

ASSESSMENT OF RADIATION EMERGENCY PREPAREDNESS IN NUCLEAR MEDICINE ABAZA A.

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ABSTRACT

Radiological accidents can have a lasting impact on public health. Because of the increasing risk of radiological emergencies, public health agencies and first-response organizations are working to increase their capability of responding. Nuclear medicine technologists (NMTs) have expertise in certain areas, such as radiation safety, radiobiology, decontamination, and the use of radiation detection and monitoring equipment, that could be useful during the response to events that involve radiological materials. Medical staff and worker personnel in the nuclear medicine department and in other department using radioactive materials needs to increase their knowledge about how to deal safely with the equipment, early and late hazards of exposure to radiation, and how to safe patients and themselves from radiation exposure or from contamination to radioactive substance. The purpose of this study was to assess the willingness and knowledge of NMTs, medical staff and Emergency medical response team to participate in radiological emergency preparedness and response operations and to determine what radiation detection, measuring, and imaging equipment they would have access to during an event at their workplace. The study also assessed whether years of work experience or past radiological emergency preparedness training had an effect on willingness and knowledge. A survey was sent electronically to the 500 members in the Department of Nuclear Medicine and Molecular Imaging in different medical centers, to some laboratory that use nuclear material and to the emergency department in some hospitals. 57 respond to the survey with response rate 11.4%. Survey results suggest that NMTs are having some knowledge and willing to respond to radiological emergencies, regardless of number of years of work experience. But this knowledge needs more studying and exercising.

The current study concluded that the initial response to a radiological emergency may include radiation detection, population monitoring, decontamination, and dose assessment. Knowledgeable, willing, and prepared individuals will be needed to assist with a response of this nature. Public health agencies will need to coordinate with NMTs and draw on their expertise and knowledge to strengthen the community's capability of responding to a radiological or nuclear emergency. Public health agencies and first-response organizations are working to build the capacity to respond to emergencies involving radiological materials. It is important that NMTs be included in preparedness efforts. Recommendations regarding the Continuous education programs shall be designed to increase the awareness about the emergency preparedness and response to radiation accident. Increase the alertness between medical worker and staff about the radiation hazards and its safety measures that prevent these hazards. However, International organizations can provide support to other countries in the education programs. Communities must try to increase the ability of the public health system to handle radiological events of any nature.

Key words: Assessment, radiation emergency preparedness, nuclear medicine

INTRODUCTION

All radiation devices in use nowadays are subject to cause serious incidents and accidents, with potential risks in exposed population groups. These risks may have immediate or long term health implications. Prevention, mitigation and treatment of the radiation effects are done by anticipating the moment of exposure and by establishing new efforts for investigation of radio-protective products (6,7). Hospitals should be prepared to respond to potential radiation emergencies as determined by risk assessments based on local and regional radioactive hazards, threats and vulnerabilities. Approach to hospital management of multiple combined radiation injury victims require attention to casualty triage, decontamination and prevention of secondary contamination, healthcare personnel radiation safety, trauma care system, medical staff knowledge of radiation related injuries and availability of pharmaco-therapeutic options(6). The general objectives of emergency response are: (a) To reduce the risk or mitigate the consequences of the accident at its source. (b) To prevent deterministic health effects (e.g. early deaths and injuries) by taking actions before or shortly after exposure and by keeping the public and emergency worker individual doses below the thresholds for deterministic health effects. (c) To reduce the risk of stochastic health effects (e.g. cancer and severe hereditary effects) as much as reasonably achievable by implementing protective actions in accordance with IAEA guidance and by keeping emergency worker doses below the levels established in IAEA guidance(4).

Medical personnel, particularly NMTs, are a source of radiological expertise that can be utilized during a public health crisis involving radioactive materials. NMTs are a valuable resource because of their knowledge and daily dealings with radioactive materials, and the education of NMTs in health physics, radiation biology, radiation safety, decontamination, and patient care can be helpful during a radiological emergency (8,10). NMTs can participate as part of a local radiological emergency response team. In this capacity, an NMT can provide expertise to assist with radiological dose assessments, population monitoring, development of radiological emergency response plans, and determination of the extent of contamination (8). NMTs who work in a hospital setting can also serve as a resource to their hospital when it is planning for, and responding to, a radiological emergency. There is a significant need for training and informational resources tailored to a hospital setting (1), and NMTs can assist in developing these resources and in training hospital staff (11). For radiological incidents Coleman and Lurie (2012) (3) have developed and continue to refine detailed plans and tools for medical responders, which also serve for any type of radiological incident. The plans are based on the best available basic science with the goal of providing planners and responders with just-in-time information and tools. A major consideration in the development of new diagnostics, medical treatment and countermeasures for radiation injury is that of 'dual utility' with potential for routine medical use for cancer care.

The current study aimed to assess the willingness and knowledge of NMTs, medical staff [Doctors & worker personnel in the department using γ -cameras, radiotherapy (teletherapy and brachytherapy), radio-isotopic scanning, and radioimmunoassay substance in hospitals, laboratories and radiological centers] and Emergency medical response team to participate in radiological emergency preparedness and response operations and to determine what radiation detection, measuring, and imaging equipment they would have access to during an event at their workplace. The study also assessed whether years of work experience or past radiological emergency preparedness training had an effect on willingness and knowledge

MATERIAL AND METHODS

A 28-question survey (Appendix A) was developed assessing the knowledge about radiological emergency preparedness and willingness to participate in a response to an emergency. The knowledge of radiation protection principles was assessed. Finally, they were asked if they had participated in continuing education in radiological emergency procedures in the last 5 y or other continuing education programs included training on radiological emergency preparedness and response. The survey was distributed in September 2014 and was open for 6 wks. A reminder e-mail was sent approximately 3 wks after the start date of the survey. Demographic information including the license, regional location, years of experience, work setting, work facility preparedness, and recentness of radiation emergency preparedness training was collected. All responses were anonymous. Statistical analyses using Chi-square test was done for detecting the efficacy of experience time on increasing the awareness and knowledge of the responder regarding the radiological emergency preparedness and the radiation protection measures.

