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Educational action: integrating care practice and research on occupational accidents involving biological material

Ação educativa: integrando prática assistencial e investigação sobre o acidente de trabalho com material biológico

Acción educativa: integrar práctica asistencial e investigación en accidentes de trabajo con material biológico

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ABSTRACT

Objective: to promote and analyze an educational action on occupational accidents involving biological material through the integration of care practice and research. **Method:** a convergent care research study conducted between November 2021 and April 2022 in a hospital located in Rio Grande do Sul, Brazil. Participants included on-duty nurses and representatives from support sectors and committees. The methodological proposal was structured into the phases of conception, instrumentation, exploration, analysis, and interpretation. Data collection methods included document analysis, semi-structured interviews, and convergence groups. Data analysis followed the stages of apprehension, synthesis, theorization, and transfer. **Results:** a tendency to underestimate risks was identified, highlighting the invisibility of such accidents. Based on participants' suggestions, an educational action was implemented regarding the correct disposal of sharp waste. **Final Considerations:** participants' reflections on accidents and the development of educational actions represent a pathway to making care practices safer.
Descriptors: Occupational Health; Accidents, Occupational; Health Personnel; Nursing.

RESUMO

Objetivo: promover e analisar ação educativa sobre o acidente de trabalho com material biológico por meio da articulação entre prática assistencial e investigação. **Método:** pesquisa convergente assistencial, realizada entre novembro de 2021 e abril de 2022 em um hospital localizado no Rio Grande do Sul. Participaram enfermeiros plantonistas e representantes dos setores de apoio e comissões. A proposta metodológica foi distribuída nas fases de concepção, instrumentação, perscrutação, análise e interpretação. Para a coleta de dados utilizaram-se pesquisa documental, entrevista semiestruturada e grupos de convergência. A análise seguiu as etapas de apreensão, síntese, teorização e transferência. **Resultados:** identificou-se subestimação do risco, denotando invisibilidade acerca do acidente. A partir da sugestão dos participantes, foi realizada ação educativa sobre o correto descarte de resíduos perfurocortantes. **Considerações finais:** a reflexão dos participantes sobre o acidente e a elaboração de ação educativa configuram-se como possibilidade para tornar a prática assistencial mais segura.
Descritores: Saúde do Trabalhador; Acidentes de Trabalho; Pessoal de Saúde; Enfermagem.

RESUMEN

Objetivo: promover y analizar una acción educativa sobre accidentes de trabajo con material biológico a través de la articulación entre práctica asistencia e investigación. **Método:** investigación convergente asistencial, llevada a cabo entre noviembre de 2021 y abril de 2022 en un hospital situado en Rio Grande do Sul. Participaron enfermeros de guardia y representantes de los sectores de apoyo y comisiones. Las fases de la propuesta metodológica fueron concepción, instrumentación, escrutinio, análisis e interpretación. La recolección de datos se realizó mediante búsqueda documental, entrevista semiestructurada y grupos de convergencia. El análisis siguió las etapas de comprensión, síntesis, teorización y transferencia. **Resultados:** se identificó subestimación del riesgo, que denota la invisibilidad del accidente. A partir de las sugerencias de los participantes se realizó una acción educativa sobre el descarte correcto de los residuos punzocortantes. **Consideraciones finales:** la reflexión de los participantes sobre el accidente y el desarrollo de la acción educativa indican que se puede lograr que la práctica asistencia sea más segura.
Descriptores: Salud Laboral; Accidentes de Trabajo; Personal de Salud; Enfermería.

INTRODUCTION

Occupational accidents (OA) are defined as any event occurring during work activities that results in bodily injury, functional impairment, and/or causes death, temporary or permanent loss, or reduction of work capacity[1]. Among these, occupational accidents involving biological material (OABM) occur when there is direct contact with blood or bodily fluids. A systematic review and meta-analysis aimed to identify the global prevalence of exposure to blood and bodily fluids among healthcare professionals based on World Health Organization regions. The highest prevalence was found in the Southeast Asia region, followed by the Western Pacific, while the lowest prevalence was observed in Europe[2].

