

## Profile of nursing students on medical waste management

*Perfil de acadêmicos de enfermagem no manejo dos resíduos de serviços de saúde*

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### Abstract

The aim of this study was to analyze the conduct of nursing students on medical waste management in their workplace. This is an exploratory, quantitative, descriptive and cross-sectional study with nursing students performing practical activities or supervised internship in hospitals located in the northern region of the state of Rio Grande do Sul, Brazil. It was verified that the participants had difficulty in identifying and classifying waste groups as mandated by the current legislation (RDC Anvisa n. 306/04). Based on this study, it was found that is essential for future professionals to be aware of actions associated with medical waste management, because nurses are familiar with the service provided to health service users and the waste generated by this service.

**Keywords:** Nursing. Education. Environmental education. Waste management. Medical waste.

### Resumo

O objetivo deste estudo foi analisar a conduta dos acadêmicos de enfermagem com relação ao manejo dos resíduos de serviços de saúde nos seus locais de atuação. Trata-se de um estudo quantitativo exploratório, descritivo e transversal com acadêmicos de enfermagem inseridos em atividades práticas ou em estágio supervisionado em hospitais localizados na região Norte do estado do Rio Grande do Sul, Brasil. Verificou-se que os participantes tiveram dificuldades em identificar e classificar os resíduos por grupo conforme a legislação vigente (RDC Anvisa n. 306/04). A partir deste estudo constatou-se que é fundamental para os futuros profissionais conhecer as ações relativas ao manejo dos resíduos de serviços de saúde, pois o enfermeiro é conhecedor do serviço dispensado ao usuário e dos resíduos gerados a partir desse serviço.

**Palavras-chaves:** enfermagem. Educação. Educação ambiental. Gerenciamento de resíduos. Resíduos de serviços de saúde.

## 1 INTRODUCTION

Environmental education has been currently discussed in the realm of health, specially addressing the medical waste (MW) generation (MACEDO ET AL, 2007; CORRÊA AND, LUNARDI AND, SANTOS, 2007; BESERRA et al, 2014; LEONEL, 2002). Medical waste when handled improperly can pose risks to the environment and to the public health. Thus, health professionals should develop activities that seek to minimize risks to the environment and to the health of workers and the general population (CORRÊA AND LUNARDI, AND SANTOS, 2007). Among these activities is the development of a medical waste management plan (MWMP), which is a mandatory document that must be prepared in a manner consistent with local regulations regarding the collection, transportation and disposal of waste, established by the local bodies in charge (BRASIL, 2004).

Undergraduate health courses must be prepared to train professionals so as to enable them to discuss and develop a management plan, as well as understand the actions proposed in the MWMP and implement them. Thus, environmental education given during the undergraduate nursing course should not be associated only with the knowledge of nature, but also with the possibility of widening citizens' political participation (REIGOTA, 1994). This is because environmental education is an essential and permanent component of national education. It must be present in a coordinated manner at all levels and modes of the educational process (BRASIL, 2002). Undergraduate nursing students generate medical waste during their academic activities, because in general the development of practical activities is intended to assist health service users. So it is necessary to put the issue in the training of future professionals, without leaving aside concern for occupational health and the environment (CAMPONOGARA et al, 2011).

It is widely accepted that medical waste poses a risk at three levels: the occupational health of those who handle it; the increase in the rate of nosocomial infection, and damage to the environment (SCHNEIDER AND RÊGO AND, ORLANDIN, 2001; NAIME AND BARBISAN, 2013). This is why it is important for undergraduate nursing students to correctly manage medical waste in practical activities or supervised internships.

This study is part of the "umbrella" project entitled: *Profile of undergraduate students and health professionals in the management of solid medical waste*, and it aims at analyzing the behavior of undergraduate Nursing students and health professionals on medical waste management at the units of curricular activities in hospitals located in the north of the state of Rio Grande do Sul, Brazil.

## 2 METHOD

This research was conducted according to the regulations of the National Research Ethics Committee, in compliance with Resolution No. 446/2012 of the National Health Council (BRASIL, 2012). The project was approved by the Research Ethics Committee of the Federal University of Santa Maria, technical report No. 20850. The subjects were invited to participate in the research and signed the consent form.

This is a quantitative, descriptive/exploratory, cross-sectional study. Descriptive/exploratory studies are used to collect detailed descriptions of the existing variables, and justify or evaluate current practices according to the data collected (LOBIONDO-WOOD AND HABER, 2001). The research was conducted with undergraduate nursing students from a Federal University, located in the northern region of the state of Rio Grande do Sul. As inclusion criteria for this study, the selected participants were undergraduate Nursing students of the aforementioned institution, engaged in practical activities and/or supervised internship, who had been attending the fifth and seventh academic semesters. Data collection was conducted by means of a questionnaire, covering basic questions about medical waste management. The development of the questionnaire was based on current legislation that addresses the issue (BRASIL, 2004). The subjects answered the questionnaire during the class period, in the same location, depending on availability.

