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## A Preliminary Study on Prepared Culture Amongst Healthcare Practitioners for Nuclear and Radiological Emergency in Malaysia

Siti Hasliah Salleh <sup>a\*</sup>, Nor Ashikin Mohamed Yusof <sup>a</sup>*<sup>a</sup>Perdana School of Science, Technology and Innovation Policy, Universiti Teknologi Malaysia Kuala Lumpur, Jalan Semarak, 54100 Kuala Lumpur, Malaysia*

### Abstract

This article highlighted prepared culture amongst healthcare practitioners in managing radiological emergency. The respondents are healthcare practitioners from selected government hospital and departments. Data are collected through interviews and observations for three months. They were analyzed using content analysis. There are two incidents involving radiation spillages. The parties differ in opinion towards preparedness culture and give varying reasons in response. Knowledge, skill and culture are fundamental factors that could promote a prepared culture. Considering the critical roles of healthcare practitioners, the study recommends for further study on the evaluation of preparedness level amongst healthcare practitioners for nuclear and radiological emergency.

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### 1. Introduction

Nuclear and radiological emergencies could possibly happen at any time and place. (Kinugasa T., 2007, State and Territorial Epidemiologist, 2010; M.A.W. Yusof and H. Mohd Ali, 2011). In Malaysia, several places are identified where nuclear and radiological emergency could possibly occur. They are (1) small research reactor in Bangi, Selangor (2) hospitals that utilize radioactive materials in medical procedures (3) factories, work places and research centres involving the usage of radiation and radioactive substances and (4) nuclear-powered ships passing through the Strait of Malacca. Apart from these places, nuclear and radiological emergency that takes place in foreign land elsewhere and in the atmosphere may possibly affect Malaysia too.

In view of the rising needs for managing this potential emergency, the government has passed a National Security Council Directive No. 20: Policy and Mechanism for National Disaster Management and Relief in 1997. Directive No. 20 outlines the responsible agencies in managing the various and potential emergencies. The leading technical agency for managing nuclear and radiological emergency in Malaysia is Atomic Energy Licensing Board (AELB). One of AELB's main responsibilities is to facilitate all licensee organizations in relation to radiation safety. The licensee organizations are research institutes, industries, universities and healthcare providers. Amongst these

\* Corresponding author: Siti Hasliah Salleh Tel.: +6019-7102440  
E-mail address: [sitihasliah@gmail.com](mailto:sitihasliah@gmail.com)

licensee organizations, healthcare providers play critical roles when nuclear and radiological emergency strikes. This is because their responsibility is not limited to events that strike within their premises, but also outside their premises (Government of Malaysia, 1997; Burchfield L.A., 2007; Ministry of Health, 2011). According to Ministry of Health (2011), healthcare providers are to provide appropriate medical care to all victims, inclusive to those on sites or at the hospital. They are also responsible for monitoring long-term health problems that could arise as a result of complications from the radiological event.

As part of the national disaster management plan, the AELB expects all healthcare providers to establish a nuclear and radiological emergency plan. It is to prepare the healthcare providers community when radiological emergency strikes within and outside their premises. In extension of the internal emergency plan above, it is also a very valuable lesson and exercise to promote a prepared culture amongst the medical response team in dealing with any nuclear and radiological emergency that strikes at the district, state or national level. The mandate was executed on 15 February 2012. Since the programs for prepared culture are new to healthcare providers, the AELB believes related training programs become fundamental. Researchers such as Chiehwen *et al* (2005), Dainial N. *et al* (2005), Crane J.S. (2005) and Council of State and Territorial Epidemiologist (2010) agree that it is essential to conduct training needs analysis before designing and conducting a training programme. In the analysis, the organization will identify any deficiencies that influence decision making and subsequently job performance.

This study tries to analyze the healthcare practitioners' needs, specifically to response performance when a radiological incident happened within their premises. This article is divided into several sections. The first section will discuss on the background of healthcare providers in Malaysia. Section two will articulate the statement of the problem, to be followed with objectives and methodology of the study. Section five and six discuss about the data and findings respectively. Section seven will conclude the study and put forwards few recommendations.

## **2. Background of healthcare providers in Malaysia**

On a very rare occasion and far in between, several healthcare providers reported small scale radiological incidents. This explains why majority of healthcare providers in Malaysia are inexperienced in handling nuclear and radiological emergency. Regardless of this, healthcare practitioners are expected to be prepared at all times. The healthcare practitioners refer to both government and private hospitals employees who are authorized to use radioactive substances in medical procedures. In general, radioactive substances are used in two medical services. They are radiotherapy and oncology; and nuclear medicine.

