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CONHECIMENTOS E PRÁTICAS DA ENFERMAGEM SOBRE OS RESÍDUOS DE SAÚDE NAS UNIDADES PEDIÁTRICAS: REVISÃO INTEGRATIVA

*Nursing knowledge and practices related to medical waste in pediatric units: integrative review**Conocimientos y prácticas de enfermería relacionados con los residuos sanitarios en unidades pediátricas: revisión integrativa*Janaina Firmo da Silva¹ Ítalo Rodolfo Silva² Laura Johanson da Silva³ Wânia Priscila Melo de Carvalho⁴⁵ 

ABSTRACT

Objectives: identifying the current scientific production in relation to Nursing knowledge and practices on medical waste in pediatric units. **Method:** integrative review in the Scielo, Cinahl, Web of Science, Pubmed, Scopus and Embase databases, between the years 2016 to 2021, totalizing 13 articles. **Results:** the findings pointed to three main categories: knowledge and practices in relation to Medical Waste, permanent education like a tool for the disposal of Medical Waste; and sustainability in the context of Medical Waste and its relationship with social responsibility. **Conclusion:** it is necessary to provide the opportunity for periodic training, as well as the use of self-explanatory instruments that can help all health professionals, especially the Nursing professionals, at the time of practice. It was checked the presence of gaps was verified with studies showing Medical Waste and Pediatric Nursing.

DESCRIPTORS: Health knowledge, attitudes and practice; Knowledge; Nursing; Pediatric nursing; Medical waste.

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RESUMO

Objetivo: identificar publicações que abordam a educação em saúde relacionada à prevenção da Síndrome da Morte Súbita em Lactentes. **Método:** revisão integrativa realizada no PubMed, Portal Periódicos da Coordenação de Aperfeiçoamento de Pessoal de Nível Superior, Cochrane Reviews, Scientific Electronic Library Online e a Biblioteca Virtual em Saúde. Incluíram-se aquelas nas línguas inglesa, espanhola e portuguesa, sem recorte temporal, disponíveis gratuitamente, independentemente do delineamento. Excluíram-se duplicidades, literatura cinzenta, editoriais e cuja população eram prematuros. **Resultados:** identificou-se duas categorias de análise: temas para educação em saúde e barreiras e facilitadores de aderência às recomendações de prevenção. O profissional de saúde deve estimular as boas práticas de saúde, identificando barreiras e facilitadores para a adesão às recomendações. **Conclusão:** o profissional deve trazer a ideia de que todo bebê tem risco potencial para a síndrome da morte súbita e utilizar as estratégias disponíveis para tirá-lo da situação de vulnerabilidade.

DESCRITORES: Morte súbita do lactente; Prevenção; Educação em saúde.

RESUMEN

Objetivos: identificar la producción científica actual en relación a los conocimientos y prácticas de enfermería sobre los Residuos Sanitarios en las unidades de pediatría. **Método:** revisión integrativa en las bases de datos Scielo, Cinahl, Web of Science, Pubmed, Scopus y Embase, con un marco temporal de 2016 a 2021, totalizando 13 artículos. **Resultados:** los hallazgos apuntaron a tres categorías principales: conocimientos y prácticas en relación a los Residuos Sanitarios, educación permanente con una herramienta para la disposición de los Residuos Sanitarios y sostenibilidad en el contexto de los Residuos Sanitarios y su relación con la responsabilidad social. **Conclusión:** es necesario brindar oportunidades de capacitación periódica, así como el uso de instrumentos autoexplicativos que puedan ayudar todos los profesionales de la salud, especialmente a los profesionales de Enfermería, en el momento de la práctica. Se verifico la presencia de lagunas en los estudios que destacan los Residuos Sanitarios y la Enfermería Pediátrica.

PALABRAS CLAVE: Conocimientos, actitudes y práctica en salud; Conocimiento; Enfermería; Enfermería pediátrica; Residuos sanitarios.

