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Nursing and waste management in health services: unveiling meanings in the hospital context

Enfermagem e o gerenciamento de resíduos nos serviços de saúde: desvelando significados no contexto hospitalar

Gestión de residuos en enfermería y servicios de salud: develando significados en el contexto hospitalario

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ABSTRACT

Objective: To unveil the meanings that nursing professionals attribute to practices related to waste management in health services, within the hospital context.

Method: Qualitative research, whose theoretical and methodological references were, respectively, Complexity Theory and Grounded Theory. A total of 30 nursing professionals from a public hospital in Rio de Janeiro participated in the study, between January and August 2022. A semi-structured interview was used for data collection.

Results: The professionals indicate the need for better knowledge about waste management in healthcare services, while revealing their understanding on the importance of this process and of themselves as important elements in impacting the environment and health.

Conclusion: The complexity of the meanings attributed to healthcare waste management practices indicates the dialogue between the fragility of nursing professionals' knowledge and their expanded perceptions about the impacts they can have on this reality.

Descriptors: Nursing. Waste management. Nursing service hospital. Sustainable development. Ecology. Environment.

RESUMO

Objetivo: Desvelar os significados que profissionais de enfermagem atribuem às práticas relacionadas ao gerenciamento de resíduos nos serviços de saúde, no contexto hospitalar.

Método: Pesquisa qualitativa, cujos referenciais teórico e metodológico foram, respectivamente, a Teoria da Complexidade e *Grounded Theory*. Participaram do estudo 30 profissionais de enfermagem de um hospital público do Rio de Janeiro, entre janeiro e agosto de 2022. A entrevista semiestruturada foi utilizada para a coleta de dados.

Resultados: Os profissionais sinalizam a necessidade de melhores conhecimentos sobre gerenciamento de resíduos de serviços de saúde, ao tempo que revelam compreender a importância desse processo e de si mesmos como elementos importantes para impactarem o meio ambiente e a saúde.

Conclusão: A complexidade dos significados atribuídos às práticas de gerenciamento de resíduos de saúde sinaliza a dialógica entre a fragilidade de conhecimento dos profissionais de enfermagem e suas percepções ampliadas sobre os impactos que podem exercer nessa realidade.

Descritores: Enfermagem. Gerenciamento de resíduos. Serviço hospitalar de enfermagem. Desenvolvimento sustentável. Ecologia. Meio ambiente.

RESUMEN

Objetivo: Revelar los significados que los profesionales de enfermería atribuyen a las prácticas relacionadas con la gestión de los residuos de los servicios de salud, en el hospital.

Método: Investigación cualitativa, cuyos referentes teóricos y metodológicos fueron, respectivamente, la Teoría de la Complejidad y la Teoría Fundamentada. Participaron en el estudio 30 profesionales de enfermería en un hospital en Rio de Janeiro, entre enero y agosto de 2022. Para la recolección de los datos se utilizó la entrevista semiestructurada.

Resultados: Los profesionales señalan la necesidad de un mejor conocimiento sobre la gestión de residuos en los servicios de salud, al tiempo que revelan que comprenden la importancia de este proceso y de ellos mismos como elementos importantes para impactar el medio ambiente y la salud.

Conclusión: La complejidad de los significados atribuidos a las prácticas de gestión de residuos de salud señala el diálogo entre la fragilidad del conocimiento de los profesionales de enfermería y sus percepciones ampliadas sobre los impactos que pueden tener en esa realidad.

Descriptores: Enfermería. Administración de residuos. Servicio de enfermería en hospital. Desarrollo sostenible. Ecología. Ambiente.

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INTRODUCTION

Technological and biotechnological advances has brought important benefits to humanity through the diversity of products and materials produced and made available on the market for human consumption[1,2]. From this scenario, the relationship between technological development, large-scale production and behavioral changes resulting from the consumption of products can be inferred. However, this reality reflects in the intense production of solid waste, which has been growing at a significant pace across several sectors of society[3].