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Despite preventive measures such as improved equipment design and staff training, injuries from sharp objects continue to occur during all stages of use, disassembly, or disposal of sharp devices[3]. In Brazil, studies highlight factors contributing to OAs among nursing professionals, including insufficient sleep due to work overload[4], holding multiple jobs[5], and medication preparation[6].

Although effective therapies exist to mitigate health risks associated with OABM, the possibility of contracting HIV, hepatitis B (HBV), or hepatitis C (HCV) can lead healthcare professionals to experience fear, anguish, psychological distress, anxiety, depression, post-traumatic stress disorder, and reduced quality of life[3]. Nationally, despite being a condition requiring mandatory reporting, OABM is underreported. This may be linked to fear of punishment[7], excessive bureaucracy, lack of knowledge on the subject, or the perception of the accident as low-risk[8], reflecting a certain invisibility of these incidents.

Both national and international literature demonstrate investment in research on OABM, emphasizing its relevance to public and occupational health. This is due to its potential for pathogen transmission, its role in raising awareness about occupational risks, its capacity to assess the impact of working conditions, and its contribution to interventions that improve safety and well-being for professionals[3,6,8,9].

However, investigating the perceptions of professionals directly involved in these accidents and proposing alternatives to enhance care safety revitalizes scientific research.

This study aimed to promote and analyze an educational action on occupational accidents involving biological material at the hospital level through the integration of care practice and research.

METHOD

This study is part of an intervention proposal that employed Convergent Care Research (CCR) as its methodological framework to identify solutions and innovations in healthcare practice. It was conducted in a private teaching hospital located in Rio Grande do Sul, which operates entirely within the Brazilian Unified Health System (SUS).

CCR seeks to benefit care contexts by identifying optimal solutions to problems, implementing changes, and introducing innovations in practice[10]. The study setting was a workplace where one of the authors, then a doctoral student, carried out her professional activities. This aligns with the methodological framework's premise that healthcare professionals are potential researchers of daily care practice issues, fostering a critical perspective on their work[10].

The distinction between CCR and other research methods is grounded in four central concepts: dialogicity, immersion, simultaneity, and expansibility[10]. Dialogicity preceded the intention to conduct the research, as the topic emerged from dialogue between the researcher and her colleagues. Immersion in care processes enabled the identification of a research problem of mutual interest. This collaborative approach highlighted gaps and challenges in hospital worker safety concerning accidents, encouraging the pursuit of innovative and effective solutions for post-OABM care.

Simultaneity was evident in the health education process, as dialogue intensified throughout the CCR process, fostering the construction of new knowledge. Expansibility occurred during the investigation as emerging themes related to care-research processes on OABM were identified. Points of convergence were highlighted, particularly those formed during collective knowledge-sharing sessions between participants and the researcher during health education actions.

The methodological proposal of the CCR was structured into the phases of conception, instrumentation, exploration, analysis, and interpretation. During the conception phase, the topic, objectives, and literature reviews were defined, considering the relevance of the subject for the participants. The instrumentation phase involved selecting participants and data collection techniques. Nurses representing units and representatives from support sectors (Specialized Service in Occupational Safety Engineering and Occupational Medicine, Hospital Infection Control Service) and internal committees (Internal Accident Prevention Committee and the Multidisciplinary Management Committee for the Accident Risk Prevention Plan with Sharp Materials) were invited to participate.

Inclusion criteria for nurses included having worked at the institution for at least six months, having provided post-OABM care at least once, and having completed an internal occupational accident report. For support sector

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and committee representatives, the criterion was working in their respective sectors for at least six months. Exclusion criteria included being on vacation or any type of leave during the data collection period.

Of the 26 on-duty nurses in the institution's care sectors, 11 were excluded: eight had not attended to workers after accidents involving biological material, and three had been employed for less than six months, resulting in 15 eligible nurses. In the support sectors and committees, 23 representatives were active. However, one was on leave, and four had less than six months of experience in their roles, leaving 17 eligible participants.