INTRODUCTION

The management of Medical Waste (MW) is of vital importance for the cleaning and organization of residential environments, urban streets, commercial buildings, companies, and healthcare environments such as clinics and hospitals. The latter becomes more complex and costly in relation to solid urban and construction wastes, since they require prior treatment¹, in accordance with the legislation in force, to minimize the risks for the cleaning professionals who collect the wastes and for the population, if they are disposed of in an inappropriate place.

In 2020, with the advent of the pandemic COVID-19, there was an increase in hospital admissions and care in screening centers, about 290 thousand tons of MW were collected by Brazilian municipalities in the year, which brings an index of 1.4kg of this waste per inhabitant.² The Southeast alone produced more than 190 thousand tons of the total², what brought the emphasis beyond its population, its commitment to care, research and technology, fundamental in this atypical year.

Infectious waste (IW), chemical waste (CW), radioactive waste (RW), general waste (GW), including recyclable waste, and sharps waste (SW)³⁻⁴ are the MW that deal with the main legislation, such as the Resolution of the Collegiate Council (RDC) No. 22/2018 and the Resolution of the National Environment Council (CONAMA) No. 358/2005. These will follow the process of MW management according to the steps of segregation, packaging, internal storage, internal transport, external storage, external collection and transport, treatment and environmentally adequate final disposal.³

Waste segregation is the first stage of MW management process, because it involves the knowledge and daily practice of health professionals in the act of separating each residue⁵, which includes the identification and disposal in the appropriate container. This stage is considered the most important for the success of the whole process because of the need to identify the waste.⁶

The nursing team ends up getting involved in this process due to its presence in all health services, in addition to being the largest in the number of professionals whose main function is related to the direct care for the patient 24 hours, in which their doing, consequently, makes them the largest producer of MW in the health environment.

According to the Resolution COFEN-303/2005, the nurse, when appointed, is qualified to exercise the function of responsible for the elaboration and implementation of the Medical Waste Management Plan (MWMP)⁷, Due to its integration in all health units, as well as its capacity to develop actions of prevention, promotion, protection and rehabilitation of health, individually and collectively, which contributes to the management actions of the MW, actively participating in their daily life in the orientation of their care team.

Considering the pediatric units as unique scenarios, since they require specialized knowledge and practices and a differentiated approach to the care of the child and accompanying family from the nursing team, it is noted the relevance of taking such scenarios as a focus for the study of an extremely frequent and important work process in daily life, which is the separation of MW. An important theme emerges in this context, which is the family, that generates the parents, as a care unit, whose presence requires the nursing team to encourage their participation in the care of the hospitalized child, the support and trust of the child, guidance and explanations about

the clinical picture, in addition to preparing the child for hospital discharge with home care.⁸

In the day-to-day care of pediatric units, there is an intense interaction between the nursing team and the accompanying family member for the care of the child. In this process, in which the separation of MW happens routinely, it can be the target of improvements for the safety and quality of health care to hospitalized children.

This uniqueness highlights the importance of a safe and hygienic environment that offers a minimum of risk to both the care team and the children, who remain secluded in the hospital environment, even under the eyes of parents or accompanying family members.⁹ Therefore, good MW separation practices are required in this scenario.

The concern revolves around the knowledge of MW of the nursing professionals in a way that allows to perform the separation process correctly and safely, understanding how the whole process happens and the factors involved in it.

The object of the study is the knowledge of nursing in the management of MW, inserting as target audience the nursing professionals of higher education and technicians of health units, especially of pediatric units.

The study aimed to identify the current scientific production in relation to the knowledge and practices of the nursing team in relation to the MW, primarily in the pediatric hospitalization units.

METHOD

The integrative review¹⁰ was conducted in six steps: (1) formulation of the guiding question; (2) literature search or sampling; (3) data collection; (4) critical appraisal of the included studies; (5) discussion of the results; (6) presentation of the integrative review.

Thus, the guiding question elaborated was: "What is the participation of the nursing team regarding knowledge and practices on medical waste in the neonatal and pediatric units of a military hospital?". The acronym PICo was used¹¹, in which P is the population (nursing team); I is the phenomenon of interest (knowledge and practices); Co is the context (medical waste in neonatal and pediatric units of hospitals or health units).