Paradoxically, there are impacts on the environment[4] and, therefore, from a systemic perspective, impacts on people's health and development[5]. Moreover, this paradox is complex and involves human behavior based on the logic of development based on the Cartesian plan of production and consumption of goods and services, without considering the relationship with the environment. As consequence, there is the increase in global and systemic vulnerabilities in life on the planet, resulting in serious health, environmental, social and economic problems[6], of which the remaining waste from human consumption stands out.

In Brazil, the Brazilian Health Regulatory Agency (ANVISA), through Collegiate Board Resolution (RDC) No. 222/2018, which guides establishments and society regarding the correct management of waste, presents a classification for such items according to their origins: industrial, domestic, hospital, agricultural, commercial and sweeping[7]. In this context, among solid waste, Healthcare Waste (HCW) stands out. Within this group is hospital waste, which is defined as any product generated in the diagnosis, treatment, immunization of human beings or animals, or in research in a place where healthcare is provided. It includes all materials used during the treatment provided to patients, as well as all items contaminated by hazardous fluids, such as blood, urine, feces and other body fluids[8].

Issues regarding HCW occupy a significant space in the discussion calendar due to the growing concern about the preservation of natural resources and public health associated with this waste. Therefore, it is worth highlighting that during healthcare in the hospital setting, numerous materials are used, contributing to the generation of different types of waste. When managed improperly, these pose risks to the health of human beings and the environment[9].

To address the problem centered on the production and management of HSW, the systemic perspective on complex phenomena can signal a relevant paradigmatic horizon when facing this challenge. This perspective indicates the need for a thinking capable of establishing connections between the parts, in a non-linear logic of cause and effect[10,11]. It is in this sense, it ist understood that inadequate waste handling can result in serious consequences for the maintenance and balance of the ecosystem leading to rapid degradation of the environment associated with global warming, thereby determining climate change.

In a contextual projection, the entire process of waste generation and disposal is of local and global interest, as several pacts and treaties tend to discuss strategies that minimize the impacts generated by waste on the planet[12]. This is how HCW management must be understood and apprehended in healthcare routines.

In health care production, depending on the interventions performed, it becomes inevitable that waste is generated, however, thinking about care in a sustainable way should be part of the daily lives of healthcare professionals[13], considering that HCW management only can be conceived and processed in its systemic, integrated perspective, connected among all parties, which makes this reality a responsibility of all health workers, as well as decision makers in the legislative sphere and in public management[14].

The need to rethink consumption standards and reduce waste generation, ensuring that they are sustainable, among other agendas, is a concern and a call to all nations by the United Nations (UN), implemented through the 2030 Agenda for Sustainable Development, which encompasses the 17 Sustainable Development Goals (SDGs), including the one that deals with the substantial reduction in waste generation through prevention, reduction, recycling and reuse[15].

Nursing, as the largest professional category of health human resources, with approximately 27.8 million professionals worldwide in the year 2020[16], corresponds, in Brazil, to a contingent of more than 2,700,000 professionals[17]. Thus, this profession has a true strength of strategies and driving force for interference in the generation and management of HCW in the hospital context. However, beyond the numerical projection, nursing can impact HCW management through its professional practice in the hospital environment.

Therefore, it is important to value the meanings that can mobilize nursing efforts towards a professional practice capable of respecting sustainability, thus, this study presents as an assumption the perspective that the implications of nursing for HCW management can be affected by the way these professionals signify the reality addressed here. Given the above and the scarcity of studies that provide answers, it is worth asking: what meanings does the nursing team, in the hospital context, attribute to practices related to waste management in healthcare services?

The objective of this research was, therefore, to unveil the meanings that nursing professionals attribute to practices related to healthcare waste management in the hospital context.

METHOD

Qualitative research, whose theoretical framework was Complexity Theory, from the perspective of Edgar Morin[11]. For the analytical process of the results, Grounded Theory (GT)[18] was used. A method consisting of intense comparative analysis between stages of the constructing concepts/categories and which provides analytical and epistemological tools for the paradigmatic ordering of concepts/categories.

