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Short Communication

Radioactive Hospital Waste: A Matter of Security and Knowledge

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Abstract

In General, hospitals and clinics use equipment that can generate radioactive waste, i.e. material with radionuclide content inappropriate for the environment and harmful to public health. The overall objective of this study is to highlight the consequences of incorrect handling and disposal of hospital material containing radioactive elements can bring to people's lives and to stress the need for more studies and public policies for control and dissemination of knowledge between employees and the public to use such services.

INTRODUCTION

To start the discussion, it is necessary to stress that is said as radioactive tailings, any material resulting from human activities, which contains radionuclide's in amounts exceeding the exemption limits specified by the standard of the CNEN (NE-6.02) [1], and for which the use is improper or unexpected ". All materials, products that fit in this specification if it is not collected, treated and/or stored properly can result in accidents, as has occurred in the case of Brazil the accident with cesium 137 in the year 1987 [2].

Health care waste, constitute about 2% of the total volume of waste generated, and risks of exposure, both of workers as users, primarily by infectious waste and radioactive waste. The radioactive waste is generated by health service providers, resulting from the use of radioactive substances non-sealed for therapeutic, diagnostic and research [3]. This generation is due both to the planned works as to the tasks of cleaning materials and work areas in case of incident, such as spills and vomiting of patients treated with radioisotope investigation on the procedures involving the disposal of radioactive waste generated in some treatments used in nuclear medicine and still a matter controversy and little discussed, as reports some authors [4,5]. These authors point out the importance of the actions of teams, especially nursing, on precautions and management of hospitalization in nuclear medicine examinations and treatments, as the process of decay and destination of the radioactive waste. It is important that such teams are aware the values of doses and their effects with internationally established dose limits.

In Brazil the body responsible is the National Nuclear Energy Commission (CNEN) [6] that receives and stores, in his institutes, disused radioactive sources from places like hospitals, clinics, research centers and medical industries. These materials are transported in accordance with special regulations, processed and stored according to international safety standards recommended by the International Atomic Energy [7].

MATERIALS AND METHODS

The template used in this research was the systematic review of published studies, where the inclusion criteria were established in advance in the definition of the words of interest and studies acceptable.

A literature review was performed in indexed journals, books, textbooks, theses and dissertations, seeking to obtain all the necessary information and relevant to the study of perceptive about risk of radioactive waste, in the last ten years.

DISCUSSION

It is essential to the recognition of potential risks in the handling of radioactive elements, which underlines the need to determine the level of radiation in the activities that require use of radioactive materials by means of monitoring procedures. Since 1950, the radioisotope ^{131}I is one of the most commonly used radionuclides in nuclear medicine, being considered "universal tracer", and the first radionuclide approved for use in the United States by the National Council of Radiation Protection and monitoring (National Council on Radiation Protection and Measurements [8], in the form of sodium iodide. Because of such limitations, dose is required of the hospital unit's deployment and execution of a Radioactive Waste Management Program, Radioactive Waste Management Program. The deployment of a Radioactive Waste Management Program is the responsibility of the direction of the establishment and health provider must not contemplate only the experimental steps of the procedures to be adopted, but also to define and document the responsibilities of professional staff involved in management of radioactive waste through standard operating procedures. Another tool that the hospital units must make available to the nursing staff is standard operating Procedures Manual therapies used; discuss

basic concepts and operational procedures of these therapies, in order to provide protection to health professionals, patients and the environment. The importance of the training of professionals involved in the activities of radiation is highlighted by [5], who worked with radioactive iodine therapy for 20 years, suggesting the drafting of manuals and videos as educational references so that they are permanently available at the nursing station in inpatient unit. In Table 1 are the annual equivalent dose limits for workers and the public.

However, there are clinics and hospitals still do not follow correctly the standards for handling, disposal and interim storage, internal and external, of the radioactive material used, people and the environment run risk of acquiring diseases and contamination, respectively. Surveillance, which should be rigid, for part of the CNEN, seems not to be appropriate for numerous factors; such as politics, lack of trained personnel, etc [7].

And important to note that in Brazil, the national agency of sanitary surveillance (ANVISA) classifies the waste generated by the hospital services in five groups. The group is represented by potentially polluting material, biological waste Group B is represented by chemical waste, the Group C is composed of radioactive tailings, contaminated with radionuclides, in Group D are common waste that require no special treatment; and in the Group and are considered sharps waste, as objects and instruments that can cause accidents and contamination [9].The amount of radionuclides that can be contained in the tailings of the Group C is established by the National Nuclear Energy Commission (CNEN). These tailings from clinical laboratories, radiotherapy and Nuclear Medicine and cannot be reused under any circumstances. Need to receive prior treatment before being stored, either temporarily, as final and cannot be handled without the compliance with safety regulations [10-13].