The search was performed in Scielo, Cinahl, Web of Science, Pubmed, Scopus and Embase databases, through the descriptors and their synonyms, ("Nursing Pediatric" OR "Nursing" OR "Enfermagem Pediátrica" OR "Enfermagem") AND ("Medical Waste" OR "Resíduos de Serviços de Saúde") AND (Conhecimento OR "Conhecimentos, Atitudes e Prática em saúde" OR "Knowledge" OR "Health Knowledge, Attitudes, Practice"), from July 1st to September 30th, 2021, with a total of 13 articles.

To select the articles (Figure 1)¹, after combining the descriptors, the titles and abstracts were read, taking into account the following inclusion criteria: articles published between 2016 and 2021, in Portuguese, English or Spanish, with at least one nurse as author, in addition to the topic in question.

The exclusion criteria included studies that had nursing students as participants, due to their inexperience in the field of work, as well as other professional categories that were not nursing;

studies that worked only with a specific type of waste that is not usually applied in the pediatric context, or not practiced in it anymore; with knowledge and/or practices of MW in pediatric units as central theme; studies that did not present a health unit as a scenario, and unavailable and duplicated texts.

The level of evidence was categorized into six levels: level 1, evidence from meta-analysis of multiple randomized controlled clinical trials; level 2, evidence from individual studies with experimental design; level 3, evidence from quasi-experimental studies; level 4, evidence from descriptive (non-experimental) studies or with a qualitative approach; level 5, evidence from case reports or experience; and level 6, evidence based on expert opinion.¹²

RESULTS

Of the 13 articles selected, the countries of origin of the publications included in the sample were: United Kingdom (one), Brazil (five), India (five), Egypt (one), and Qatar (one). Regarding the year of publication, four (45%) were published in 2017, two (15%) in 2018, two (15%) in 2016, two (15%) in 2020, and three (24%) in 2021.

In terms of methodological design, there was an emphasis on experimental studies, level two (three), descriptive and/or qualitative studies, level four (six), evidence of quasi-experimental studies, level three (four).

The authors are nurses, specialists, masters, master's students, doctoral students and doctors in nursing; and others involved in one paper, mathematics, and two articles, doctors. They developed studies on the work of nurses, culminating in three articles that relate the MW with the pediatric issues, but the others were chosen because they contain contexts that can be related to the pediatric universe, such as knowledge and practices of MW in the pediatric context. This reflects the importance of this debate in this very specific place.

The results indicated inadequate knowledge and practices in the disposal of the MW, lack of knowledge about the institutional PGMW, and non-realization and/or participation in in-service training.

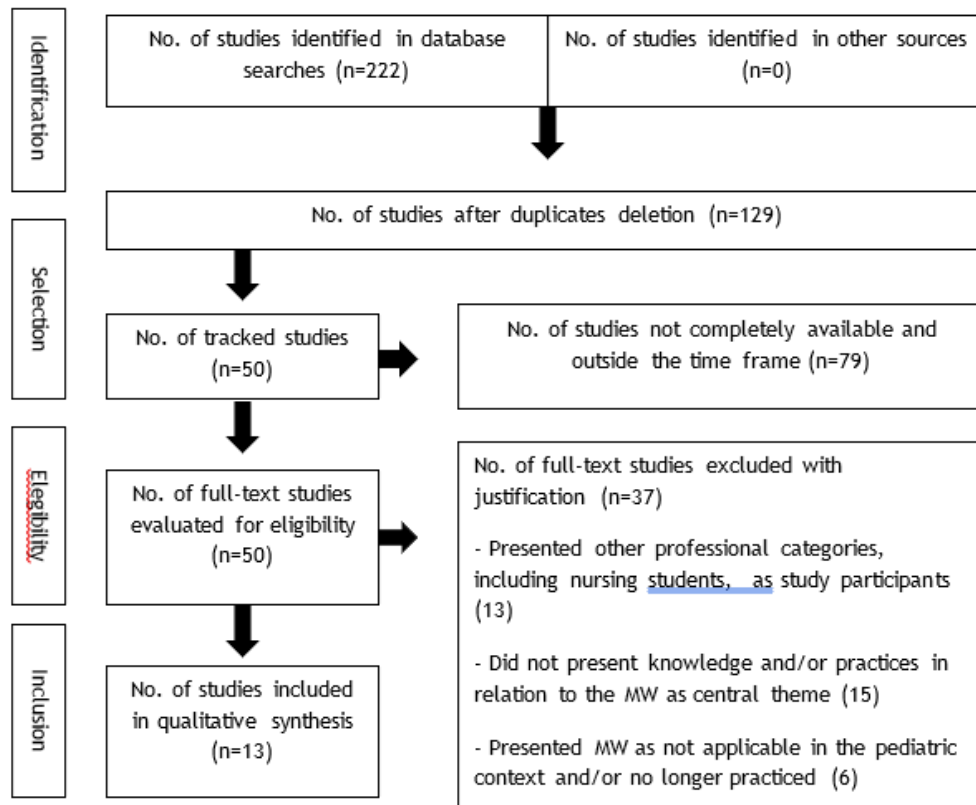
Some of the articles analyzed showed significant improvements in the knowledge level and standards in their results when post-tests were performed, with the application of a self-explanatory tool and/or training on the management of MW.