A random selection process conducted via the website www.sorteiogo.com determined the participants among eligible nurses and representatives, ensuring the inclusion of at least one nurse from each sector and one representative from each committee. After the invitation, one nurse declined to participate, and the next selected individual was invited. Among the representatives, six participated in the interview phase: one from the Specialized Service in Occupational Safety Engineering and Occupational Medicine (SESMT), one from the Hospital Infection Control Service (SCIH), two from the Internal Accident Prevention Committee (CIPA), and two from the Multidisciplinary Management Committee for the Accident Risk Prevention Plan with Sharp Materials (COGEMMP).

The exploration phase allowed for an in-depth analysis of the phenomenon using a triangulation of techniques: document analysis, interviews, and convergence groups. The document analysis was conducted in February 2022 using records archived by SESMT regarding OABM incidents from 2018 to 2022 (the most recent five years).

Data were collected regarding the procedure that led to the accident, considering whether it was related to blood collection, improper waste disposal, or aspiration, as well as the measures and actions taken immediately after the accident, such as the use of prophylactic medications, tests to determine pathogen exposure, laboratory exams, and subsequent follow-up. Additionally, a critical review of the accident records was conducted in light of current regulations. This step identified the need for adjustments in occupational documents for recording accidents.

Semi-structured interviews were conducted by the study's first author. The interview guide included questions about understanding occupational accidents involving biological material, personal experiences with such incidents, knowledge of post-OABM care, and strengths and weaknesses in post-OABM worker care. Participant characterization included variables such as sex assigned at birth, age, work duration, and shift at the institution.

Interviews with nurses were conducted in person between November 2021 and March 2022 at their workplace in a private room designated for this purpose, adhering to COVID-19 sanitary protocols. All eligible nurses were interviewed to ensure diverse information. For representatives, interviews concluded upon reaching data saturation, when no new information emerged[11]. Selected participants were invited to the study, provided with its objectives, and given an informed consent form for review and signature. Upon agreement, the date, time, and location were scheduled. A voice recorder was used with participant consent, and interviews lasted an average of 30 minutes.

For convergence groups (CG), participants from the interviews were invited. These sessions occurred between March and April 2022 in an institutional meeting room during morning, afternoon, and evening shifts to accommodate participants' availability. Three sessions were held, each lasting approximately 60 minutes. This technique encouraged participants to reflect and question one another, contributing to the collective construction of research findings.

The planning and conduct of the meetings followed the phases of the convergence group: the recognition phase, during which the integration and cohesion of the group were sought through dialogue; the revelation phase, where experiences were shared among participants based on the visualization of OABM images; the sharing phase, aimed at presenting information from manuals, guidelines, and scientific evidence on care practices related to OABM; and the rethinking phase, during which debates and reflections took place based on observed needs for change, with the goal of equipping workers for self-care. Sessions were scheduled in advance with participants.

The CG sessions were facilitated by the study's first author, a doctoral researcher responsible for initiating discussions, encouraging participation, and deepening responses and comments. A research assistant, an undergraduate scientific initiation scholar with qualitative data collection experience, documented participants'

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verbal and non-verbal expressions and assisted with session management, including timekeeping and recording equipment operation.

Audio recordings were transcribed verbatim into a text editor by three project members -undergraduate scientific initiation scholars trained for this task during research group meetings. The transcribed text was reviewed by the study's first author, who compared it to the audio recordings. A thorough and exhaustive reading of the material followed to develop a detailed understanding of its content.

In the analysis phase, data coding (apprehension process) was initially performed by marking transcript excerpts with symbols to highlight cohesive paragraphs that allowed tracking similar phrases and organizing information into categories. Immersion in the material enabled grasping the essence of the data (synthesis), facilitating continued changes in practice contexts. Systematized data were discussed alongside similar studies and current regulations (theorization).

The abbreviations IN (interview note) and GN (group note) were used in numerical order without distinguishing between nurses, support sector workers, or committee members. The research protocol received approval from the Research Ethics Committee, and written informed consent was obtained from participants.

RESULTS AND DISCUSSION

Most participants were women aged between 29 and 49 years. The length of employment at the institution ranged from 6 months to 11 years. Regarding work shifts, most participants worked during the morning and afternoon periods.