Complexity Theory establishes links, based on its principles and concepts, with the object of research, as among others, there is the concept of the ecology of action, in which an initial development can result in unimaginable consequences, which are beyond the control of the author who triggered the initial action[11]. Thus, it corroborates the understanding that HCW management can be an action capable of suffering important feedbacks and, therefore, resulting in transformation to reduce ecological impacts resulting from this process.

The research setting was a federal university hospital, therefore, linked to the Ministries of Health and Education in the city of Rio de Janeiro – RJ. This hospital has around 550 beds and receives, on average, around 200 admissions/day, for various clinical specialties. Due to the research aiming to unveil the meanings about practices related to HCW management, in the hospital context, the scenario forms a favorable context for the comprehensive field regarding the research object. It is worth mentioning that the study involved the medical and surgical clinical sectors, considering that in these places there is a significant production of waste arising from direct and indirect nursing care.

Nurses and nursing technicians participated in the study and comprised, respectively, two sample groups. The inclusion criteria were: having at least one year of professional experience in the institution, in the data collection scenario, and in direct patient care as a nurse or nursing technician. Participants absent from work, on leave or on vacation were excluded. Participants were invited in person, for convenience, in the study setting. There was no refusal or dropouts.

Data were collected from semi-structured interviews. The interviews took place in individual meetings, in a private environment, at the study setting, at previously agreed times that did not compromise the work activities of the interviewees. Data collection took place from January to August 2022.

The interviews were recorded digitally (audio) and lasted an average of 30 minutes each. The interviews were not repeated with the same participant and were not returned to the study participants, a position assumed by the researchers, who despite representing a limitation in the methodological scope, supported this decision when considering that the GT analytical process aims to analyze the nuances of the responses at the time of the interview. After collection, as well as during its immediate transcription, researchers prepare memos that may or may not signal hypotheses that direct the return to the same interviewee with different questions, or necessary clarifications.

This research did not indicate, in its memos, hypotheses for returning to interviewees. Moreover, the concurrent data collection and analysis process also allowed theoretical saturation to be achieved with greater precision, which was discussed among the researchers before data collection was completed. In order to develop a theoretical matrix based on Data, GT seeks to achieve concepts capable of establishing explanatory coherence about a certain reality, especially based on the interactions between the different concepts that are developed and complement each other around a theoretical matrix[18]. The authors of the method point out that GT favors researchers' understanding of theoretical saturation by simultaneously data collection and analysis, a fact corroborated in this research. Such saturation does not occur from the understanding that new data are not achieved, but from the understanding that concepts are developed[18].

The researcher responsible for data collection, who is a nurse, developed skills for the methodological approach described in this study, having conducted research with the same methodological framework. It should be noted that there was no conflict of interest, personal or professional, in conducting the study in the scenario and with the research participants.

For this research, the constructivist perspective of the "Corbinian" school of GT was adopted, which in common with other schools, presents a comparative approach, constant questioning, theoretical sampling, elaboration and integration of concepts[18]. However, it differs in the paradigmatic model, which is now composed, in version of Corbin and Strauss, by three and no longer five dimensions, namely: conditions, which deal with the factors that influence the development of the phenomenon; actions-interactions, which deal with strategies for developing and confronting the problem; and consequences, which signal potential reactions based on the implemented strategies. In the previous model, from the "Straussian school", the "conditions" dimension was divided into three types: causal, intervening, and contextual

conditions. In the model of the study in question, these three possibilities are combined in the "conditions" dimension[18].

The interview data were subjected to analysis following the stages of GT coding, namely: open, axial and selective integration. In open coding, the data was segmented into distinct parts, rigorously examined, and compared in search of similarities and differences[18]. At this stage, the initial codes are provisional.