Only a qualitative study of a neonatal unit showed in its results, the awareness of hospital costs and the concern for sustainability.

From the material obtained, in order to organize and summarize the data, the researchers developed a data grouping instrument (Chart 2).

DISCUSSION

Three categories were outlined from the analysis of the results: knowledge and practices regarding medical waste, continuing education as a tool for medical waste management, and sus-

Chart 1 – Article Selection Flowchart. Rio de Janeiro, RJ, Brazil, 2021

Source: Research Data. Rio de Janeiro, 2021.

tainability in the context of medical waste and its relationship to social responsibility.

Knowledge and practices regarding medical waste

Studies^{5,13-18} have shown that there is a lack of knowledge about the management and disposal of MW, especially in the main stage of separation^{5,14,19}, a crucial action for the success of other stages. The correct practice of segregation significantly reduces the amount of IW, preventing the contamination of other MW²⁰, which minimizes the damage to the environment, in addition to reducing costs.

Other studies²¹⁻²² have demonstrated a good level of knowledge combined with good practices, bringing concern with the exposure to infectious and puncture-cutting materials in areas of intensive care to the patient, due to the proximity of waste generated with blood and secretions in large quantities, which increases the risk of infection of these exposed professionals.

In this context, the importance of the wide dissemination of the PGMW, an institutional document that describes all the actions related to the steps associated with the management of the MW, such as the generation point, identification, segregation, packaging, collection, storage, transportation, treatment, destination and environmentally appropriate disposal of this waste, in addition to specifying each health sector of the institution, the type of waste produced and its specific actions.³ Sometimes the document is

unknown to the caregivers and can be of great value in managing the process.^{13,23}

It is worth mentioning the relevance of the lack of knowledge and practice of RQ management^{14,23-24}, which are frequent in pediatric units²⁴, which continue to be discarded in inappropriate places such as sink drain, puncture-cutting box, IW bin, CW trash can and others, making the issue of their identification unfeasible. Considering the degree of toxicity and corrosiveness, QW should be disposed in containers made of rigid material, rounded due to the possibility of tipping, with opening and closing device, in their original container, in addition to their identification.³⁻⁴

There is great concern, especially among pediatric nurses, about handling a large volume of drugs that go through several stages of dilution and redilution before reaching the correct dosage for the child, increasing their exposure, and the appropriate container is crucial.²⁵⁻²⁶

Continuing education as a tool for medical waste management

International studies of the quasi-experimental type^{15,17-18,22} have shown satisfactory results, despite an insufficient level of knowledge, with the application of post-tests combined with differentiated teaching methods, such as the implementation of an in-service training program^{15,18}, instruction through the preparation of a Standard Operating Procedure (SOP)¹⁶, and the preparation of a self-instructional module⁷ on the management of MW.

