

## Barriers to Preparedness amongst Emergency Medical Personnel towards Radiation Emergency

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### Abstract

Significant policy implementation programmes has been made at national level to prepare the medical providers towards radiation emergency. However, it is unclear what impact these initiatives have had. As part of policy implementation programme evaluation, this article attempted to identify the dominant factors that hinder their preparedness. In the past, most available measurements for preparedness were conducted qualitatively through drills and exercises. This research proposed the measurement to be conducted quantitatively using an instrument which had went through necessary stages of validation process by experts and statistical software to ensure the data and the results produced were valid. The samples were selected using purposive sampling method involving medical personnel of emergency departments in Klang Valley hospitals. The assessment focused on three criteria of preparedness namely: able, willing, and ready. The findings showed that the main barriers to preparedness were inadequacy of knowledge and skills on response operation, and fear of radiation threat. Several suggestions were proposed to lessen these barriers, and strengthening the policy implementation towards radiation emergency preparedness.

**Keywords:** Policy implementation, programme evaluation, radiation emergency, disaster preparedness, ability, willingness, readiness

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### ■ 1.0 INTRODUCTION

In Malaysia, several places are identified where nuclear and radiological emergency could possibly occur such as small research reactor in Bangi, Selangor, hospitals that utilize radioactive materials in medical procedures, factories, work places and research centres involving the usage of radiation and radioactive substances and nuclear-powered ships passing through the Strait of Malacca (Siti Hasliah and Nor Ashikin, 2013). So far, Malaysia is very lucky to never had experience radiation emergencies even it is categorized as one of the national prioritized disasters. However, Malaysia should nonetheless learn from the collapse of the Highland Towers Condominium in Hulu Klang, regarded to date as one of the prominent disasters locally (National Security Council, 2012). The complete collapsed of the whole tall condominium building is the first of its kind in Malaysia. Response operation was delayed and in turn caused a high number of fatalities due to the insufficiency of available resources (Mat Said and Ahmadun, 2007). Concerns on the above, significant policy implementation programmes have been made at the national level to prepare all response agencies towards this kind of disaster.

In order to strengthen the process of capacity building, and to improve the policy implementation

programmes, the National Security Council of Malaysia (hereinafter is referred to as the NSC) has relied on drills or exercises to evaluate in advance the capacity of response agencies in providing an emergency response (National Security Council, 2012). These activities were part of the policy implementation exercise, which is globally recognized as the preparedness phase of disaster management (Hemond and Robert, 2012). However, drills and exercises are rarely conducted because they globally known require large investments specifically to budget and time (Dewi Hermawati et al., 2010). Besides that, this kind of assessment is frequently done on an ad hoc basis, and the data gathered is usually qualitative in nature (Savoia et al., 2014). As an implication, it is essentially quite tricky to aggregate the data and to draw valid conclusions (Savoia et al., 2014).

The above issues prompted the study to investigate the state of preparedness of the national response agencies, specifically the emergency medical services (hereinafter is referred to as the EMS) if radiation emergency happens. The self-developed survey instrument, namely the Ready, Willing and Able Scale (hereinafter is referred to as the RWA Scale) is used in this study as an alternative to drills and exercises. This is especially important since it is already 19 years that the NSC Directive No. 20 categorized it as one of the national prioritized disasters. Within this period, it is logical to expect that the preparation made by the EMS has matured to a certain stage hence more than capable of providing a proactive and pre-emptive response. So far, it is unclear what impact these initiatives have had because the number of related studies in Malaysia is scarce if any.

## ■ 2.0 METHODOLOGY

This study aimed at identifying barriers to preparedness amongst the EMS personnel towards radiation emergency by using 48 items of the RWA Scale. Person-item-map, which is also known as Wrights map is used to depict the relationship between the personnel's underlying level of preparedness and the difficulty of the items on the same logit scale. The person-item map is based on the Rasch measurement model. It has been used to complement CTT methods in the development, validation, and interpretation of measurements. Research participants were amongst the EMS personnel work in hospitals within West Peninsular Malaysia. Only selected hospitals are eligible for selection within the region. They are specially selected because they provide medical services that utilize radioactive materials such as in Radiotherapy and Nuclear Medicine. Therefore, they generally have at least basic resources required to respond to a radiation emergency. Initially, eight proposals that seek permission and invite these hospitals to participate in this study were issued. In the end, only three hospitals are interested to participate.

## ■ 3.0 RWA SCALE

Historically, it was McCabe et al who first talked about RWA framework in 2010. They mooted the idea of applying the framework to the area of public health services. It intended to improve the preparedness amongst individual or organization in responding to possible catastrophes and public health emergencies [9]. As illustrated in Figure 1, the framework is consisted of three equal-sized circles. Each of them represents 'ready', 'willing' and 'able' construct. The intersection of circles denotes that they are equivalently significant. In this context, the fulfillment of all constructs shows that the individual or organization has achieved a high level or quality of preparedness. In Malaysia context, these constructs are actually considered by the EMS and even all other categories of responders. For instance, Singh and Subramaniam et al. (2009) studied about healthcare providers' readiness to provide disaster response in Malaysia, Muhamad Sukri (2015) studied all three constructs amongst medical doctors' disaster preparedness in Terengganu, and Aniza et al. (2016) studied ability of emergency nurses and community health nurses in disaster management. Accordingly, the following subsections will discuss related components of RWA namely readiness, willingness and ability to provide response.