Considering that GT originates from a significant amount of data, due to interviews and memos that constitute important analytical resources, the analysis process was organized based on the systematic data, transcribed in Microsoft Office Word® 2016, storing files for mapping concepts and developing reports by importing files into the NVIVO® 12 software. This software, among others available, is essential for conducting studies with GT[19]. It is a software for qualitative research analysis composed of tools for working with textual investigation. Its projection manages documents such as audio interviews. In the analysis process, it facilitates text coding and information grouping. After uploading in the program all the files duly identified with each interview, the coding process began.

Next, grouping the data by similarities and differences gave rise to the concepts presented by the authors of the method as an abstract representation of a fact, object or action that the researcher perceives as significant in the data[18].

The grouping of concepts by similarities originated the categories, which reduced the number of units with which to work. Axial coding requires the researcher to have some constructed categories to relate them to their subcategories to then generate more precise and complete explanations about the phenomena, as well as their properties and dimensions[18].

In axial coding, correlations occur between categories and subcategories. It is therefore called axial because it involves connections between concepts that orbit a common axis of a given category, forming a kind of axiom. In this process, the data that were previously divided in open coding were regrouped. What is expected in axial coding is to generate denser abstractions capable of explaining the investigated phenomenon based on systematically developed and correlated categories[18].

In the meantime, the paradigmatic model provides important analytical resources for positioning the categories in a logic that allows giving meaning to the process of constructing a GT, as a theory requires concepts/principles to establish connections that allow meaning to the whole and the parts that conform it. In GT, from the "Corbinian" perspective, the paradigmatic model is constituted from the following components: conditions, motives/reasons/meanings unveiled by the participants for the triggering of a certain fact, in addition to the reasons why they react to a certain action; actions-interactions: non-linear reactions of participants to events (investigated phenomenon) or problem-situations; the consequences result from the perspective or objective reactions in relation to the actions-interactions signaled in the previous component[18].

In integration, the process of refinement of the categories occurs through theoretical deepening that takes place based on the connections established between principles (subcategories) towards the concept (category). Thus, the subcategories were integrated, organized around a category of greater theoretical abstraction, capable of encompassing the subcategories and this, in turn, starts to support the concept/category[18,19].

The Ethics Committee on Research with Human Beings approved the research project, under CAAE registration: 49198921,3,0000,5238, Opinion no.4,941,218. All ethical and legal precepts were ensured, including the principles of autonomy and anonymity of the participants. Therefore, the study participants, when mentioned in excerpts from statements, were designated as follows: NU (nurse) and NT (Nursing technicians) followed by the number of their respective interviews.

RESULTS AND DISCUSSION

A total of 30 nursing professionals participated in the research, of which 10 were nurses and 20 nursing technicians. Of the group of nurses, 9 were specialists. The average time of training was 12 years and 9 months, while the average time of professional experience, in the research setting, was five years and 10 months.

The data presented in this article conform to the conditions dimension of the GT paradigmatic model, which consists of the motives/reasons/meanings unveiled by the participants for triggering a certain fact, in addition to the reasons why they react to a certain action, represented in the category/concept **Meanings attributed by nursing professionals to practices related to HCW management in the hospital context**, which is structured into three subcategories/principles. Thus, it is highlighted that the presentation of this concept, supported by its principles, arises from the theoretical density of the results, which therefore requires proper depth in the presentation and discussion, now contained in this article.

In this sense, in the hospital context, HCW management is a fundamental practice to ensure the safety of patients, healthcare professionals and the environment[20]. Thus, the results revealed how nursing professionals, responsible for carrying out different and plural activities, are involved in the HCW management, from segregation to final disposal. Therefore, nursing stood out as an important source of information for understanding HCW management practices in the hospital context.