The analysis of documentation related to internal accident reports revealed an average of 18 recorded accidents per year between 2018 and 2022, considering an average of 317 workers annually. Incomplete records of occupational accidents were observed, including missing information on the results of rapid tests performed on workers, the actions taken, limited data on the follow-up of prophylactic treatment, and a lack of laboratory test results during the monitoring period. These findings suggest deficiencies in worker health care.

The interview data were organized by similarity of information, and a synthesis was conducted after exhaustive reading. This synthesis summarized similar ideas and served as a guide to stimulate discussion of the topic among participants during the first convergence group.

The invisibility of occupational accidents involving biological material and trivialization of risk: *"Is this really an occupational accident?"*

One emerging aspect from the data was workers' understanding of occupational accidents involving biological material (OABM). The following accounts highlight the trivialization of harm caused by sharp injuries:

> *[...] people think it might only be serious if there's a lot of blood, if it's deep, if it's visible. If it's something very striking. Otherwise, if it's something very superficial, sometimes the person doesn't even report it to their supervisor or others." (IN05)*

> *[...] I notice the difficulty people have in understanding the importance of following the protocol. Many people seem to think it's unnecessary, you know? 'No, but it was nothing!' Or: 'The patient doesn't have anything, so I don't need to do it!' Or: 'Is this really an occupational accident?' These are things we often hear." (GN01)*

These accounts revealed the invisibility of the consequences of accidents involving biological material, as workers perceived minor injuries sustained during such incidents as having minimal health repercussions. This distorted perception is challenged by authors who emphasize that needle or sharp object injuries are critical occupational hazards for healthcare professionals. Exposure to blood and bodily fluids through these injuries increases the risk of bloodborne pathogen transmission[12]. Risks are inherent to hospital work processes and cannot be normalized.

The surgical center is one of the areas where exposure to various types of sharp materials and high-risk procedures can cause stress or fatigue among professionals, contributing to accidents[13]. In this study, participants identified this hospital unit as a site of exposure and injuries caused by needles or sharp objects, consistent with previous studies[12,4]. This can be explained by the nature of the work and medical activities performed in these areas.

The following accounts illustrate situations experienced by workers regarding post-accident procedures involving biological material.

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> *[...] she [doctor] mentioned it in the operating room [referring to a finger injury with a suture needle], but she didn't give it much importance because the procedure continued. She washed her hand, changed her glove, and continued the procedure. (IN03)*

> *[...] she [obstetrician] asked me [nurse from the department]: 'But do I have to do all this?'. It seemed like she was doubtful because pregnant women, when they arrive here, undergo rapid tests and lab exams. And then there's the issue of non-reactive results, with the doctor not wanting to follow the protocol. (IN01)*

There were references to the lack of care by medical workers involved in accidents with biological material regarding their own health;

> *[...] the biggest challenge in the department is with doctors; they don't consider the window period or the importance of using PEP. When there's an accident here in the surgical center involving a doctor, they don't want to do rapid tests; they only want to test the source patient. And also because it's a doctor being evaluated by another doctor. (GN01)*

> *She [doctor] reported it to us, and we discussed at the time whether she would go to the Emergency Care Unit or not—there was this back-and-forth about leaving the department. Should she go or not? She said she was wearing gloves, so does she really need to? I noticed she thought it wasn't important. I reinforced it along with my colleague, who said she had to follow the accident protocol. (IN09)*

This issue is significant and requires attention from healthcare institutions, as studies indicate that 12% of accidents occur in surgical centers among all hospital sectors. Furthermore, nursing technicians were identified as the most affected group, with sharp materials, bodily fluids, or falls being the primary causes[15]. Similarly, another analysis found that among occupational risks faced by surgical center professionals, accidents involving sharp materials during medication preparation accounted for 45% of incidents[6].

In this study, participants expressed their normalized view of occupational accidents involving biological material while simultaneously acknowledging the importance of adopting measures to minimize health consequences for workers. These findings suggest that identifying assertive actions, including proper reporting and post-accident procedures for biological material incidents, can help mitigate health effects on workers and promote workplace safety.