Chart 2 – Overview of studies included in the review by author/year, type of study, main results. Rio de Janeiro, RJ, Brazil, 2021

Author/ Year	Study type	Main Results
Bento ¹³ 2017	Mixed exploratory and descriptive	Lack of knowledge about MW and the PGMW, in addition to the lack of training on the subject.
Sanches ¹⁴ 2018	Exploratory and descriptive	Lack of knowledge about the segregation and packaging of MW, especially the QW.
Matos ¹⁹ 2018	Mixed and descriptive	Evidenced the inadequate disposition of the MW.
Mamantha ¹⁵ 2020	Nearly experimental	Considerable increase in knowledge about MW, after training performed.
Nichols ²⁸ 2017	Qualitative	The neonatal unit showed awareness of the problems.
Dash ⁵ 2021	Experimental	Of the 100 nursing professionals, 48 (48%) have excellent knowledge about the MW. All had at least one training.
Musa ²¹ 2020	Experimental	Great segregation at the point of generation of MW. The obstacle was the inevitable exposure related to the MW in intensive care units.
Vallepalli ²² 2017	Experimental	Of the 165 nursing professionals, 157 (95%) have good knowledge about the MW.
Patidar ¹⁶ 2017	Nearly experimental	Of the 150 nurses, 100% do not have knowledge, attitude and practice. After applying an SOP, these parameters scores increased.
Gomes ²³ 2021	Quantitative, exploratory and descriptive	Of the 15 nursing professionals, 11 (65%) had never taken a course or similar and denied receiving information about the QW.
Sonopant ¹⁷ 2016	Nearly experimental	Of the 120 nursing professionals, 76 (63 %) have insufficient knowledge about the MW. After implementation of an Instructional Module (ISM), it was observed Excellent knowledge.
Mohamed ¹⁸ 2021	Nearly experimental	Of the 120 nursing professionals, 76 (63 %) have inadequate knowledge about the MW, which improved after the test.
Almeida ²⁴ 2016	Quantitative, descriptive and observational	It was observed that the recommended did not comply with the legislation in relation to the QW.

Source: Research Data. Rio de Janeiro, 2021.

All these tools presented by such studies can stimulate the knowledge and, consequently, the practice related to the MW and its correct disposal, which has been corroborated by other studies^{5,13} that concluded that the highest scores of knowledge, practice and attitude are those of nursing professionals who had in their trajectory at least one qualification in service, or, on the contrary, that pointed out the lack of training as an obstacle to knowledge on the subject.

In this sense, all these points bring the importance of the permanent reduction, inserted in a theme so present and daily of multiple repercussions. It consists of learning at work, where teaching and learning complement each other, allowing reflection on work practice, teamwork, reconstruction of work processes and participatory management. It provides the opportunity for more meaningful learning and for changing practices that occur in the daily dynamic.²⁷

It is worth highlighting the importance of educating patients and caregivers⁵ to participate in the management of the waste produced by them, emphasizing the moments of admission and discharge to the home environment, according to the needs presented. In the pediatric context, with the continuous presence of the accompanying family member, this idea can help the nursing professionals in the correct disposal of MW in the unit.

Sustainability in the context of medical waste and its relationship to social responsibility

Studies^{19,28} have shown concern with the issue of social responsibility, linking the issue of MW with environmental issues in terms of sustainability and unnecessary costs. Affirm that there needs to be a change in practice, as well as feedback to all professionals involved.

A study carried out in an intensive pediatric unit²⁸ attempted to understand the nursing professionals thinking on the management of the unit's MW considering sustainability, identifying opportunities for intervention. It showed awareness of environmental problems and perspectives for adopting behavioral changes both to reduce institutional costs and to transform their practice in a more sustainable way, which confirms the idea of sustainability within the health unit, going against the Sustainable Development Goals of the 2030 Agenda for Sustainable Development.²⁹

According to the analysis of the studies, most of the nurses do not put into practice the philosophy of recycling within the health unit, either due to lack of knowledge, availability of adequate equipment and supplies, lack of guidance or even encouragement from the institution. Recyclable waste must be donated to a cooperative or association of recyclable waste collectors, through a commitment with the institution, which generates employment and income, reduces institutional costs and contributes to the cleaning of the site by reducing the storage time of the waste, in addition to optimizing space within the unit.

