



The development of a protocol for emergencies involving sources of ionizing radiation at nuclear medicine sites

O desenvolvimento de um protocolo em emergências envolvendo fontes de radiação ionizante em locais que operam com medicina nuclear

Giovanni Mouta Giglio

Alexandre Luís Belchior dos Santos

Márcia Motta Pimenta Velloso

ABSTRACT

Decree No. 2.648 of the Presidency of the Republic, of July 1, 1998 (D.O. DE 02/07/1998, P. 1), which promulgates the Protocol to the Convention on Nuclear Safety (BRASIL,1998), signed in Vienna on September 20, 1994, establishes in Chapter 1, as one of the objectives of the convention: " II) to establish and maintain effective defenses in nuclear installations against potential radiological damage, in order to protect individuals, society and the environment from the harmful effects of ionizing radiation originating from these installations;"

Keywords: Radiation, Nuclear, Civil Protection and Defense.

RESUMO

O Decreto nº 2.648 da Presidência da República, de 1º de Julho de 1998 (D.O. DE 02/07/1998, P. 1), que promulga o Protocolo da Convenção de Segurança Nuclear (BRASIL,1998), assinado em Viena, em 20 de setembro de 1994, estabelece no capítulo 1, como um dos objetivos da convenção: “ II) estabelecer e manter defesas efetivas em instalações nucleares contra danos radiológicos potenciais, de forma a proteger indivíduos, sociedade e meio ambiente dos efeitos nocivos da radiação ionizante originária dessas instalações;”

Palavras-chave: Radiação, Nuclear, Proteção e Defesa Civil.

1 INTRODUCTION

Decree No. 2.648 of the Presidency of the Republic, of July 1, 1998 (D.O. DE 02/07/1998, P. 1), which promulgates the Protocol to the Convention on Nuclear Safety (BRASIL,1998), signed in Vienna on September 20, 1994, establishes in Chapter 1, as one of the objectives of the convention: " II) to establish and maintain effective defenses in nuclear installations against potential radiological damage, in order to protect individuals, society and the environment from the harmful effects of ionizing radiation originating from these installations;"

The National Civil Protection and Defense Policy (PNPDEC) (BRASIL, 2012) establishes that civil protection and defense throughout the national territory encompasses prevention, mitigation, preparedness, response and recovery actions.



The purpose of this study was to encourage the creation of a protocol, with the aim of contributing to this process. The mapping of nuclear medicine sites, as well as the sources of ionizing radiation used, will provide input for a practical and objective protocol for not only responding to, but also preventing and predicting the risks of accidents and disasters.

In nuclear medicine, which is widely used in the state of Rio de Janeiro, there are various radiological materials stored in the state's various clinics and hospitals. However, there is no protocol for Civil Defense to act in the event of accidents or incidents involving radiopharmaceuticals.

2 OBJECTIVE

To verify the possibility of developing a protocol for civil protection and defense agents to respond to radiological emergencies and disasters in nuclear medicine.

3 METHODOLOGY

Applied research in terms of purpose, which set out to carry out bibliographical research and data collection to solve concrete problems observed during the research, verifying the proposition of a protocol that promotes safety on the subject, awareness and increased risk perception of the target audience (emergency response agencies and the general population), in order to minimize damage and losses.

As for the means, this study carried out a bibliographical survey, based on legislation, books and published articles, according to the theoretical framework, using a qualitative approach method

4 DEVELOPMENT

The International Atomic Energy Agency (IAEA) and the National Nuclear Energy Commission have several technical documents dealing with radiation safety in facilities, and private companies such as Eletronuclear and research institutes have verified and recognized technical procedures on the subject.

The International Atomic Energy Agency (IAEA) defines a radiological emergency as any event involving a radioactive source/material that could result in significant human exposure and/or material damage. And an adverse event of a radiological nature is one of the possible emergencies that make up nuclear emergency scenarios.

In nuclear medicine, which is widely used in Rio de Janeiro, there are various materials of a radiological nature that are stored in the various clinics and hospitals in the municipality and state. However, there is no protocol for civil defense in the event of accidents or incidents involving radiopharmaceuticals.

Care for radioactive patients must comply with criteria such as the level and type of contamination (internal or external). The National Nuclear Energy Commission (CNEN) must carry out radioactivity measurements on patients and in locations affected by the nuclear event.



In the state of Rio de Janeiro there are several clinics and hospitals that use radioisotopes for diagnostic and therapeutic purposes in nuclear medicine, such as those used in cancer treatment Civil Defense to act in the event of accidents or incidents involving radiopharmaceuticals.

