REVISTA ONLINE DE PESQUISA

CUIDADO É FUNDAMENTAL

Universidade Federal do Estado do Rio de Janeiro • Escola de Enfermagem Alfredo Pinto

RESEARCH

DOI: 10.9789/2175-5361.rpcfo.v13.8181

THE DISPOSAL OF CHEMICAL-PHARMACOLOGICAL WASTE IN HOSPITALIZATION UNITS

O descarte de resíduos químico-farmacológicos em unidades de internação

El descarte de residuos químico-farmacológicos en unidades de hospitalización

Patriny Marcelle Mariano Gomes[1], Nathalia Dorcelino do Nascimento[2], Graciele Oroski Paes[3]

How to cite this article :
Gomes PMM, Nascimento ND, Paes GO. The disposal of chemical-pharmacological waste in hospitalization units. 2021 jan/dez; 13:192-196. DOI: http://dx.doi.org/0.9789/2175-5361.rpcfo.v13.8181.

ABSTRACT

Objectives: To identify the knowledge of the nursing team about the management of chemical-pharmacological residues; Analyze the practice of disposal with what is recommended. **Method:** A quantitative, exploratory and descriptive study carried out with professionals from hospitalization units at a University Hospital. Approved by the Ethics Committee of the institution under number 839.729. Data were collected through structured questionnaires about current legislation and activities carried out. **Preliminary results:** Participated 17 nursing professionals, 11 nursing technicians and 6 nurses. Regarding course achievements on the subject, 11 (65%) said they had never done it and 10 (59%) denied having information on chemical-pharmaceutical residues. **Conclusion:** It is a process of professional awareness and deepening in the studies about the management of chemical residues to enable improvements in disposal and management.
Descriptors: Pharmaceutical Preparations; Medical Waste; Medical Waste Disposal.

RESUMO

Objetivos: Identificar os saberes da equipe de enfermagem sobre o manejo dos resíduos químicos-farmacológicos; Analisar a prática de descarte com o que é preconizado. **Método:** Estudo quantitativo, exploratório e descritivo realizado com profissionais de unidades de internação em um Hospital Universitário. Aprovado pelo comitê de Ética da instituição sob o número 839.729. A coleta de dados se deu por meio de questionários estruturados sobre a legislação vigente e sobre atividades realizadas. **Resultados:** Participaram 17 profissionais de enfermagem, sendo 11 técnicos de enfermagem e 6 enfermeiros. Em relação a realizações de cursos sobre a temática, 11 (65%) afirmaram nunca terem realizado e 10 (59%) negaram terem informações sobre resíduos químico-farmacêuticos. **Conclusão:** Cabe um processo de conscientização profissional e aprofundamento nos estudos acerca do gerenciamento de resíduos químicos para viabilizar melhorias no descarte e manejo.
Descritores: Preparações farmacêuticas; Resíduos de serviços de saúde; Eliminação de Resíduos de Serviços de Saúde.

RESUMEN

Objetivos: Identificar los saberes del equipo de enfermería sobre el manejo de los residuos químicos-farmacológicos; Analizar la práctica de descarte con lo que se preconiza. **Método:** Estudio cuantitativo, exploratorio y descriptivo realizado con profesionales de unidades

1 *Universidade Federal do Rio de Janeiro (UFRJ), Brazil.* Nursing Graduate by the UFRJ, Registered Nurse at Hospital Pró-Cardíaco.

2 *Universidade Federal do Rio de Janeiro (UFRJ), Brazil.* Nursing Graduate by the UFRJ, Postgraduate by the Health Multiprofessional Residency Program from the UFRJ.

3 *Universidade Federal do Rio de Janeiro (UFRJ), Brazil.* PhD in Nursing by the UFRJ, Professor of the Nursing Department at UFRJ.

de internación en un Hospital Universitario. Aprobado por el comité de ética de la institución bajo el número 839.729. La recolección de datos se dio por medio de cuestionarios estructurados sobre la legislación vigente y sobre actividades realizadas. **Resultados preliminares:** Participaron 17 profesionales de enfermería, siendo 11 técnicos de enfermería y 6 enfermeros. En cuanto a realizaciones de cursos sobre la temática, 11 (65%) afirmaron nunca haber realizado y 10 (59%) negaron tener informaciones sobre residuos químico-farmacéuticos. **Conclusión:** Cabe un proceso de concientización profesional y profundización en los estudios sobre el manejo de residuos químicos para viabilizar mejoras en el descarte y manejo.