CONCLUSION

It is concluded that it is necessary to carry out periodic training on the management of MW, encouraged both by direct activities and at the level of decision, being an opportune moment to provide feedback on the results achieved and expected to nursing professionals, leading to reflection on the benefits to the health of the community beyond environmental issues.

It was verified the presence of gaps regarding studies evidencing the MW and pediatric nursing. It was necessary to have a greater breadth of databases covering the subject, even if in a more generalized way, but without losing the essence of the results of nursing knowledge and practices brought by the field research presented.

In the international scenario, interesting quasi-experimental studies have been carried out, addressing issues of sustainability, costs and awareness of caring for others. In addition, good results have been demonstrated in terms of knowledge and practices after training and/or education on MW, including experiences with the use of self-explanatory teaching tools, which can be of great value for the proposed knowledge and practices.

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REFERENCES

1. Canejo C. Gestão integrada de resíduos sólidos: múltiplas perspectivas para um gerenciamento sustentável e circular. Rio de Janeiro: Freitas Bastos Editora; 2021.
2. Associação Brasileira de Empresas de Limpeza Pública e de Resíduos Especiais. Panorama dos resíduos sólidos no Brasil 2021. [Internet]. São Paulo: ABRELPE; 2021 [acesso em 18 de fevereiro 2022]. Disponível em: <https://abrelpe.org.br/panorama/>.
3. Agência Nacional de Vigilância Sanitária (Brasil). Resolução de Diretoria Colegiada nº 222, de 28 março de 2018. Regulamenta as boas práticas de gerenciamento dos resíduos de serviços de saúde e dá outras providências [resolução na internet]. Diário Oficial da União 29 mares 2018 [acesso em 13 julho 2022]; Seção 1 (61). Disponível em: https://bvsms.saude.gov.br/bvs/saudelegis/anvisa/2018/rdc0222_28_03_2018.pdf.
4. Conselho Nacional do Meio Ambiente (Brasil). Resolução nº 358, de 29 de abril de 2005. Dispõe sobre o tratamento e a disposição final dos resíduos dos serviços de saúde e dá outras providências [resolução na internet]. Diário Oficial da União 04 maio 2005 [acesso em 16 julho 2022]; Seção 1. Disponível em: <https://www.legisweb.com.br/legislacao/?id=102253>.
5. Dash K, Das M, Satapathy NK. Assessment of knowledge, attitude, and practices about biomedical waste management among nursing professionals in a tertiary care hospital, Bhubaneswar, Odisha. *EJMCM*. [Internet]. 2021 [cited 2021 jul 20];8(3). Available from: https://ejmcm.com/article_9772.html.
6. André SCS, Veiga TB, Takayanagui AMM. Geração de resíduos de serviços de saúde em hospitais do município de Ribeirão Preto (SP), Brasil. *eng sanit ambient*. [Internet]. 2016 [acesso em 15 de julho 2021];21(1). Disponível em: <https://doi.org/10.1590/S1413-41520201600100140092>.
7. Conselho Federal de Enfermagem (Brasil). Resolução COFEN nº 303, de 23 de junho de 2005. Habilitação do enfermeiro, devidamente inscrito e com situação ético-profissional regular no seu respectivo conselho regional de enfermagem, assumir a responsabilidade técnica do plano de gerenciamento de resíduos de serviços de saúde [resolução na internet]. Ed. Brasília: COFEN; 2005 [acesso em 18 de julho 2021]. Disponível em: http://www.cofen.gov.br/resoluo-cofen-30320005_4338.html.
8. Wilson D, Hockenberry MJ. Wong: fundamentos de enfermagem pediátrica. 9.ed. Rio de Janeiro: Elsevier; 2014.
9. Peres MA, Wegner W, Cantarelli-kantorski KJ, Gerhardt LM, Magalhães AM. Percepção de familiares e cuidadores quanto à segurança do paciente em unidades de internação pediátrica. *Rev. gaúch. enferm*. [Internet]. 2018 [acesso em 16 julho 2021];39. Disponível em: <https://doi.org/10.1590/1983-1447.2018.2017-0195>.
10. Souza MT, Silva MD, Carvalho R. Revisão integrativa: o que é e como fazer. *Einstein (São Paulo)*. [Internet]. 2010 [acesso em 16 junho 2021];8(1). Disponível em: <http://dx.doi.org/10.1590/s1679-45082010rw1134>
11. Moher D, Liberati A, Tetzlaff J, Altman DG. Preferred reporting items for systematic reviews and meta-analyses: the PRISMA statement. *BMJ*. [Internet]. 2009 [cited 2021 sep 30];339:b2535. Available from: <https://www.bmj.com/content/bmj/339/bmj.b2535.full.pdf>.
12. Stetler CB, Morsi D, Rucki S, Broughton S, Corrigan B, Fitzgerald J, et al. Utilization-focused integrative reviews in a nursing service. *Appl. nurs. res*. [Internet]. 1998 [cited 2021 jul 15];11(4). Available from: [https://doi.org/10.1016/S0897-1897\(98\)80329-7](https://doi.org/10.1016/S0897-1897(98)80329-7).
13. Bento DG, Costa R, Luz JH, Klock P. O gerenciamento de resíduos de serviço de saúde sob a ótica dos profissionais de enfermagem. *Texto & contexto enferm*. [Internet]. 2017 [acesso em 16 julho 2021];26(1). Disponível em: <http://dx.doi.org/10.1590/0104-07072017006680015>.
14. Sanches APM, Mekaro KS, Figueiredo RM, André SCS. Resíduos de serviços de saúde: conhecimento de enfermeiros da atenção básica. *Rev. Bras. enferm*. [Internet]. 2018 [acesso em 18 julho 2021];71(5). Disponível em: <https://doi.org/10.1590/0034-7167-2017-0244>.