RESULTS

There were 57 only who responded to the survey, for a response rate of 11.4%. Table (1) shows the net results of the descriptive data of the survey. Nearly, 88% of the responders are working in Private Center / Hospital. Many of them (43.8%) worked in laboratories & the others in Radiological centers (35.1%) and Hospitals (21.1%). Teletherapy and brachytherapy was the equipment used in 35.1%, Radio-isotopic scanning in 26.3%, Radioimmunoassay substance in 29.8%, and γ -camera in 8.8%. Seventy nine percent of the responder in the present study, having radiation protection measures, and 56% of them were using these measures. On the other hand, Survey meter was available in 96.5% of the responder and 93% were receiving the radiation protection courses. The 22.8% of the responder, only having information about radiation emergency preparedness, 10.5% of them were found to be aware with its measures. Many of responder (64.9%) having emergency plane, but 3.5% only receiving training course within the last 5 years. However, Continues education in radiological emergency preparedness occurs in one responder only. Also, no one having re-training course or doing scenarios and drills in radiation emergency preparedness within the last 5 years. Additionally, the current study represents a statistically significant difference regarding the effects of years of experience on increasing the radiological emergency preparedness and the radiation protection knowledge and awareness at the responders (Table 2&3).

Table 1: Descriptive Data

Descriptive Variables		NO.	%
Type of Center / Hospital work setting	- Private Center / Hospital	50	87.7
	- Government Center / Hospital	7	12.3
Working place	- Hospitals	12	21.1
	- Radiological centers	20	35.1
	- laboratories	25	43.8
Years of experience	- < 10 years	15	26.3
	- > 10 years	42	73.7
Equipment used	- γ -camera	5	8.8
	- Radiotherapy (teletherapy and brachytherapy)	20	35.1
	- Radio-isotopic scanning	15	26.3
	- Radioimmunoassay substance	17	29.8
Radiation protection measures	- Present	45	78.9
	- Absent	12	21.1
Using the radio-protective measures	- Yes	32	56.1
	- No	25	43.9
Radiation protection course	- Present	53	93.0
	- Absent	4	7.0
Availability of survey meter	- Present	55	96.5
	- Absent	2	3.5
Information about Emergency preparedness	- Present	13	22.8
	- Absent	44	77.2
Good emergency preparedness measures	- Present	6	10.5
	- Absent	51	89.5
Emergency plane	- Present	37	64.9
	- Absent	20	35.1
Training Course in emergency preparedness within the last 5 years	- Present	2	3.5
	- Absent	55	96.5
Continues education in emergency preparedness	- Present	1	1.8
	- Absent	56	98.2
Re-training Course in emergency preparedness within the last 5 years	- Present	0	0
	- Absent	57	100
Scenarios and drills	- Present	0	0
	- Absent	57	100

Table 2: Effects of years of experience on the increasing the radiation protection knowledge

Radiation Protection Measures	Below 10 years		Above 10 years		Total		P- value
	No.	%	No.	%	No.	%	
Present	7	12.3	31	54.4	38	66.7	0.0556
Absent	8	14.0	11	19.3	19	33.3	
Total	15	26.3	42	73.7	57	100	

Table 3: Effects of years of experience on the increasing the radiation emergency preparedness knowledge

emergency preparedness knowledge	Below 10 years		Above 10 years		Total		P- value
	No.	%	No.	%	No.	%	
Present	4	7.0	9	15.8	13	22.8	0.024
Absent	29	50.9	15	26.3	44	77.2	
Total	33	57.9	24	42.1	57	100	

CONCLUSION

The initial response to a radiological emergency may include radiation detection, population monitoring, decontamination, and dose assessment. Knowledgeable, willing, and prepared individuals will be needed to assist with a response of this nature. Public health agencies will need to coordinate with NMTs and draw on their expertise and knowledge to strengthen the community's capability of responding to a radiological or nuclear emergency. Public health agencies and first-response organizations are working to build the capacity to respond to emergencies involving radiological materials. It is important that NMTs be included in preparedness efforts and recruited to volunteer through programs such as MMRS, MRC, and ESAR-VHP (11). Efforts to include radiological response procedures in NMT continuing education and training should be examined. There are apparent gaps in NMTs' knowledge and familiarity with response resources. Therefore, it is suggested that radiological emergency preparedness courses be designed for appropriate continuing education credit for NMTs. This step is becoming increasingly important as this study and others show that training increases the willingness to respond (11). Hospitals should consider capitalizing on their NMT staff's knowledge and willingness to help with planning and training efforts within the hospital. This measure can help fill gaps in a hospital's planning and ability to respond to patients contaminated with radiological materials (11). The most important consideration in the medical evaluation of people involved in a radiation incident is the medical stability of the affected individuals. The relative magnitude of the situation and the resources needed to address the emergency are also important considerations.



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