Descriptores: Preparaciones Farmacéuticas; Residuos Sanitarios; Eliminación de Residuos Sanitarios.

INTRODUCTION

The concern about the development of sustainable culture has been gaining normative and scientific space internationally. Hospital facilities stand out in this framework for the high consumption of resources and for the production and handling of materials generated during care provision, which have a high environmental impact and produce hazards to the population.[1] In view of the advancement of technologies and therapies offered by medicine, the generation of Medical Waste (MW) has become a matter to be addressed in the fields of public and environmental health in order to promote sustainability in the hospital setting and the safety culture.

In Brazil, the bodies responsible for the regulatory basis are the *Agência Nacional de Vigilância Sanitária (ANVISA)* [Brazilian Health Regulatory Agency] and the *Conselho Nacional do Meio Ambiente (CONAMA)* [National Environment Council].[2,3] We currently have the following legislation in force: *Resolução de Diretoria Colegiada (RDC)* [Collegiate Board Resolution] No. 306/2004 from the *ANVISA*, which provides for the technical regulation for MW management, and the Resolution No. 358/2005 from the *CONAMA* that addresses the legislation on processing and final disposal of MW.

According to the *ANVISA*, MW are defined as all materials from activities that provide care to human or animal health. And they follow the following classification: Group A – Biological Waste; Group B – Chemical Waste; Group C – Radioactive Waste; Group D – Common Waste; and Group E – Sharps.[2]

Among the groups aforementioned, the second contains chemical substances that may be hazardous to public health and the environment according to their characteristics of flammability, corrosivity, toxicity and reactivity. Group B includes laboratory reagents, residues containing heavy metals, effluents from image processors and apparatus used in clinical analyzes, and pharmaceutical residues, which have a major impact on the management of waste from healthcare services, since they are part of one of the main care activities carried out in hospitals and are largely discarded in such institutions.[2]

According to the World Health Organization, the following items are considered pharmaceutical residues: 0.9% saline solution bottles, vaccines and all expired, damaged, unused, contaminated medications that require specific care during their disposal due to their hazardous characteristics. In addition to items used during the medication process that contain remnants of medications, such as vials, ampoules, boxes with residues, connection tubes, gloves and masks.[4] Some pharmaceutical classes deserve more attention due to their impact on the environment. Antimicrobials, hormones, antineoplastic drugs, immunosuppressants and antiretrovirals are capable of causing contamination in flora and fauna, in addition to having toxic and mutagenic effects that can cause damage to environmental health.[5]

According to the *CONAMA*, pharmaceutical residues or those resulting from the medication process are considered hazardous residues and require specific care for their processing and final disposal.[3] In Brazil, there are no laws addressing pharmaceutical residues. Even with the current resolutions, there are gaps regarding the MW from Group B. Nevertheless, it is possible to quote regulations that fulfill some needs in the scope of safety and sustainability. The Ordinance No. 344/1998, from the Brazilian Ministry of Health, addresses the technical regulation on substances and medicines subject to special control, including their final disposal, and includes a list of medicinal substances subject to specific care. Furthermore, the Brazilian Medicines Policy points out issues in regard to both prescription and rational use of medicines, as well as their control, safety and quality, guiding the debate about indiscriminate drug prescriptions and future misuse.

Studies addressing hospital effluents have been showing the presence of chemical substances from drugs with high toxic indexes, capable of causing river damage and soil contamination.[6] The erroneous material segregation and the improper practice of disposing of pharmaceutical residues are largely responsible for their inappropriate destination.

It can be said that most professionals are unaware of the environmental hazards associated with the effects of pharmaceutical compounds, as well as the rules to be followed for their handling, material segregation, disposal, processing and final disposal. Studies point out the lack of knowledge by health professionals regarding what is recommended for the management of MW.[7,8]

Given the importance of the nursing team for the promotion of a sustainable culture in hospital practice, this work turns out to be relevant in exploring the theme and favoring the construction of environmental knowledge in health care. This research meant to identify the nursing team understanding vis-à-vis the management of chemical-pharmaceutical residues, as well as, to analyze the practice of disposing chemical-pharmaceutical residues considering what is actually recommended.