These services are executed by team of authorized staff only. The team comprises of well-experience staff in managing medical procedures related to radiation. They are consistently sent to attend series of radiation related training and education programmes yearly. Their familiarity, knowledge and various exposures to programs related to radiation and nature of the organization have made them somewhat proficient. With such backgrounds, the same team are identified and selected to be the response team in dealing and managing with any possible nuclear and radiological emergency within the hospital premise or on site.

Relevant training and education programmes are very crucial for promoting a prepared culture amongst healthcare practitioners in managing emergencies (World Health Organization, 1998). However, previous studies found that there are challenges in developing and maintaining prepared culture amongst medical response team. Even though the response team has been attending series of training, exercise and drill, several responders are reported as unprepared and unwilling to discharge their roles if the strikes are related to chemical, biological, radiological, nuclear and high-yield explosion (Dainial N., *et al*, 2006; Kinugasa T., 2007; Council of State and Territorial Epidemiologist, 2010).

This study focuses on nuclear and radiological emergency. It hypothesizes similar scenario would equally happen in Malaysia. The challenges are even bigger for Malaysia considering the issue on nuclear and radiological emergency is relatively new. In order to ensure relevant training and education programmes are well designed, a study on current issues related to culture of preparedness becomes an essential pre-requisite. The outcomes could be useful in developing and designing guidelines of future plans and programmes as well as a baseline evaluation of those programs, plans, strategies or action plans.

### 3. Objectives of the study

In facilitating healthcare providers to design relevant education and training programmes, this study will identify deficiency(s) of competencies and lack of preparedness culture amongst healthcare practitioners in facing nuclear and radiological emergency in Malaysia.

### 4. Methodology

The study is conducted in specifically selected government hospitals. Six government hospitals that use radioactive substances in medical procedures (Ministry of Health, 2011) are identified. They are Sultanah Aminah Hospital, Sultan Ismail Hospital, Kuala Lumpur Hospital, Pulau Pinang Hospital, Sarawak General Hospital and Likas Hospital. In each hospital, there are two departments in which their healthcare practitioners use radiation substances in medical procedures. The healthcare practitioners comprise of medical specialists, physicists, pharmacists, medical assistances, technologists, nurses and hospital attendances. Nearly all respondents have at least 3 years working experience in dealing with radiation. They too have attended radiation-related development programme at least once a year. Data are collected through observations and interviews using unstructured questions for a period of three months. They are analyzed using content analysis.

### 5. Findings

Within the three months study, there is no nuclear and radiological emergency reported, either within the hospital premise or outside. However, one hospital reported two small scale radiological incidents. The reported incidents are identified and categorized as radiological spillages. Both incidents do not have any negative health implications or interrupt medical services therein. Presumably the healthcare practitioners are well-prepared in managing the incidents. However, the observations discover different scenario. They could be described as the followings.

(i) The responsible person on duty was called upon to decontaminate radiological spillage. The contamination was radioactive substance in liquid form on less than 1 meter<sup>2</sup> floor. It happens in a controlled area. Generally speaking, a controlled area refers to an area which is restricted to public. Since the incidents are identified as small scale spillage in a controlled area, the responsible person believes that it can be managed at the department level only. Hence, hospital response team was not called upon. For the purpose of decontamination process, the responsible person knew about the available options and numbers of initiatives that could be taken into consideration. Each initiative has advantages and disadvantages. As stipulated by various provisions in Atomic Energy Licensing Act 1984 (Act 304), the decontamination process should reduce the exposure to an accepted level for radiation workers. At the same time, the decontamination waste should be managed well so that it shall not pollute the environment. In that circumstances the responsible person must think critically before making any kind of decisions. Alternatively he is encouraged to work with other persons who are familiar with the decontamination process. The study found that members of the response team are not cooperating with each other. The responsible person on duty has the tendency of making decision individually. The rest of the teams chose to stay in the background. When interviewed for their indifference and malaise attitude towards the spillage and teammate, their justifications are somewhat unprofessional. They believe the responder on duty is capable of managing and handling the situation alone and well.