According to the law, the CNEN 10,308/2001 is responsible for initial, intermediate and final deposits of radioactive waste produced in the national territory, with her design, build and install the intermediate and final deposits [14]. Nuclear power plants, hospitals, industries are among the biggest generators of these tailings that following the norm CNEN-NE-6.05 can be divided into the following classes:

Class 0: Waste Free

Feature radionuclides with activity values in mass or volume, lower than the levels of exemption set out in the standard CNEN-NE-6.05 [15].

Table 1: Primary annual equivalent dose Limits.

Equivalent Dose	Worker	Public
Effective * - He	50 mSv	1 mSv
Organ OR Tissue - HT	500 mSv	1 mSv / W_T*
Skin	500 mSv	50 mSv
Ends	500 mSv	50 mSv
Lens of Eyes	150 mSv	50 mSv

*WT: Weighting Factor: considers the degree of damage that an organ would cause independently for the whole body
Source: CNEN NE 3.01 (2005)

Class 1: Waste of half life too short

Waste with a half-life of 100 days or less, with higher activity levels and discharge levels that can meet within a period of 5 years the criteria for exemption laid down by the CNEN-NE-6.05 [15].

Class 2: Low and medium-Level Waste

Waste with a half-life of 100 days or less, with higher activity levels and discharge levels that can meet within a period of 5 years the criteria for exemption laid down by the CNEN-NE-6.05.

Class 3: High-level Waste

Tailings with concentrations of radionuclides long half-life in excess of the limitations for classification as rejects from short half-life. Consists of solid and liquid fuel used in nuclear power plants.

The final destination corresponds to the stage of external management, consists in the provision of such waste at sites structured in accordance with the requirements of the competent environmental agencies, and must receive the prior treatment according to their specific features before they are forwarded to the final provision [16]. You must evaluate the residues for checking the degree of radiation, and if it is above the unhealthy value send to decay. This process is the period in which the radioactive tailings, is packaged in an appropriate place to lose your dangerousness, not showing more risk factor to the individual and the environment. The radioactive waste, depending on your class, must pass through decay step up to meet the criteria for release to the environment as per the [15] and subsequently the disposal via municipal collection of urban waste (solid) or depletion sanitary (liquids) [17].

RISKS: PERCEPTION

With the advance of new technologies, the advantages of modernity, the perceptive process of individuals including way of looking at the environment and prospects have changed, the various phenomena that emerged from the technological process affecting the environment and these stocks can be perceived revealing a concept of risk for each individual. Risk perceptions of the people involve an additional valuation process facing the risk, which includes an evaluation in a sense of the seriousness of the risk, no matter where the presence or absence of fairness of the effects. She also corresponds to a certain intuitive estimate of risk undertaken by individuals or social groups, namely, an estimate that is not based on mathematical calculations of probability or magnitude, but it is a balance of various risk characteristics and the context in which he If inserts. It is appropriate to point out that the new paradigms of science have been diverted from exclusively scientific tradition. The reflexivity matter driving scientific initiatives in an analogy between partially objective considerations and partially subjective. Decisions seek to consider for now, too, the ethical issue in studies and scientific discoveries. In doing so, the concerns are focused on minimizing impacts to human health and the environment, giving credibility to the acceptability of the risks which depend on the perception of the risk estimated by the opinions and attitudes of the public. In addition to the alleged contribution, in a parallel vision, it

becomes clear the need to consolidate the following challenge: the implementation of public policies in the nuclear sector for the development of actions of clarification along to people who use services and primarily to developers who work daily in areas of potential risk. And, finally, conceive the idea that there is a constant search for safety in hospital sectors in General who crave new search procedures/treatments that aim to minimize the suffering and extending human longevity. However, it is clear the new policies, and inspection requirements for the procedures and safety standards to be implemented and followed by such a way to cause a full benefit.

FINAL CONSIDERATIONS

Rosa describes in your research where espoem the qualitative, quantitative and clinical waste management, "it is necessary to draw up a strategy that results in an improvement in the management of this waste [18,19]. This improvement has to be drawn up in line with existing legislation and guidelines based on tools that are beginning to make more clear and agile the processes involved in the implementation of solid waste management in health. And the implementation of a program of continuing education and permanent education to implement efficiently the normative precepts about the appropriate management of solid waste of health, with a view to transform practices that constitute the current institutional culture. A transformative process of this size can only be possible with the action on the part of managers of consistent policies that have the function of disseminating the knowledge and educate workers about individual and collective risks that inappropriate management can lead ".

Mousquer analyzing the medical services and nuclear research in Porto Alegre, RS, points out that the results of your study made it possible to analyze the attendance of legal restrictions on the licensing process [20]. Verified the existence of irregularities in the temporary storage of waste, lack of knowledge regarding the quantification of radioactive materials and the radiation protection mechanisms adopted. What comes to confirm on the alert to the need for policies aimed at the monitoring and the efficiencies of the existing laws.