There is underreporting of occupational accidents in healthcare services. This may be related to assumptions that the source patient does not carry bloodborne pathogens, non-adherence to standard infection control precautions, lack of awareness about reporting procedures, or the perception among healthcare professionals that the injury is not severe[12]. Underreporting of occupational accidents poses a significant obstacle to corrective actions and the implementation of intervention strategies. This highlights the need for institutional planning that raises workers' awareness of self-care, encourages them to rethink their professional practices, and addresses the legal aspects of occupational accidents.

Another factor identified by workers that may contribute to the normalization of accidents is related to night shifts and the underestimation of risks, which discourage seeking specialized clinical care.

> *At night, the risk is higher, and sometimes they don't report it because they're working two jobs, so they're too tired to go through the whole process, like going to the emergency care unit and everything else. The risk of not reporting is higher. Around midnight, they're exhausted, very sleepy, and the accident is minor. (IN06)*

Although participants acknowledge the risks, underestimating them is an issue that needs to be reconsidered in the workplace. It is essential to recognize and accept that risk is an inherent part of working in healthcare. Nursing work demands a high degree of attention, concentration, skill, and responsibility. These characteristics, combined with night shifts, long work hours, and poor sleep quality, can negatively impact health, particularly in the relationship between poor sleep quality and the occurrence of occupational accidents.

A study conducted with 139 nursing workers on night shifts found that 19.4% (n=27) had another job, which may exacerbate fatigue and increase the likelihood of occupational accidents[5]. The reduction in daily sleep hours and the inability to recover them after night shifts are significant contributors to worker fatigue. When combined with high shift demands, work overload, multiple jobs/shifts, and stress, these factors increase workers' vulnerability to occupational risks and the severity and frequency of occupational accidents[4].

Additionally, it should be noted that night work complicates the reporting of occupational accidents. Research has shown that night shifts result in a 2.4 times higher rate of underreporting compared to actual notifications, with

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the highest proportions observed among nursing professionals[16]. This finding aligns with the previously described inference that workers need to be educated about safe work practices and the risks associated with OABM.

The participating nurses reported feelings of fear and nervousness when accidents occurred to them personally. The role of nurses as leaders in the workplace is crucial in providing support and care to colleagues in situations involving occupational accidents. However, a contradiction becomes evident when nurses themselves are the injured party. The care and support they provide to others are not reciprocated when they are the ones affected. This lack of reciprocity highlights a gap in the culture of care for those in need of attention. Initial support for the injured worker is fundamental to achieving favorable outcomes. Participants mentioned experiencing feelings of loneliness when accidents happened to them, contrasted with solidarity when accidents involved their colleagues.

> *[...] I filled out the form myself, went to the Emergency Care Unit, saw the doctor, and then picked up the medication. We feel scared, especially when the patient is HIV-positive. Since we are nurses, it's just us and ourselves. At night, we work alone. We only tell the technicians, 'I pricked myself! Hold on a moment; I'm going to the emergency care unit.' (NE12)*

> *I took care of everything myself, including retrieving the test results. For us, it's easy because we have access to the system. But the person feels very nervous. A lot goes through your mind, and even though you're a healthcare professional, at that moment, it feels like you don't know anything. (IN02)*

After the accident, biological, psychological, and social well-being are affected, and feelings of anxiety while awaiting serological test results are intensified. The findings align with studies showing that injured individuals may experience distress, anxiety, despair, sadness, fear of possible infection[17], and concern about the consequences of the accident for themselves and others[7,18]. These heterogeneous feelings reflect the complexity and breadth of impacts caused by such accidents. An accident is not limited to biological and economic effects but also encompasses psycho-emotional issues that directly affect quality of life and cause stress for the worker, their family, and colleagues[7].

Moreover, nursing is a professional category exposed to occupational accidents involving biological material due to constant and direct contact with patients[13], handling potentially contaminated materials with infectious agents, and using sharp objects such as needles, glassware, and blades. In other words, most nursing tasks expose workers to biological risks, which can sometimes lead to normalization because it becomes part of their routine work.

Thus, it is essential to conduct research and care practices through educational actions with workers, based on a dialogical process. In this context, during the convergence groups, participants

emphasized the importance of guiding care teams working in surgical centers on the proper disposal of sharp waste. The need for this guidance arose from reports of sharp materials being found in the Central Sterilization Supply Department and the laundry, increasing the risk of accidents. This movement aligns with the concept of expansibility, which supports the construct of convergence in CCR and broadens the initial purpose of the study.