15. Mamatha IV, Reddy NK. Awareness of biomedical waste management among nursing personnel and auxiliary staff. *J Critic Ver.* [Internet]. 2020 [cited 2021 aug 13];7(4). Available from: <http://dx.doi.org/10.31838/jcr.07.04.64>.
16. Patidar D, Ravindra HN, Cristian K. Effectiveness of standard operating procedure regarding knowledge, attitude and practice of biomedical waste disposal among nursing staff working in selected hospital, Vadodara. *Int. j. nurs. educ. scholarsh.* [Internet]. 2017 [cited 2021 jul 15];9(3):11.
17. Sonopant GJ, Jayalakshmi N, Waghmare S. Effectiveness of self-instructional module (SIM) on bio-medical waste management in terms of knowledge among staff nurses working in selected hospitals in Aurangabad, Maharashtra. *Int j. nurs educ.* [Internet]. 2016 [cited 2021 july 16];8(4). Available from: https://www.researchgate.net/publication/311246819_Effectiveness_of_Self-instructional_Module_SIM_on_Bio-medical_Waste_Management_in_Terms_of_Knowledge_among_Staff_Nurses_Working_in_Selected_Hospitals_in_Aurangabad_Maharashtra.
18. Mohamed MYA, Elkarmalawy EM, Elshair IH. Effect of biomedical waste management program on nurses of family health centers. *Indian J Forensic Med Toxicol.* [Internet]. 2021 [cited 2021 sep 10];15(3). Available from: <https://medicopublication.com/index.php/ijfimt/article/view/16024/14370>.
19. Matos MCB, Oliveira LB, Queiroz AAFLN, Sousa AFL, Valle ARMC, Moura MEB. Conhecimento de profissionais da enfermagem sobre o gerenciamento de resíduos produzidos na atenção primária. *Rev. bras. enferm.* [Internet]. 2018 [acesso em 2021 agosto 03];71(Supl 6). Disponível em: <https://doi.org/10.1590/0034-7167-2018-0308>.
20. Oliveira AF. Sistema de gerenciamento interno de resíduos sólidos de serviços de saúde. Pelotas: Cópias Santa Cruz; 2018.
21. Musa F, Mohamed A, Selim N. Assessment of nurses' practice and potential barriers regarding the medical waste management at Hamad Medical Corporation in Qatar: a cross-sectional study. *Cureus.* [Internet]. 2020 [cited 2021 aug 03];12(5):e8281. Available from: <https://pubmed.ncbi.nlm.nih.gov/32601557/>.
22. Vallepalli C, Rao K, Reddy KT, Sekhar KC, Gogineni SS, Deotale PG. A study on knowledge and practice of hospital waste management among nursing staff of tertiary care centre hospital in Eluru, West Godavari District, A.P. *Indian J Public Health Res Dev.* [Internet]. 2017 [cited 2021 jul 30];8(3). Available from: https://www.academia.edu/43619140/A_Study_on_Knowledge_and_Practice_of_Hospital_Waste_Management_among_Nursing_Staff_of_Tertiary_Care_Centre_Hospital_in_Eluru_West_Godavari_District_A_P_India.