Nursing Understanding about HCW

This subcategory signals the multidimensionality involved in the understanding that nursing professionals have of the reality affecting HCW in the hospital. In this sense, study participants understand HCW as hospital waste, encompassing a variety of materials, such as syringes, needles, gloves, gauze, expired medications, chemicals, that is, all those that come from health care, as seen in the statements below:

> [...] *there is biological waste, which is white waste, we dispose waste which is blood, biological material and common waste, it's just these three.* (NT 24)
>
> *It's all waste derived from the care we provide to the patient, the excreta or everything we handle, PPE.* (NU 02)
>
> *Look, hospital waste* [...] *is what remains after you do a procedure, or change a dressing, everything that comes from a practice, right after a practice that's dirty, that you won't use anymore.* (NT 08)
>
> *So, waste is everything that we are involved with in the wards, from blood, feces, urine, chemical waste, medication* [...] *I think everything that involves healthcare services.* (NT 17)

In line with the aforementioned results are the results of a study[21] which, through observation of wards, consisting of seventy-seven beds, heterogeneously distributed, showed that waste groups A and D were the most generated. It is worth mentioning that group A is composed of waste that present the possible presence of biological agents, and that may imply a risk of infection due to their concentration or virulence characteristics. Group B waste, which does not present biological, radiological, or chemical risk, is treated in the same way as household waste. However, in that context, regarding group A waste, the most found materials were materials that were widely used by nursing, namely: dressings and compresses.

Despite understanding what waste consists of, the nurses and nursing technicians in the study demonstrated partial or absent knowledge about the stages of HCW management, as observed in the following statements:

> *I think it goes to a specific place, right? Where hospital waste does not go into regular trash, it goes to a specific location for this material.* (NT 01)
>
> [...] *then someone comes to collect it, but I don't know how it works there. Then the trash from the ward is collected by the cleaning lady, but how they dispose of it when it leaves the sector, I don't know.* (NT 10)

The professionals' lack of knowledge about the type of final disposal offered to waste aligns with the perception that the establishment's responsibility is related to the stages of intra-establishment management. From this reality, it can be seen negative impacts from waste disposal, such as open-air dumping, with the risk of vector proliferation; or near ponds, with the risk of groundwater contamination[22].

The study conducted in Brazil, in Primary Health Care, corroborates the above, in which 61.8% of the participating nurses were unable to inform the type of final disposition offered to the HCW; and 28.6% commented that HCW were sent to landfills. For 50% of those nurses, the RSS were sent to landfills and 50% were unable to inform the type of final disposal provided for the waste[23].

On the other hand, as evidenced in the following statements, the professionals in this study understand that knowledge about waste is necessary for its management to be conducted correctly.

> [...] *in the ward I see the two bins there, you just have to put them in the right place, but sometimes, there is that issue, that you don't know that the white bag is for contaminated waste, you know? And there is no labeling outside. I was interested, when it came to discarding, I always thought about it a lot, but due to lack of knowledge, people could end up making these mixtures.* (NT 17)
>
> *I think of it this way, as it is not a subject that is much debated, right?! Many times we learn it during our undergraduate studies or suddenly we hear about from an article, or someone comments, it's information that ends up getting lost, you end up focusing more on the fact that that bag over there is for normal waste, and here I can only put it contaminated waste, but not that if you are asked in detail, I believe it is very difficult for people to be able to discuss about it, to explain each one.* (NU 04)

I really don't know much, I only know about sharp objects, which are not supposed to cause accidents, but apart from that I don't see that much care. (NT 08)

The lack of knowledge about HCW and its management can lead to failures in the segregation stage, a reality that also occurs in other contexts, such as Ethiopia, for example[24]. Despite this reality, research results[21] indicate that nurses (88%) and nursing technicians (100%) signal that there is a difference in the management of different groups of waste. For those professionals, sharps, masks, gloves and paper are the most generated waste, and regarding the location of segregation of healthcare waste, there was concern with sharps, infectious material, disposed, respectively, in designated boxes and milky white bags with identification labels.