Educational action on occupational accidents involving biological material: integration of care practice and research

The use of the convergence group technique contributed to deepening the results obtained from previous techniques, seeking a collective perspective to foster improvements in care. The exchange of experiences created conditions for shared decision-making regarding the purpose of the meetings[10].

In the CGs, participants mentioned situations that predict occupational accidents and suggested the need for educational action to guide workers and students practicing in surgical centers on the proper disposal of sharp waste. They reported that the cycle of such accidents begins when materials are improperly discarded, leading to injuries that could have been avoided.

> *"[...] actually, the accident itself starts when sharp materials are discarded in the wrong place. When a worker gets injured with this material, it's already the outcome of the occupational accident cycle." (GN02)*

> *"[...] I notice how much sharp material is coming through because people aren't discarding it properly. And I'm not just talking about professionals; there are also many students who are in their first practical internship field and don't know how to discard properly, which is causing accidents. There needs to be training for these students especially because professionals already have some knowledge, but students are still learning." (GN01)*

Unsafe conditions in healthcare environments and the lack of personal protective equipment increase the risk of exposure to bloodborne pathogens and lead to preventable infections[19]. Healthcare professionals need to be protected

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from occupational risks because these risks can cause illnesses and injuries and negatively impact both worker health and the quality of care provided[20].

Based on this suggestion, educational actions were carried out over two days during different shifts to include as many participants as possible. Each session presented a step-by-step guide on disposing of suture needles and scalpels. The reflection-action movement was an important outcome triggered by the ongoing CCR proposal, materializing the convergence between research and care. It mobilized participants to reflect on workplace safety and self-care. The following figures illustrate this action.

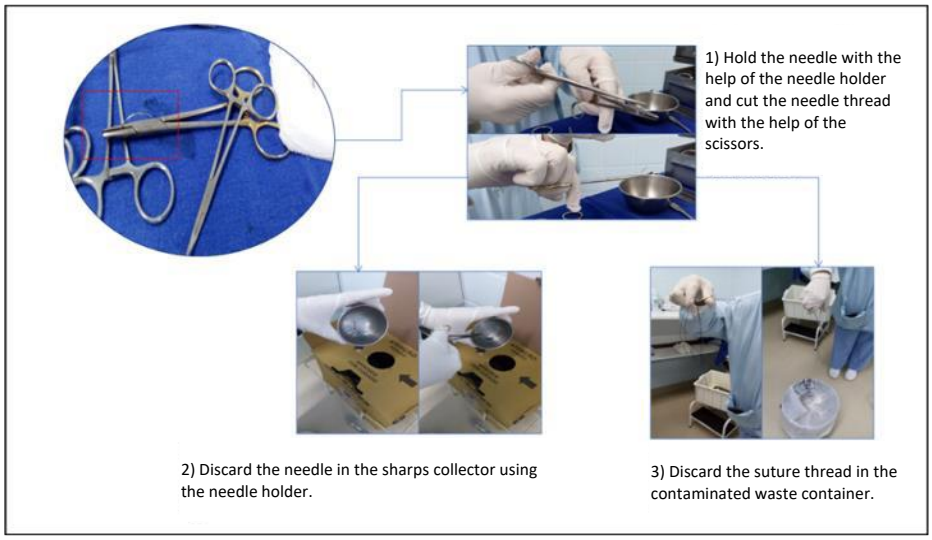

Figure 1: Infographic on proper scalpel disposal. Santa Maria, RS, Brazil, 2022.

