure organized in networks, in an open and dynamic system[13] that forms itself as a retroactive circuit of self-regulation[3] through the information that is generated and accessed.

Therefore, for the nurses in this study, ICTs constitute a set of scientific and empirical knowledge that, when well organized, ensures scientific advancement and innovation, which in turn will be employed by nurses in their work process to achieve the necessary goals for the development of their social roles. Therefore, these technologies are presented, in a multifaceted perspective, as a set of devices, services, and knowledge enabled by computers and software that have the ability to produce, reproduce, and distribute information with agility, as well as providing possibilities for accelerated communication, supporting human interactions in the physical and in the virtual environment to serve the work process[2,14].

The insertion of clinical nurses in ICTs systems contributes to the renewal of their ideas and their relations with work. Regarding this phenomenon, it can be considered as an open system generating a multiple access network, strong, imposing, innovative, adapting levels of reality and interdependent relationships between professionals[15]. In addition, this reality can be understood by the Principle of Complexity, which addresses the reintroduction of knowledge in all knowledge produced[3], because, when accessing information for the construction of knowledge and behavioral changes at work, these nurses modify themselves based on the changes that occur in the field of meanings.

The data indicate the importance of quick access and dissemination of information, in addition to other mechanisms promoted by ICTs. In this context, we confirm the understanding that the time in the nurse's work process is usually in constant scarcity[16] so optimizing it directly impacts the quality of the service provided to the client. Therefore, when it comes to time optimization, ICTs are an ally nurses, as fast information can help in problem-solving and in making short-term decisions. In addition, the use of these technological aids allows nurses to achieve productivity and high performance in the work activities they perform[17]. This is especially so because such tools favor the exchange of information between professionals[18], enhancing interactions, knowledge, and dialogue between the nursing team and other health professionals with greater rationality that raises awareness and autonomy[19].

Added to this reality is the fact that this new informational paradigm highlights a process of transformation that has been taking place in the labor market. The new technologies are

evidenced with the arrival of new work instruments and tools to assist the nursing work process, contributing to a new model of work organization, as they enable new dynamics of information flows permeating the organization and the work process itself[20].

From the complexity perspective, with regard to changes related to health care, the new forms of the work process are a consequence of the dialogue between the digital interface and everyday life, in which they seek the reintegration of the whole, that is, through a complex vision, it is possible to overcome uncertainties and build new work organizations, using ICTs for this purpose[2].

The society as a network understands, in this sense, that ICTs play a notable role, as they favor work with a new management model and moral values[13]. In this way, the work mediated by these technological resources is part of a context in which nurses experience the new health and care demands of those who enter in contact with health care services.

ICTs focused on the management field appear to value data collection and analysis of adverse events, that serve as indicators for assessing nursing care; for staff sizing; in the codification of nurses' payments, medication, materials, and analysis of hospital bills[17,21]. In this same dimension, it is considered that their use in these different functions is complementary to the work process performed by nurses[22-23].

Regarding the resources and dynamics of using ICTs in the nursing work process, it should be noted that the internet is an important mechanism used for research by these professionals. When used individually, this tool answers specific questions, offering information according to the depth of the user's search[24], stimulating the nurse's active posture, and enabling the production of information.

In this context, in line with the research results, it is worth highlighting the influence that the Google platform has on humanity, which can be understood by contextualizing its technological expanse, developed in the midst of Internet-based products and services. This platform runs on a million servers around the world and processes more than a billion search requests daily. As a research tool at work, it facilitates and optimizes the lives of those who seek information[25]. Therefore, it appears for these professionals as a source of remote search/access during the work process.

In addition to this reality, the fact that ICTs enabled the generation of numerous devices that allow new interactive possibilities, such as social media, which increased access to information and the interaction between individuals[26]. Thus, the nursing work process can be favored, as social networks on digital platforms embrace interactivity and permit the sharing of information, opinion, and experience among peers[27]. These devices reveal possibilities for work activities - for example, in the monitoring of injuries caused by pressure through the sharing of photos, helping to define the best treatment according to the stage of the injury[28]. Another resource is the creation of groups that enable the interaction of several individuals at the same time to exchange information and media[29].