Moreover, it is worth highlighting, for contextualization purposes in global projection, the term Biomedical Waste (BMW), translated into Portuguese as HCW, which includes all types of waste generated in different hospital departments, such as general and surgical wards, radiology, laboratory and research, mortuary, and others. According to the WHO Guidelines on Sanitation and Health[25], BMW is generally classified into two categories (non-hazardous waste and hazardous waste). General or domestic waste that does not cause harm to the environment is generally called non-hazardous waste[25,26].

On average, non-hazardous waste in high-income countries ranges between 2 and 4 kg/bed/day, which is lower compared to middle-high and low-income countries, ranging between 4 and 6 kg/bed/day, which may stem from socioeconomic reasons. In this sense, the study highlights the reality in which high-income countries have better management policies, more advanced disposal technologies, competent regulatory authorities and trained health workers compared to high- and lower-middle-income countries[25,26]. Thus, for example Iran, whose average production of non-hazardous waste in specialized private hospitals (8.6 kg/bed/day) is higher than the average in public hospitals (3.1 kg/bed/day).

As evidenced in this study, non-hazardous waste/Group D is mainly generated in general wards and domestic facilities provided in hospitals, such as food waste, paper, plastics, and others. It is noteworthy, however, that hazardous waste can represent a serious threat to human health and the environment[25,26]. In this sense, a variety of hazardous waste generated by hospitals was classified into subcategories, such as infectious waste, pathological waste, sharps, pharmaceutical waste, genotoxic and cytotoxic waste, chemical waste and radioactive waste, this action aimed to facilitate classification by different international organizations and regulatory bodies[25].

In another reality, a study conducted in Bhutan, with healthcare providers and support staff at a national hospital, revealed that 98.5% of participants[27] are aware of hospital waste management and 69.7% know the regulations on hospital waste management. Despite this, the study revealed that half of HCW in that reality is not transported based on the correct segregation process.

In research about the HCW management in the routine of Primary Health Care nurses, in the Brazilian context, participants reported that the packaging of HCW in Family Health Teams was done in the following way: 61.8% reported that the biological waste was stored in bins with pedals and lids and 71.3% were unable to inform how chemical waste was stored. Furthermore, 43.8% of nurses stated that common waste was stored in open bins without lids and pedals; and 95.2% responded that sharps waste was stored in specific boxes[23,28]. Regarding the identification of HCW generated in Family Health Teams, 90.5% (19) of nurses stated that the containers used for disposing biological waste were identified only by the white packaging; and 76.1% (16) were unable to provide information about the identification of chemical residues[28].

Waste separation: a necessary concern

This subcategory reinforces the importance of correct waste disposal to ensure the safety of healthcare professionals, patients, and the environment in contrast to what occurs in the reality of Brazilian public health. It reveals how waste is disposed and segregated in everyday hospital life, from the perspective of nursing professionals.

The results showed that while nursing is concerned with the safety of professionals, with the risk of contamination and accidents when handling sharps, the participants indicate that inadequate waste disposal is a reality.Thus, there seems to be a paradox in the context of waste segregation in which the participants demonstrated that they know better about the disposal of sharps while, for them, it becomes more difficult to segregate other waste.

[...] *regarding sharps, yes, people generally dispose of them at Descarpack. The glass part, I answer for my part, I use glass instead of sharps, needles. I try to do my part correctly.* (NU 08)

[...] *the health problem it can cause, if you discard a material in an inappropriate place, it can harm others, the cleaning staff, not that happened to me, it was in other sectors there, the cleaning boy went to dispose of cleaning, then he got stuck with the needle.* (NT4)

Despite the concern signaled by professionals with handling to avoid accidents and contamination of workers, through correct segregation of sharps, the segregation of other waste is described as inadequate.