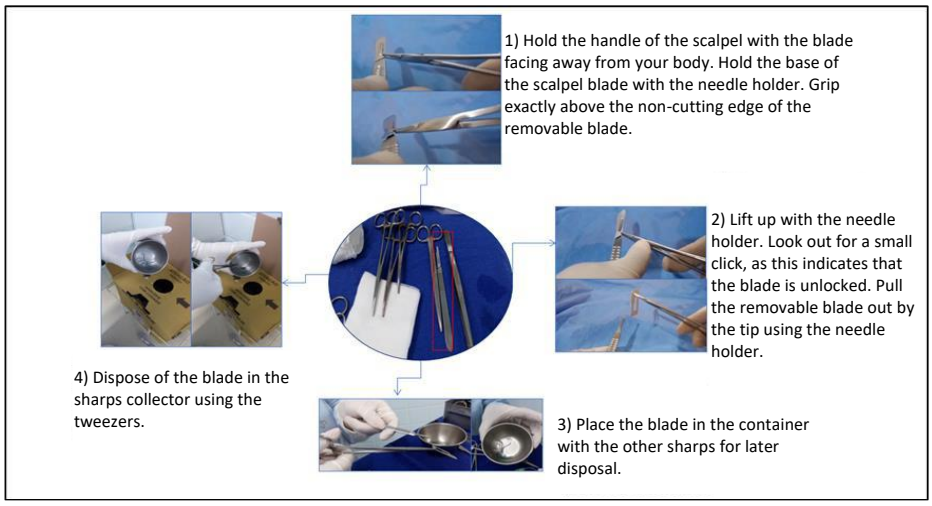

Figure 2: Infographic on proper suture needle disposal. Santa Maria, RS, Brazil, 2022.

Worker safety in the context of accidents involving biological material should be addressed and discussed during academic training so that students and recent graduates are encouraged to critically reflect on their daily professional actions, overcoming the dichotomy between theory and practice in health courses. It is crucial to develop action plans to raise awareness about adopting safe practices related to occupational risks faced by professionals. For example, a study implementing seminars and training programs to report incidents involving needle or sharp object injuries found that after training and guidance, incident reporting decreased, suggesting improved awareness[3]. This resembles the results of a Chinese program developed to improve nurses' knowledge, attitudes, and practices regarding the prevention of needle and sharp object injuries[9].

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The workers' accounts in the CGs revealed that, in practice, there are challenges to be overcome in adhering to these recommendations, as well as in effectively providing care and follow-up for affected workers. The interaction of students with the practical field offers an understanding of the realities and challenges related to accidents involving biological material during their undergraduate studies, encouraging the development of a critical perspective on this context. Having trained, informed, and critical professionals ready to handle situations involving OABM can contribute to creating a safer work environment while also providing workers with a sense of fulfillment and satisfaction. This experience can foster self-care and strengthen a culture of prevention.

The CCR methodology provided a comprehensive view of the dynamics involved in the investigated context. The transferability of results, demonstrated through health education actions related to the disposal of sharp waste and the sharing of educational materials tailored to the investigated setting, is a key contribution of this study. However, it underscores the ongoing challenge of maintaining active reflection on the necessary processes of change.

Thus, the researcher and participants involved in the CG discussions, through dialogicity combined with broad democratic interrelationships, collectively reflected on the reality in which accidents occur and the subjective particularities of those involved. The chosen method enabled the identification of improper disposal practices as a determining factor in the cycle of accidents (scientific research activity) and the implementation of educational interventions (care practice action) as a solution to problems identified in practice.

Study limitations

As a limitation, it should be noted that participants' opinions may not represent the views of all healthcare workers in the institution, which constitutes a limitation of the method, as it is not possible to generalize the results.

FINAL CONSIDERATIONS

Reflection on occupational accidents involving biological material and the educational action emerged as opportunities to transform care practices, making them safer. This will contribute to promoting worker health and improving healthcare delivery.

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Conceptualization, P.H.F. and R.M.S.; methodology, P.H.F. and R.M.S.; validation, P.H.F. and R.M.S.; formal analysis, A.F.P.C.C., L.R.R. and K.C.C.; investigation, P.H.F.; resources, L.R.R.; data curation, P.H.F. and R.M.S.; manuscript writing, P.H.F., R.M.S., L.M.C.S., K.C.C. and C.S.Z.; writing – review and editing, P.H.F., R.M.S. and A.F.P.C.C.; visualization, P.H.F., R.M.S., A.F.P.C.C., L.M.C.S., K.C.C. and C.S.Z.; supervision, R.M.S.; project administration, P.H.F. and R.M.S. All authors read and agreed with the published version of the manuscript.