Another tool pointed out by the participants of the study are the Electronic Medical Records (EMRs), with successful experiences in the field of management and health care in nursing. It is a technology organized by a logical sequence that will be executed by a computer, which will result in the storage or transmission of information or in the printing of reports[30-31].

The use of EMRs was authorized by the Brazilian Federal Nursing Council (Cofen) only in 2012, through Resolution No. 429[30], indicating how Brazil was a late adopter when compared, for example, to the USA, which has used this resource since 1977 to increase productivity and to bring agility to the nursing work process[32]. However, it should be noted that, in the beginning, there were concerns about the possibility of unauthorized people accessing patient data, as well as fraud and adulteration of information[33]. However, the improvement of the programs did not take long to eliminate these doubts through protection mechanisms such as login and password or the use of biometrics[33].

The nursing record, done through EMRs, is the main means of transmitting information between the members of a multiprofessional team, gathering the interventions, the results, and the condition of the patient. Before, the records were done by hand, on paper, creating problems due to messy writing, loss of documents, and the excess of paper files[34]. Therefore, the introduction of these online resources makes it possible to manage material and medicine stocks, to ask for complementary exams, receive results and prescriptions, and manage nurses' schedules. Another possibility of EMRs is to be a source of data for academic research, allowing them to become information available to science. With this, nurses get a broader view of the context and the work process[33].

ICTs, in spite of allowing the development of better services and assistance to the population, also made clear the need to discuss the ethical and bioethical precepts for their use. In health care spaces, it is very common to observe health care professionals using mobile devices to record patient data, without their proper authorization[35-37]. In this way, digital ethics in health involves values and principles adopted by an organization in its relationship with individuals and technology[38], being, therefore, essential to the good functioning of health services[39].

The popularization of ICTs and the spread of the internet in health care spaces exposed the daily lives of nurses and other health professionals in the hospital[40]. Thus, compromising images are occasionally published on social media, with information that may imply a breach of the confidentiality required for professional care[41].

Confidentiality and secrecy are guaranteed by the Code of Ethics for Nurses[42], which establishes that nursing care must respect the dignity, privacy, and intimacy of the human being, also prohibiting the publishing of images or information that may reveal the identity of people or organizations without their authorization. Therefore, following the inevitable changes in the nursing work process by the use of ICTs, Cofen[42] established, in 2017, Resolution No 554/17, defining criteria for the proper behavior and use of social media by nursing professionals.

Cofen's reasoning for this resolution is to protect patients from unnecessary exposure and to watch over the image of nursing professionals and the institutions they work for, giving regulatory authorities the responsibility of identifying infractions and taking appropriate measures to curb those who threaten the credibility of the nursing profession[42].

Study limitations

The limitations of the research are related to the epistemic field from which the results emerge. Thus, the explanatory capacity for the phenomenon investigated is limited by the context in which the data were collected (tertiary care, in a university hospital), which may overrepresent some particularities of that setting in the use of ICTs within the nursing work process. Therefore, it is recommended to replicate this research in the contexts of primary care as well as in private institutions.

Contributions to nursing

The results can provide an expanded/contextualized understanding of the importance of ICTs in the nursing work process, based on the meanings that nursing assistants, in the hospital context, attribute to them in their work functions. In addition, the results suggest a need for the development of skills enabling nurses to employ ICTs in their work process in the best way possible.

FINAL CONSIDERATIONS

ICTs are perceived by health care nurses, in the clinic context, in a multifaceted way, significantly connected to the way they use these technologies in the work process they practice. In this sense, the meanings attributed by these professionals showed that such technologies are indispensable for the management of nursing care.

As such, clinical nurses considered that ICTs contribute mainly to the communication process, but they also pointed out different possibilities that can influence the organization of the work process, including the ethical and legal concerns for the use of social media in this context of interactions.

Even though we raised a hypothesis that led to the creation of a second sample group, that generations influence nurses' meanings for the use of ICTs in the work process they practice, clinical and resident nurses exhibited similar perspectives. They revealed ICTs as important resources that should be explored to better manage patient care, not only directly, through virtual communication, but also indirectly through remote access to updated knowledge in the health area.

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