[...] *let's take a glove as an example, a glove contaminated with blood, throw it in the general trash, not throw it in the right place, many times, I've already thrown it in the common trash, I went there and looked for it. Contaminated glove* [...] *there was a time when I accidentally got the needle, when I was putting it in the trash, there was all that trash, I threw it in the regular trash, I went there and picked it up.* (NT 04)

Yeah, I think it's really bad, there's no charge, so the waste is exposed for a long time, there's no routine for collecting it, so, that's what I see, I've been here for 2 months, I don't see that routine like that, very clear for you collect, schedule. (NT 11)

The concern and greater caution with the handling of sharps waste seems to be based on the conscience of professionals given the unhealthy work environment due to the actions in which they are involved in their daily work. Despite this reality, a study[21]showed that health professionals consider that their work environment poses risks, and that they have even suffered some type of occupational accident. Moreover, in the aforementioned study, all participants attested to having used Personal Protective Equipment (PPE).

It should be noted that occupational accidents in the healthcare sector, especially in hospitals, have significant importance for public health, as, in line with what the Complexity Theory[11] highlights when dealing with risks, uncertainties and illusions, which mask the reality, such workers are routinely exposed to different types of risks, such as: physical, biological, ergonomic, and even psychics. Despite the above, the biological dimension to such risks seems to be the most important in the health-disease and epidemiological process, given the varieties of pathogens that can be transmitted to healthcare professionals, including Hepatitis B and C, as well as the Human Immunodeficiency Virus (HIV)[29].

Therefore, in the hospital setting, occupational accidents, with biological risk, are closely related to the use of sharp materials, a fact that may explain the greater caution in segregating this group of waste by the nursing professionals interviewed in our study. In this context, it is important to highlight the exposure of the nursing team to this risk, as they remain in continuous contact with patients. These professionals attribute unfavorable working conditions as the main reason for accidents, including inadequate facilities, lack of human resources, excessive working hours and lack of resources and materials[29].

Another issue highlighted in this subcategory is the mixture of infectious and common waste, especially in the ward environment. It is assumed, in the results, that healthcare professionals make mistakes and may segregate waste incorrectly, influenced by multiple factors, however, it was also revealed, in this study that patients and companions contribute to improper waste disposal.

[...] *We even have separate bins, infectious and contaminated, but what we see, when we enter the wards, is mainly a mixture. I think that inadequately (disposal), each ward has an identified trash bin, biological and non-biological waste and there is no guidance* [...], *the companions who dispose of it.* (NU 02)

Garbage bags are all mixed up [...] *there are two bins in the ward, large bins, one with contaminated waste and the other for common waste, and sometimes, it's all mixed up, because not everyone knows. If you look at the bin and see the white bag and you know that it's contaminated trash, you're going to dispose of it there, but there are people who don't know and like, from the outside you can't see that, contaminated waste and common waste, it has no label.* (NT 14)

These results reinforce the multifaceted reality in which professionals are unaware of waste segregation, but also the need to include patients and companions in the HCW management routine. Therefore, it may be a nursing demand to create strategies to address these challenges.

Moreover, according to the WHO, of the total waste generated by healthcare activities, approximately 85% is general and non-hazardous waste, while the remaining 15% includes clinical solid waste, expired vaccines, unlabeled products, medical instruments and organic fluids considered infectious, toxic and hazardous to humans and the environment[25].

Nursing and the ecology of action to raise awareness about environmental issues: impacts on waste management in health services

Environmental awareness is an important factor that directly influences the disposal of hospital waste. It can be a key factor in ensuring proper management of healthcare waste and promoting environmental sustainability, contributing to disease prevention and public health promotion. Therefore, it is from the complexity awareness leads to strategic actions that nursing can, through public policies, achieve broad perspectives for achieving global agendas, such as the UN 2030 Agenda, to achieve the SDGs, especially concerning the relationships between health, well-being, sustainable consumption and production, action against global climate change, sustainable cities and communities, among others[15,20].

Paradoxically, the results of this research have shown the lack of connection made by professionals between nursing practices and the impact on the environment. On the other hand, in the ecology of action there is the principle of complexity, in which an intentional or unintentional action, when inserted in a set of contextual interactions, can imply unimaginable reflexes by the author or initial actors of its process. Therefore, it is important to highlight, based on the results, that the strengthening or neglecting environmental awareness, in the hospital context, could result in concrete impacts, which depending on the case, could be either negative or positive for the management of HCW.