Mapping these locations is therefore necessary in order to build an integrated civil defense protocol, involving various agencies that will take part in first response actions and which are essential for minimizing the consequences generated by incidents and accidents, sometimes of the magnitude of disasters of this nature. The International Atomic Energy Agency (IAEA) defines a radiological emergency as any event involving a radioactive source/material that could result in significant human exposure and/or material damage. And an adverse event of a radiological nature is one of the possible emergencies that make up nuclear emergency scenarios.

In nuclear medicine, which is widely used in Rio de Janeiro, there are various materials of a radiological nature that are stored in the various clinics and hospitals in the municipality and state. However, there is no protocol for civil defense in the event of accidents or incidents involving radiopharmaceuticals.

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It is increasingly necessary to develop and disseminate a safety culture and protocols, reflecting on current methods and updating them. Protocols involving radiation safety must be created and continuously improved, exposing possible vulnerabilities in order to propose new variables and minimize risks to human beings, property and the environment.

The individual experience of civil protection and defense agents who work in this area, as is the case of the authors of this article, shows that the practice of this professional needs to be valued and is important to assist in decision-making, but not in isolation, and that science, research and current techniques must be applied as foundations.

Protocols for responding to radiological incidents and accidents in nuclear medicine are essential for safely conducting activities involving substances emitting ionizing radiation in various areas of professional activity. The protocol must be effective and the consequences of an accident can be limited and/or minimized by identifying and assessing potential accident situations.

An adequate response must be guaranteed to prevent or aggravate exposure of the general public and workers, with emergency procedures in line with the nature and intensity of the risk involved. Solving the emergency is an interdisciplinary and inter-institutional process involving public and private organizations from the three spheres of government with their own peculiarities, combining skills and efforts.



The damage to physical and mental health, the economy and the environment goes beyond the moment the disaster occurs, generating negative effects over time, especially for the residents of the affected region and its surroundings.

Integration and coordination between agencies and entities is provided for by law, based on general rules and federal, state and municipal legislation, as well as specific rules for each agency. To this end, it is necessary to have a document that integrates this information and is the azimuth for managing the situation.

This protocol does not exist within the scope of municipal and state civil defense, so this proposal seeks to eliminate this gap for the safety of the population as a whole.

It is worth noting that Decree No. 46,935 of February 12, 2020, which establishes the State Civil Protection and Defense Policy, provides for radiological monitoring and that the Sendai Framework for Disaster Risk Reduction 2015-2030 provides for Understanding Disaster Risk as priority number one.

It also repeatedly points to the need to promote global, national and local policies and strategies that include disaster risk reduction knowledge in formal and non-formal education at all levels, seeking and reinforcing public education and awareness.

The Brazilian Codification of Disasters (COBRADE) foresees a radiological accident (2.2.3.1.0) as a technological disaster:

Subgroup: 1. Disasters related to radioactive substances; distributed in 3 subgroups:

- Sidereal disasters with radioactive risks - Satellite fall (radionuclides);
- Disasters involving radioactive substances and equipment used in research, industry and nuclear power plants - Radioactive sources in production processes;
- Disasters related to the risk of intense environmental pollution caused by radioactive waste - Other sources of release of radionuclides into the environment. Thus, when any of these situations occur, the National Civil Defense System can declare a State of Emergency (SE) or a State of Public Calamity (ECP).

For the health sector, when a nuclear emergency (SE or ECP) is declared/recognized by the National Civil Defense, the Ministry of Health must assess the situation and declare a level III Public Health Emergency (PHE), as described below:

Level III: the risk is significant, exceeding the response capacity of the affected or threatened localities, and/or when the threat is of national relevance with a high impact on the health of the affected population, requiring a broad government response. This event constitutes an exceptional situation of potential seriousness, or seriousness that has been established, and may culminate in the declaration of a Public Health Emergency of National Concern (PHEIC) and/or if the situation is classified as a potential Public Health Emergency of International Concern (PHEIC), the World Health Organization must be notified.



5 FINAL CONSIDERATIONS

According to the research and studies carried out, it was found that all radio accident victims must undergo screening, initially based on clinical and surgical severity criteria (trauma, burns, etc.).

The patient's clinical stabilization must precede any decontamination process and must be a priority in clinical care, regardless of radiological exposure. And the procedures for decontaminating radio-accident victims and their belongings will be instructed by CNEN.

The removal of radio-accident patients must be carried out by teams specifically trained for this type of activity, after the patient has been decontaminated, with specific training and equipment.

Depending on the magnitude of the event, a reference hospital network should be designated with the capacity to provide care, to be designated by the Ministry of Health in partnership with the institutions that are part of the Brazilian Nuclear Program Protection System.

The results obtained from the literature review indicate, according to the data collected and some of which is presented in this paper, that there is a real need to draw up a protocol for dealing with radio accidents so that the various agents involved, especially those working in civil protection and defense, have their actions standardized when responding to incidents and disasters, which could be developed in future work continuing this research.



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