23. Gomes PMM, Nascimento ND, Paes OG. O descarte de resíduos químico-farmacológicos em unidades de internação. *Rev. Pesqui. (Univ. Fed. Estado Rio J., Online).* [Internet]. 2021 [acesso em 10 setembro 2021];(13). Disponível em: <https://doi.org/10.9789/2175-5361.rpcf.v13.8181>.
24. Almeida MAR, Wilson AMMM, Peterlini MAS. Avaliação do descarte dos resíduos de medicamentos em unidades pediátricas. *Rev. Esc. Enferm. USP.* [Internet]. 2016 [acesso em 16 agosto 2021];50(6). Disponível em: <http://dx.doi.org/10.1590/S0080-623420160000700007>.
25. Secretaria de Saúde Estadual (SP). Portaria do Centro de Vigilância Sanitária nº21, de 10 de setembro de 2008. Aprovação da norma técnica sobre gerenciamento de resíduos perigosos de medicamentos em serviços de saúde [portaria na internet]. *Diário Oficial da União* 11 set 2008 [acesso em 13 julho 2022]; Seção 1. Disponível em: <https://cvs.saude.sp.gov.br/zip/cvs-21.pdf>.
26. Associação Brasileira de Normas Técnicas. NBR ISO nº 10.004, de 30 de novembro de 2004. Resíduos sólidos – classificação [Internet]. Rio de Janeiro: ABNT; 2004. [acesso em 23 de agosto 2021]. Disponível em: https://www.suape.pe.gov.br/images/publicacoes/normas/ABNT_NBR_n_10004_2004.pdf.
27. Ministério da Saúde (BR). Secretaria de Gestão do Trabalho e da Educação na Saúde. Planejamento das ações de educação permanente em saúde no sistema único de saúde: orientações [Internet]. Brasília: Ministério da Saúde; 2018 [acesso em 05 setembro 2021]. Disponível em: https://bvsmms.saude.gov.br/bvs/publicacoes/orientacoes_planejamento_acoes_educacao_permanente.pdf.
28. Nichols A, Mukonoweshuro R. Understanding and knowledge of sustainable waste management within the neonatal unit: a qualitative investigation. *Pediatr Neonatal Nurs.* [Internet]. 2016 [cited 2021 aug 20];(23). Available from: <http://dx.doi.org/10.1016/j.jnn.2016.10.002>.
29. Ministério da Saúde (BR). Secretaria de Ciência, Tecnologia e Insumos Estratégicos. Agência nacional de prioridades de pesquisa do Ministério da Saúde [Internet]. Brasília: Ministério da Saúde; 2018 [acesso em 10 maio 2022]. Disponível em: https://bvsmms.saude.gov.br/bvs/publicacoes/agenda_prioridades_pesquisa_ms.pdf.
30. Brasil. Decreto-Lei nº 10.936, de janeiro 2022. Regulamenta a lei nº 12.305, de 2 de agosto de 2010, que institui a política nacional de resíduos sólidos [decreto na internet]. *Diário Oficial da União* 12 jan 2022 [acesso em 10 junho 2022]; Seção 1. Disponível em: https://www.planalto.gov.br/ccivil_03/_ato2019-2022/2022/decreto/D10936.htm.