The following statements illustrate this reality.

> [...] *But there should be better awareness, for example, about infectious people, so that the bin actually used for infectious waste, because there is no such awareness.* (NT 13)

> *Without needing someone to see you, because it's a cultural issue, that's what I'm talking about, it's about establishing a culture for yourself, so it's about making the situation happen without being observed, you know? It's a cultural issue, so, as I come from the residency, the approach is different, as I spent a lot of time at HICC, I stayed at HICC for a long time. So, we end up having a vision, the broader view of the situation, you know?* (NU 03)

> *What you don't want for yourself, you don't want for others. I try to do my best, in my part of conscious ... My job is to do it right.* (NT 04)

The results also signaled a certain distance between the perceived reality and the problematized reality, when it comes, to the management of material resources used by nursing and the HCW management. On one hand, there is an understanding of the importance of material resources for good work performance; on the other hand, this same reality seems to be neglected in the context of HCW management.

> *I think professionals don't think much about it* [...] *I think we don't think about optimizing what I'm going to spend, what I'm going to discard, none of that, I think. I'm speaking for myself, when I go to the bed, I change the diaper, if it were to optimize.* (NT 11)

The results also revealed that, within the scope of the meanings revealed by nursing professionals about HCW management, there is a fragmentation of the connection between health and the environment. Such a disruptive view between reality and need can be explained in light of the dominant paradigm, that is, the Cartesian perspective dominant among research participants, which highlights the need for investments in the emerging paradigm that values the systemic view of life from a complex thinking[11].

The systemic view of life recognizes health as a multidimensional and multileveled process in which living systems of nature include individual organisms, parts of organisms, and communities of organisms, and all of them share a set of common properties and organizing principles that cannot be dissociated[30]. The systemic view of health, which integrates the systemic view of life, can be applied to different systemic levels, with corresponding levels of health being mutually interconnected, namely: individual, social, and ecological.

This approach considers that human health is intrinsically linked to the health of the environment and vice versa. It also recognizes that healthcare systems and natural ecosystems are complex and connected at different levels. The proper functioning of a system depends on the balance and interaction between its components. When there are environmental imbalances, such as air, water and soil pollution, ecosystem degradation, loss of biodiversity and climate change, this can negatively affect human health[20].

When managing healthcare waste, nursing professionals must understand that this is an approach to address challenges related to health and the environment. It is part of policies and practices that promote environmental sustainability in the hospital environment and consequently, with benefits for public health and social equity. The search for sustainable solutions in the hospital environment must take into account not only biomedical aspects, but also social, economic and environmental aspects, recognizing the interdependence between all these elements[30].

As a limitation of the study, we highlight the lack of validation of the theoretical framework with expert judges, a possibility presented by part of the authors of the method. Therefore, it is recommended that studies be conducted to include the validation of the matrix from plural points of view that explore the perspective of concepts in contextual generalizations different from the scenarios in which the data were collected. It is understood that the nature of the data may reveal the similarities or not to distinct contextual and cultural realities, but transversal within the scope of the hospital nursing work process.

CONCLUSION

The meanings unveiled by hospital nursing regarding HCW management align with the perspective of complexity by revealing multifaceted issues, as represented in the reality in which there is concern about the disposal of healthcare waste, notably sharps, while there are incorrect practices in this process, reported by the participants. The research indicates possibilities for reflections on care management in a broader perspective, capable of considering not only the scenario of nursing care relationships with the patient but also the surroundings.

Although the meanings do not overlap with the knowledge about a certain reality, the results showed that nursing professionals signal the need for better knowledge about HCW management, while revealing that they understand the importance of this process beyond the hospital setting. In this sense, they perceive themselves as important elements to impact the environment and, consequently, human health through HCW management.

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