### 3 RESULTS AND DISCUSSION

The study included fifty-six (56) subjects, twenty-five (25) students of the fifth semester (Group I) and thirty-one (31) students of the seventh semester (Group II). Data collection lasted for one day for each group of students. All the students who were present on the day of collection agreed to participate in this study. A given amount of time was requested during the class period to present the project, answer participants' questions, read the Terms of Informed Consent (IC) and administer the questionnaire.

The first part of the questionnaire consisted of demographic questions, which revealed that 86% of the subjects in the study were women and 14% were men. The reported average age was 24 years, ranging between 19 and 40 years.

The other sections of the questionnaire contained specific questions about medical waste management (MWM). These questions were based on Resolution RDC N.306/04 of the National Health Surveillance Agency (ANVISA) (BRASIL, 2004). Among the students of the fifth semester, 72% had received orientation on the subject, 72% in class and 28% in the work placement. As for the scholars of the seventh semester, 97% had received such orientation: 83% in class and 17% in the work placement. About the final destination of medical waste, 56% of the fifth-semester students reported that each type of waste receives the proper treatment; 24% do not know the destination of medical waste; 16% said that medical waste is incinerated and 4% said that it is discarded at dumps. For 77% of the students of the seventh semester, the treatment applied to each type of medical waste is considered to be appropriate; 16% do not know the destination; 3% said that medical waste is discarded at dumps and 3% said that it is incinerated.

As for the classification of medical waste, 48% of the students of the fifth semester partially know the classification, 44% are unaware of it, and only 8% know the classification entirely. 71% of the students of the seventh semester claimed to know it partially, 16% know the classification, 13% do not know it or did not answer the question.

Questions associated with Groups A and E are presented sequentially, because these groups represent the share of medical waste considered to be infectious (BRASIL, 2004).

As for the composition of Group A, 8% of the students of the fifth semester answered correctly and 28% did not. Out of those students who answered incorrectly, 20% confused it with waste from group B, 4% with that from group C and 4% with waste from group D. The remaining students (64%) were not aware of the composition of group A. 26% of the students of the seventh semester knew the composition of the group while 45% answered incorrectly. Out of those who answered incorrectly, 23% confused it with group B, 16% with group C and 16% with group D. 29% of them did not know the answer.

8% of the students of the fifth semester answered about the composition of Group E correctly, 24% gave incorrect answers, and 68% did not know the answer. All the subjects who made a mistake marked the alternative corresponding to the components of Group A. In the seventh semester, 23% of the students answered correctly, 32% answered incorrectly, and 45% did not know the answer. Again, the subjects who did not answer correctly selected the option associated with the components of Group A.

The waste classified as Groups B, C and D corresponds to non-infectious waste or waste whose treatment and final destination was differentiated because of their composition (for example, radioactive or chemical waste) (BRASIL, 2004).

As for the composition of Group B, 8% of the students of the fifth semester answered correctly and 24% did not; 16% of the latter confused it with Group A and 8% with Group C. 68% of them did not know how to answer the question. A total of 39% of the students of the seventh semester did not know the answer, 42% made a mistake by confusing the composition with other groups (32% with group A and 10% with group D) while 19% answered correctly.

As for Group C, 68% of the students in the fifth semester were unable to answer and 32% answered incorrectly. Out of these, 28% confused it with the composition of Group E and 4% with that of group D. 6% of the students of the seventh semester answered correctly, 39% did not know the answer, and 55% answered incorrectly. The subjects who answered incorrectly marked the alternatives associated with the compositions of Groups E (32%), D (10%) and A (13%).

As for the composition of Group D, 68% of the students of the fifth semester did not know

the answer and 12% answered correctly. The other students answered the question incorrectly; for 12% of them, the group was composed of waste from Group B and for 8% of them, it was composed of waste from Group A. 26% of the students of the seventh semester answered correctly, 39% were unaware of the composition of the group and 3% did not answer the question. Besides, 32% of them answered incorrectly; 13% of these confused the composition of the group with that of Group B and 18% with waste from Group A.

Table 1 briefly shows the percentage of correct answers to the questions about the composition of the waste groups.