METHODS

It is a descriptive-exploratory study with a quantitative approach, which was performed with Registered Nurses and Nurse Technicians from a University Hospital in the *Rio de Janeiro* city, over the period from January to March 2018. It was approved by the Institution's Research Ethics Committee under the Legal Opinion No. 839.729, in accordance with the Resolution No. 466/2012 from the National Health Council.

The study has as scenarios the hospitalization sectors of the hospital. The population corresponds to 17 nursing professionals, 6 of them having higher education and 11 having secondary education who met the following inclusion criteria: being over 18 years old, having at least 6 months professional activity and performing activities in the hospitalization services.

Data collection took place through structured questionnaires with closed questions and a three-point Likert scale about the *RDC* 306/04 from the *ANVISA* and about the practices carried out within the institution. The consistency of the instrument was measured by Cronbach's alpha (0.745). The professionals responded at the time of delivering the questionnaires, without the possibility of consulting bibliographic materials. Subsequently, the answers' assessment was performed using a template and the data obtained were recorded in an Excel® spreadsheet, then statistically analyzed in a descriptive manner.

RESULTS

This study included 17 professionals who make up nursing teams in the hospitalization sectors. Most are nurse technicians corresponding to 11 (65%) of the professionals studied, with only six (35.2%) professionals holding higher education degrees. Regarding the time since graduation, six (35.2%) professionals graduated more than 10 years ago.

Observing the time of professional activity at the institution, 10 (59%) professionals have worked at the hospital for less than five years. When asked about attending courses on health-care waste management, 11 (65%) said they had never done it and 10 (59%) claimed not having information on chemical-pharmaceutical residues.

For a better assessment of the results, they were categorized into two groups, as follows: Professional knowledge about the current legislation and Segregation Practices.

Professional knowledge about the current legislation

The assessment of the professionals' knowledge about what is recommended by the *RDC* 306/2004 from the *ANVISA* was performed through data collection using the Likert scale. Regarding the Health-Care Waste Management Plan (HCWMP), although 11 (65%) understand that it is a document that points out and describes actions related to the management of MW and actions related to the protection of both public health and environment, 15 (88%) also reported that the plan aims to guarantee medical care to professionals in the event of an accident and 12 (70%) were unaware of the existence of the institution's HCWMP.

When asked about the proper disposal place for hazardous medication ampoules, 16 (94%) knew that they should be disposed of in collectors of inert material that are resistant to breakage and leakage. However, only seven (41%) stated that the ampoules of medicines are discarded in appropriate collectors at the institution.

Concerning chemical-pharmaceutical residues from antimicrobials, antineoplastic drugs, immunosuppressants, immunomodulators, and antiretrovirals, five (29.4%) were unaware that they must undergo specific processing and final disposal. Moreover, six (35%) were unaware of the inadequacy of the disposal of antibiotics in sink drains and sewers. And nine (53%) said they do not dispose this type of waste in specific collectors.

Segregation practices

When asked about the operational practice of material segregation, in other words, in which container they should dispose each material during their work routine, we obtained the answers underlined in the table below:

Table 1 - Distribution of the number of both correct and wrong answers according to the correct place for material disposal. *Rio de Janeiro* city, 2018.

Material	Correct		Wrong	
	f	%	f	%
Empty ampoule	13	76	4	24
Ampoule containing remnants of medication	9	53	8	47
0.9% saline solution empty bottles	0	0	17	100
0.9% saline solution bottles containing remnants of liquid	8	47	9	53
Gear used	4	24	13	76

Source: Elaborated by the authors. *Rio de Janeiro* city, 2018

Concerning the eight (47%) professionals who were wrong where to dispose ampoules with remaining medication, all indicated the disposable collectors of Group E, in other words, sharps.

With regard to 0.9% saline solution empty bottles, all participating professionals erred in the correct destination of the material, and eight (47%) stated that they should be discarded along with the infectious waste. Concerning the 0.9% saline solution bottles still containing liquid, 9 (53%) of the participants were wrong and five (30%) indicated that the collectors for infectious waste were the correct ones for disposal. Considering the 13 (76%) professionals who missed the destination of the 0.9% saline solution gear, nine (53%) indicated the collectors for infectious waste as the most appropriate.