There is a need for that in hospitals and in clinics providing Nuclear medicine services to occur greater dissemination of knowledge in the field of radiological protection, for all use of ionizing radiation, the standards must be laid down and followed to respect the basic principles of radiation protection during their manipulation. It can be concluded that most of the non-conformity is bureaucratic. The independence between monitored and watchdog, the distribution of information and the maintenance of the inclusive process are bureaucratic problems requiring issuance of regulatory acts to be solved, but also of knowledge about procedures for radioactive waste drops, where many of the workers have not seen or have little knowledge. Procedures such as regular courses and lectures on the subject should be part of the daily life of all health establishments, but unfortunately, that does not happen. Coelho in your article on radioactive waste management, propose a formulation in managing, structuring and in the routine of work adapting them to the conditions and limitations of the nuclear medicine Department for her review [21]. Suggests follow-up through "on the job" training for the technicians of the Nuclear Medicine Service, so that the management can be absorbed into the routine of service without causing major changes and/or disorders and have your quality maintained over time, where streamlines the documentation required by the CNEN-NE-6.05, seeking a better match.

REFERENCES

1. CNEN. National Commission of Nuclear Energy. Licensing of Radiating Installations - CNEN Standard NE-6.02. Brazil. 2002.
2. IEN. Institute of Nuclear Engineering. Receipt of radioactive tailings. IEN, Products and Services. 2012.
3. dos Santos Leal TC, Crispim VR, Frota M, Kelecom A, da Silva AX. Use of a bioindicator system in the study of the mutagenetical effects in the neighborhoods of deposits of radioactive waste. Appl Radiat Isot. 2008; 66: 535-538.
4. Costa WM, Fonseca MCG. The importance of hospital waste management and its positive aspects to the environment. Hygeia. 2009; 5: 12-31.
5. Thompson MA. Radiation Safety Precautions in the Manegement of the Hospitalized 131I Therapy Patient. Journal of Nuclear Medicine Technology. 2001; 29: 61-66.
6. CNEN. National Commission for Nuclear Energy, 2005. Limits of tolerances - Standard CNEN NN -3.01, Brazil.
7. Oliveira AM, Carvalho PRSF. Analysis of the management of waste and radioactive waste from a nuclear medicine clinic in Teresina -PI. CONNEPI. 2010.
8. NCPR- National Council on Radiation Protection and Measurements. Limitation of exposure to ionizing radiation: recommendations of theNational Council on Radiition Protection and Measurements. 1993.
9. ANVISA. National Health Surveillance Agency provides for the Technical Regulation for the management of waste of health services. 2004.
10. NETO GCO, Shibao FY. Management of Infectants and Radioactive Waste in Three Hospitals of São Paulo: Performance Indicators for Process Control. 2013.
11. BRASIL. Ministry of Health. Management of health service waste. Brazil. 2006.
12. Monteiro IHTS. Determination of the environmental and occupational dose rates of gamma radiation, as a consequence of the presence of RDS-111 and the IEN / CNEN Radioactive Waste Repository. Dissertation (Sciences in Nuclear Engineering). Rio de Janeiro. 2005.
13. CNEN. National Commission for Nuclear Energy. Management of Radioactive Rejection of Low and Medium Levels of Radiation_ Standard. Brazil. 2014.
14. Xavier AM. Radioactive tailings management. Rio de Janeiro: CNEN. 2012.
15. CNEN. National Nuclear Energy Commission, 2014 Radioactive Rejects. Brazil.
16. Takayanagui AMM. Waste management of health services. In: PHILIPPI JR. A. Sanitation, health and the environment: foundations for sustainable development. São Paulo. 2005; 323-374.
17. National Commission for Nuclear Energy. Radioprotection and safety requirements for nuclear medicine services. Rio de Janeiro. 1996.
18. Cussiol NAM. Final disposal of potentially infectious waste from health services in special cells and by co-disposal with urban solid waste. Belo Horizonte: 2005. Thesis (Doctorate in Sanitation, Environment and Water Resources) - Department of Sanitary and Environmental

Engineering and Department of Hydraulic Engineering and Water Resources. Federal University of Minas Gerais. 2005.

19. Rosa FR. Diagnosis of waste management in a hospital in the Rio Pardo Valley. Rio Pardo Valley. Masters dissertation. University of Santa Cruz do Sul. 2016.

20. Mousquer AC, Garrafiel GF, Rossoni RB. Diagnosis of the management of radioactive waste from the medical and nuclear research services in Porto Alegre-RS. Blucher Engineering Proceedings. 2016; 3: 887-896.

21. Coelho. Rosangela Franco. Implementation of radioactive waste management system in the nuclear medicine service of unicamp clinic hospital. Synthesis: SIMTEC Electronic Magazine. 2016; 171-171.

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