(ii) The second scenario also revolves around the same incidents. Atomic Energy Licensing (Basic Safety Radiation Protection) Regulations 2010 stipulates response team to report to the licensee (Hospital Director) of any radiological incident without delay. In this case, Radiation Protection Officer (RPO) will assist response team to manage the situation. Despite the legal mandate, the observation observes that the department's response team failed to do so. Although the incident is not categorized as disaster, the Regulation nonetheless expects all members of the response team to understand and appreciate respect the various stipulated regulations. In the interviews, several members of the response team rightly categorized the incident as small scale. They regarded the incident could be managed at department level. Because of this, they presumed there is no necessity in reporting the incidents to

Director of the hospital. At the same, the rest of the team claim to have knowledge about the legal expectation of Basic Safety Radiation Protection and its various provisions in reference to reporting any radiological incident. Yet they choose to stay behind. They like to believe the matter should be left to the person on duty only. According to them it is the responsibilities and duties of the person on duty hence he should be able to think and handle the situation.

(iii) The third scenario was observed when radiopharmaceutical (pharmaceutical tagged with radioactive substance) leaked from its container and spilled on paper. When they noticed the spillage, this study found the respondents' and department's first reactions were panicky. One of the respondents ran and brought with him the contaminated paper unprotected to the responsible person of the department. His intention was to confirm whether the spill was radioactive or not. The radiation detector confirms the spill as radioactive but at low exposure. By any standard, the teams, department and individual's responses, reactions or actions are actually inappropriate. By moving or carrying the spilled and contaminated paper from one end to another, there are high tendencies that contamination may spread to other and bigger areas. Even though the respondents are trained, experienced and have attended series of trainings and seminars on radiation protection and radiation safety, this study found that their anxieties towards radiation remain. Positively the study also found that not all healthcare practitioners responded or reacted in similar manner. Some of them responded positively and behave accordingly. They even tried to soothe others, typically those who are panic. In addition, there were few practitioners who give valuable advice to response team of the department in working together and try to bring back the situation to normalcy.

## 6. Discussions

Findings from this study demonstrated several deficiencies in terms of attitude, knowledge and skills amongst healthcare practitioners in government hospitals in Malaysia. The attitude, knowledge and skills mentioned above are the backbones of preparing and forming a better attitude towards works, teammates and organizations. They in turn are interpreted as fundamental factors that construct culture of preparedness amongst the healthcare practitioners. The two small scale radiological incidents reveal noticeable deficiencies in decision making skill. Decision making in any nuclear and radiological emergency is generally a complex skill. It becomes more complex particularly in radiological decontamination process. There are many radiation and non-radiation related issues and aspects to be considered during the process (Hedemann-Jensen P., 2003; Hermann J., 2011). Both are equivalently important for ensuring the response actions are carried out without undue and unreasonable delay.

Since the incidents rarely happen and when they do, challenges individual's judgments, group decision making skill becomes a very fundamental and crucial tool in constructing the same understanding and commitments in discharging their responsibilities and duties (Sinkko K. *et al*, 2004; Kiker G.A. *et al*, 2005; Burchfield L.A., 2009; Andonov F., 2009). The study clearly shows group decision-making does not happen as expected. The spirit for teamwork remains in theory and is not clearly visible as anticipated. Practically the response team within the department does not display any good quality of teamwork spirit or skill in solving the spillage problem. It is also noted that the lack of decision making skill and team work spirit are breaking the established good relationship between members on personal basis. At departmental level, the same is affecting them psychologically and professionally.

The second issue highlighted the fact that there are still group of healthcare practitioners who either do not understanding, appreciate or respect the basic regulations of their duties. When working with radioactive substances, all authorized personals healthcare practitioners inclusive must fully understand and strictly abide to the provisions of Act 304 the principle law and regulations. The strict obedience of Act 304 is to ensure the practitioners are well equipped with the latest knowledge and skills of know-how of their trade. For example, the law expects the responsible person on duty to report the incident, to the RPO and licensee of the organization. The mandate must be respected and carried out regardless of the scale of the incident. This is because the RPO is a person of better experience, well-trained and more knowledgeable. As such he has the abilities and capabilities in dealing with and in most probability solve the immediate problem within an appropriate time frame.

The third issue shows several members of response team still have anxiety towards radiological incident. The anxiety also manages to affect them psychologically. Potentially it could lead to a bigger and threatening health problem. This is despite of the scale of the incident. Burchfield L.A. (2009) and Ansari A. (2010) have been discussing the same issue. This study believes the anxiety is unwarranted. Likewise the potential health problem could be avoided long before it occurs. The negative stigma towards radiological incident is built based on events that take place outside their work place. For example, the healthcare practitioners have been personally exposed to or fed with confusing information. Media coverage on several previous emergencies and disaster like Chernobyl, Three Mile Island and Japan has somehow left a permanent mental scar on them. As a result they felt vulnerable when encountering face to face radiological incident. Apart from that they too have possibly formed incorrect assumption about exposure to radiological incidents. When they are confused and scared about their actual health risks, they could easily or inadvertently such develop negative physical reactions.