**Table 1 – Answers about the composition of waste groups according to Resolution RDC N.306/04.**

	<b>5th semester</b>	<b>7th semester</b>
<b>Group A</b>	8%	26%
<b>Group B</b>	8%	19%
<b>Group C</b>	0%	6%
<b>Group D</b>	12%	26%
<b>Group E</b>	8%	23%
<b>Average</b>	7%	20%

The students were also asked about the stages of the medical waste management plan (MWMP). None of the students of the fifth semester answered this question correctly. Only 45% of the students of the seventh semester knew the management steps.

The survey results made it clear that students have difficulty in identifying the waste groups. Such difficulty impairs waste sorting, because lack of awareness of the correct way to sort waste may result in incorrect disposal, thus endangering the health of all professionals involved, as well as public health and the environment.

It was also observed that most students of the fifth semester (72%) and the seventh semester (97%) had received orientation on medical waste management. It should be noted that it is important to know the management stages, because it is during these steps that all waste coming into contact with infectious material must be treated as such. This requires specific procedures for the storage, collection, transportation and final disposal and, thus, there are increased costs for treating this waste (GARCIA AND, RAMOS, 2004). If these steps are followed properly, the amount of waste and the costs for treating and disposing of the infectious waste can be reduced (PILGER AND, SCHENATO, 2005).

The question about the final destination of medical waste raised a great deal of doubt about this topic, and a significant percentage of the students do not know the correct destination (44% of students of the fifth semester and 23% of the seventh semester). Currently, the most commonly used forms of treatment before the final destination of medical waste are autoclaving, incineration and microwaving (DIAZ AND SAVAGE, AND EGGERTH, 2005; LEE AND, ELLENBECKER AND, MOURE-ERSASO, 2004; ALAGÖZ AND KOCASOY, 2007; PRUSS AND GIROULT AND, RUSHBROOK, 1999).

Autoclaving has great efficiency, but it does not reduce the volume of waste generated. In fact, the volume may even increase as a result of the water vapor, present in the process, which can be absorbed by the waste (DIAZ AND SAVAGE, AND EGGERTH, 2005). Besides, after the treatment, the waste may produce manure at the disposal site even though it is disinfected because its constitution was not changed, only its pathogenicity (ELEUTÉRIO AND HAMADA AND, PADIM, 2008).

In contrast, incineration is defined as a physical-chemical process of oxidation at elevated temperatures which results in transforming materials by reducing waste volume and destroying organic

matter (BRASIL, 2006). This process aims at disposing of hazardous waste that can cause damage to the environment or people's health, if not managed properly (PACHECO AND HEMAIS AND, FONTOURA AND RODRIGUES, 2003). This process reduces the physical volume of waste, but gases, ash and slag are generated, and liquid effluents are also generated from the activity of this type of treatment (ELEUTÉRIO AND HAMADA AND, PADIM, 2008). In addition, ash and slag contain heavy metals at high concentrations and cannot be disposed of in landfills. They should be taken to a special landfill for hazardous waste (ELEUTÉRIO AND HAMADA AND, PADIM, 2008). Effluents generated by the incineration system must meet the pollutant emission limits established by the current environmental legislation (ELEUTÉRIO AND HAMADA AND, PADIM, 2008).

In microwaving, the waste is subjected to microwave radiation for 30 minutes in a preheated chamber. Thus, it is kept at a minimum temperature of 93 °C to ensure disinfection. However, the microwave treatment is not sufficient for sterilization, because some microorganisms can survive in the form of spores (DIAZ AND SAVAGE, AND EGGERTH, 2005).

Waste from Group B should be treated as chemicals and go through decharacterization processes before the final destination (BRASIL, 2005). The treatment of waste from Group C - Radioactive Waste is storage under appropriate conditions, for the decay of radioactive elements (PRUSS AND GIROULT AND, RUSHBROOK, 1999). Later, the waste must be sent to a hazardous waste landfill class I (BRASIL, 2004). Waste from Group D is sent to common landfills, but there is a large share of such waste can be sorted just like recyclables.

As for results for the questions about the composition of waste groups, it was found that the students of the seventh semester had a higher number of correct answers, when compared with students of the fifth semester, as shown in Table 1. One possible cause for this result is the higher percentage of students of the seventh semester who had received orientation on medical waste management, as previously reported. In addition, students of the seventh semester had more practical experience in academic activities compared with students of the fifth semester.

#### 4 CONCLUSION

The application of this study allowed the identification of the difficulties that nursing students have regarding medical waste management. Thus, it was concluded that it is essential for future professionals to be aware of actions associated with medical waste management, because nurses know the service they provide to health service users and the waste generated from this service, for example: gauze, gloves, cotton, several types of paper, medication vials and ampoules, syringes, among others. Moreover, nurses work on a team and can identify the simple and complex aspects of waste management. However, this can take place provided that medical waste management is in the basis of nursing training and is included as a topic for debate in curricular courses.

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