DISCUSSION

Concerning the comprehension of waste management, it was possible to notice a gap in taking courses and achieving improvements towards professional practice enhancements. Considering that health establishments are responsible for managing the waste they produce, the absence of information on the management of this waste directly impacts on its disposal, as well as the rest of the management chain.[9]

DOI: 10.9789/2175-5361.rpcfo.v13.8181

Professional knowledge about the current legislation

Herein, data show that the participating professionals do not know what a HCWMP really means. The Health-Care Waste Management Manual explains the steps for elaborating a HCWMP, a mandatory document in the institutions that generate MW that aims to point out how the waste management should be carried out in the institution, in addition to ensuring safety in the management and the reduction of production.[4] Additionally, according to the *Conselho Federal de Enfermagem (COFEN)* [Brazilian Nursing Council], the registered nurse is qualified to assume the Technical Responsibility of the HCWMP, being able to assume a leadership role in partnership with other members of the health team.

The *ANVISA* recommends that Group B waste should be disposed of in inert and closed containers that are resistant to breakage and leakage, aiming to avoid deterioration and weakening of the packaging and possible damage to those who handle it. Containers must be identified with the associated hazard symbol and with a description of the chemical substance and hazard warnings.[2]

Chemical waste, when not destined to reuse, recovery and recycling process, must undergo specific processing and final disposal.[2] The *CONAMA* reaffirms the specificity of the final disposal of Group B waste with hazardous characteristics contained in the Safety Information Sheet of Chemical Products.[3]

The improper final disposal of chemical waste can cause major risks to both environment and population. The disposal of chemical waste in the sewer has toxic effects on waters and the ecosystem, which is already related to antimicrobial resistance and malformations in animals.[5] It is necessary to emphasize that cytotoxic substances, mutagens, and carcinogens, expose professionals to hazards, as well as the rest of the population that has the possibility of coming into contact with these factors. The *ANVISA* lists a series of pharmaceutical substances that require specific processing and final disposal. Among them are hormonal, antimicrobial, cytostatic, antineoplastic drugs, immunosuppressive, digitalis, immunomodulatory, and antiretroviral products, where all of them are widely used in hospital units.[2]

Segregation practices

In the considered hospital, there is no availability of specific collectors for Group B waste. Ampoules of medication should be disposed of separately from syringes and other materials in Group E. Nonetheless, the data show that professionals, despite knowing the need for special disposal for this type of material, they dispose ampoules in the yellow collectors for sharps. Hazardous medications that end up being discarded together with infectious MW undergo processing by heating, which can cause the release of toxic gases and vapors.[10]

Many materials present in hospital routines might contain remnants of drugs, such as syringes, needles, infusion devices, vials, and catheters. A study performed by Silva et al. correlates the residual volume of medicines with the extension of gears after the administration of medications and shows that it is 12.0 mL per gear on average. In addition to causing damage to patients, since the therapy is not fully infused, they also cause damage to the environment since we cannot guarantee the proper disposal of these chemical waste when they are combined to other materials.[11]

Many professionals are unaware of the possibility of recycling some materials used in the hospital setting. It is well-known that only a quarter of the waste generated in hospitals is hazardous and needs specific handling and disposal.[12,13] The rest belong to Group D and can be recycled, making it possible to reuse materials in the production of new ones, reduce medical supply utilization, and increase the useful life of the material. This system also reduces the waste accumulation in landfills and septic ditches. Proper material segregation is essential to reduce the amount of infectious waste and unnecessary processing costs.

CONCLUSIONS

When it comes to chemical-pharmaceutical residues management in the hospital setting, it was possible to observe the big knowledge gap by health professionals, mainly according to the specificities of Group B. Professional practice shows divergences concerning what the *ANVISA* recommends, then causing environmental hazard for both professionals and public health.

There is a great need for the implementation of permanent education courses for the institution's professionals, in addition to the construction of methods for valuing recycling and sustainable practices in the care environment. Bearing the aforesaid in mind, it is suggested a process of professional awareness and deep learning from studies addressing the management of chemical waste to enable improvements in its disposal and management. Therefore, enabling the safety culture expansion and adaptation to what is recommended in the country as well.