## 7. Conclusion and recommendation

In general, the study has identified several types of deficiencies that are currently obstructing promotion of preparedness culture in dealing with radiological incident. They are (1) decision making skill (2) team work skill (3) understanding of regulations (4) appreciation of regulations and (5) anxiety towards radiation. These factors represent a small fraction of three basic competencies in building a preparedness culture. The three basic groups of competencies are namely knowledge, skill and attitude. It is also possible that different factors could be affecting the preparedness culture depending on the scale incidents, different departments and hospitals. This writing recommends a further study on the identification of competencies for preparedness and response in nuclear and radiological emergency in Malaysia.

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## References

- Andonov F. (2009). Interactive methods for group decision making. A paper selected from XV<sup>th</sup> International Conference “Knowledge-Dialogue-Solution” KDS 2009, Varna, Bulgaria, June – July 2009. International Book Series “Information Science and Computing”. Intelligent support decision making (Chapter 10)
- Ansari A. (2010). Radiation threats and your safety: A guide to preparation and response for professionals and community. Taylor & Francis Group. Chapman & Hall Book
- Burchfield L.A. (2009). Radiation safety: Protection and management for homeland security and emergency response. John Wiley and Sons, Inc. Publication. Cleanup and decontamination after a radiological incident (Chapter 10)
- Chiehwen E.H., Mas F.S., Jacobson H., Papenfuss R., Nkhoma E.T. and Zoretic J. (2005). Assessing the readiness and training needs of non-urban physicians in public health emergency and response, *Journal of Disaster Management and Response*, 3 (4), 106 – 111
- Council of State and Territorial Epidemiologist (2010). The status of state-level radiation emergency preparedness and response capabilities, Atlanta
- Crane J.S. (2005). Assessment of the community healthcare providers’ ability and willingness to respond to a bioterrorist attack in Florida. University of South Florida. Graduate school thesis and dissertations. Paper 2839, available at <http://scholarcommons.usf.edu/etd/2839>
- Dainial N., Carpini D.D., Bohan M., Wernmann M., Wilds E., Barlow A., Beck C., Cheng D., Daly N., Glazer P., Mas P., Nath R., Piontek G., Price K., Albanese J., Roberts K., Salner A.L. and Rockwell S. (2005). Development of a statewide hospital plan for radiological emergencies, *International Journal Radiation Oncology, Biology and Physics*, 65 (1), 16 – 24.
- Government of Malaysia (1997). Directive no. 20: The policy and mechanism for national disaster management and relief. Percetakan Nasional Malaysia Berhad.
- Hedemann-Jensen P. (2003). Radiation protection and decision-making on cleanup of contaminated urban environments. NKS Conference on Radioactive Contamination in Urban Areas. Risø National Laboratory, DK-4000 Roskilde, Denmark, 7 - 9 May, 2003
- Hermann J. (2011). Planning for psychosocial and behavioral health in a radiological/nuclear event. Presentation slides in Bridging the Gaps: Public Health and Radiation Emergency Preparedness Summit: March, 22-24, 2011
- Kiker G.A., Bridges T.S., Varghese A., Seager T.P and Linkov I. (2005). Application of multicriteria decision analysis in environmental decision making. *Integrated Environmental Assessment and Management*, 1 (2): 95 – 108

- Kinugasa T. (2007). Education and training for radiation emergency medical management in Japan, International Congress Series 1299, 189 – 195
- M.A.W. Yusof and H. Mohd Ali (2011). Radiological emergency: Malaysian preparedness and response. Radiation Protection Dosimetry (2011), Oxford University Press. Vol.146 (1–3): 38–41.
- Ministry of Health (2011). Medical response for radiological emergency. Hospital Kuala Lumpur. 2011 edition (draft).
- Sinkko K., Hamalainen R.P., Hanninen R. (2004). Experiences in methods to involve key players in planning protective actions in a case of nuclear accident. Radiation Protection Dosimetry, 109 (1 – 2): 127 – 132.
- World Health Organization (1998). Community emergency preparedness: A manual for managers and policy-makers. Geneva