REFERENCES

1. Furukawa PO, Cunha ICKO, Pedreira MLG. Avaliação de ações ecologicamente sustentáveis no processo de medicação. Rev Bras Enferm. 2016;69(1):23-9. DOI: http://dx.doi.org/10.1590/0034-7167.2016690103i.
2. BRASIL. Agência Nacional de Vigilância Sanitária, ANVISA. Resolução de diretoria colegiada (RDC) Nº 222 de 28 de março de 2018. Dispõe sobre o Regulamento Técnico para o gerenciamento de resíduos de serviços de saúde. Publicada no DOU de 29/03/2018.
3. BRASIL. Ministério do Meio Ambiente, Conselho Nacional do Meio Ambiente, CONAMA. Resolução N° 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. Publicada no DOU de 20/04/2005.
4. Chartier Y, Emmanuel J, Pieper U, Prüss A, Rushbrook P, Stringer R, et al. Safe management of wastes from health-care activities. 2.ed. Genebra, Suíça: World Health Organization; 2014.
5. Estal LM. Conhecimentos, atitudes e práticas dos profissionais de saúde sobre o gerenciamento de resíduos farmacêuticos e o risco ambiental: um estudo de caso em uma unidade hospitalar [dissertação]. Rio de Janeiro: Escola Nacional de Saúde Pública Sergio Arouca – ENSP; 2016. Available at: https://www.arca.fiocruz.br/handle/icict/19440

6. Santos LHMLM, Gros M, Rodriguez-Mozaz S, Delerue-Matos C, Pena A, Barceló D, et al. Contribution of hospital effluents to the load of pharmaceuticals in urban wastewaters: Identification of ecologically relevant pharmaceuticals. Sci Total Environ. 2013; v.461-462, p.302–316. DOI: https://doi.org/10.1016/j.scitotenv.2013.04.077
7. Tabash MI, Hussein RA, Mahmoud AH, El-Borgy MD, Abu-Hamad, BA. Impacto f na educational program on knowledge and practice of health care staff toward pharmaceutical waste management in Gaza, Palestine. J Air Waste Manag Assoc. 2016;66(4):429–438. DOI: https://doi.org/10.1080/10962247.2016.1146638
8. Gomes PMM, Nascimento ND, Paes GO. Gerenciamento de Resíduos em Unidades Hospitalares: Uma Revisão Integrativa. Rev Evidentia. 2019;16:11620. Available at: http://ciberindex.com/c/ev/e11620
9. Meira SRC. Educação permanente na gestão de resíduos em um hospital universitário [dissertação]. Goiás: Faculdade de Medicina, Universidade Federal de Goiás; 2016. Available at: http://repositorio.bc.ufg.br/tede/handle/tede/6478
10. Amorim PMS. Estratégias de tratamento de resíduos químicos gerados na FCF/USP [dissertação]. São Paulo: Faculdade de Ciências Farmacêuticas, Universidade de São Paulo; 2018. DOI: 10.11606/D.9.2018.tde-03042018-155021
11. Silva VLS, Furlan MLS, Fabrício-Wehbe SCC. Identificação do volume residual em equipos de soluções parenterais após administração de medicamentos. Rev. enferm. UERJ. 2011; 19(2):192-7. Available at: http://www.facenf.uerj.br/v19n2/v19n2a04.pdf
12. Pereira MS, Alves SB, Souza ACS, Tipple AFV, Rezende FRR, Rodrigues EG. Gerenciamento de resíduos em unidades não hospitalares de urgência e emergência. Rev. Latino-Am. Enfermagem. 2013; 21(Spec):259-266. DOI: http://dx.doi.org/10.1590/S0104-11692013000700032
13. Mesquita MGR, Paes GO, Nascimento ND. Segurança e sustentabilidade no gerenciamento dos resíduos de saúde em unidades hospitalares. Rev Enferm UFPE online. 2015; 9(1):248-52. DOI: https://doi.org/10.5205/1981-8963-v9i1a10332p248-252-2015

Received in: 30/09/2018
Required revisions: 20/03/2019
Approved in: 18/05/2019
Published in: 15/03/2021

Corresponding author
Patriny Marcelle Mariano Gomes
Address: Rua Donatello, 260, Guaratiba
Rio de Janeiro/RJ, Brazil
Zip code: 23028-210
Email address: patrinyb@gmail.com
Telephone number: +55 (21) 98385-6442

Disclosure: The authors claim to have no conflict of interest.