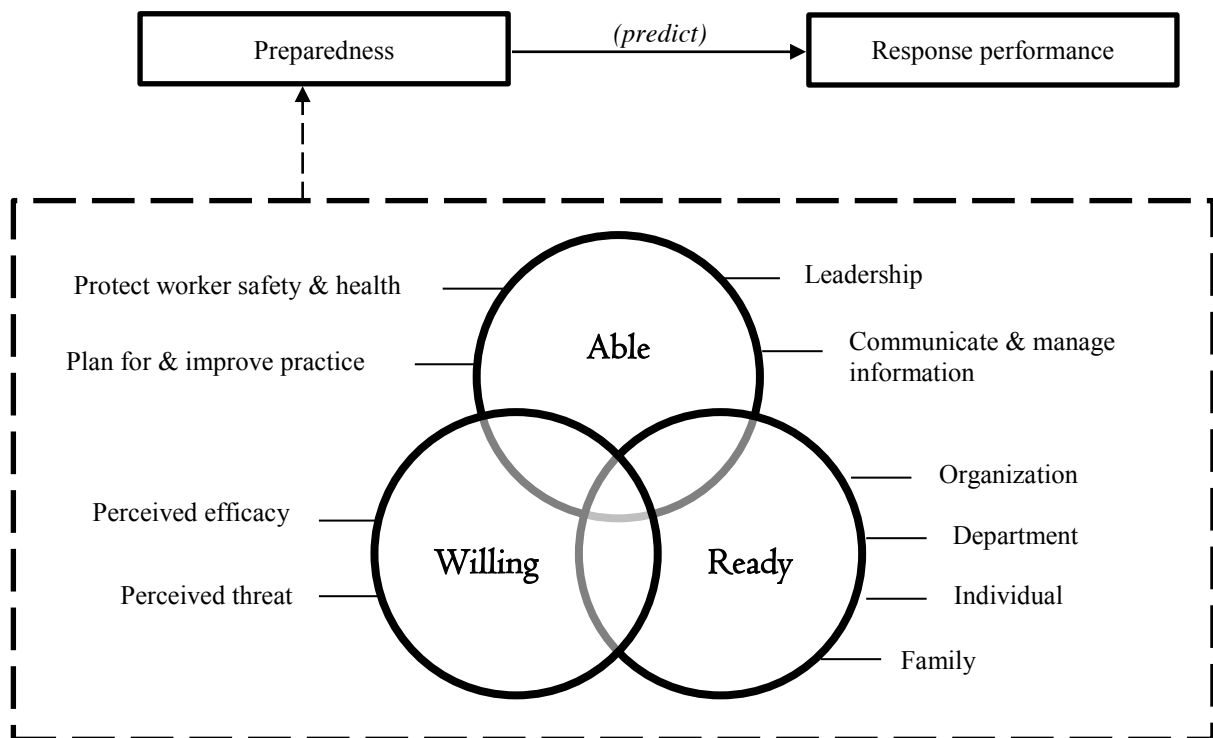


Figure 1: RWA Scale framework for EMS preparedness towards disaster (adapted from McCabe et al, 2010)

### ■ 3.1 Readiness

Readiness could be described as the support of human and material resources possesses by healthcare personnel to perform well in medical emergency response operation. On the same hand, readiness amongst healthcare personnel is influenced by four hierarchy levels. From the top, they are organizational, department, individual, and family levels respectively. Each of them is fundamental in ensuring the individual working as healthcare personnel is always ready to report for duty.

### ■ 3.2 Willingness

Willingness is defined as the tendency of healthcare personnel to participate in medical emergency response operation enthusiastically. According to McCabe et al., willingness of an individual to respond to disaster event is essentially depending on their perceptions on personal and contextual factors (McCabe et al, 2010). These factors include their perception on risk, personal responsibility, and support system. These information are equally applicable to this study. They could be interpreted as perception on radiation emergency risk, personal responsibility as healthcare personnel, and healthcare support system.

### ■ 3.1 Ability

Ability refers to capacity of healthcare personnel to perform a task that requires particular competencies. According to a report on public health preparedness and response competency model by Centers for Disease



**Table 1:** Barrier to preparedness according to priority

Prioritized barrier	Statistical procedure	
	Rasch analysis (logit value)	Descriptive analysis (maximum percentage)
Barrier 1: Item B19	+1.65	90.2%
Barrier 2: Item B14	+1.51	88.4%
Barrier 3: Item D10	+1.44	84.8%
Barrier 4: Item B1	+1.22	80.3%
Barrier 5: Item C9	+1.00	72.3%

## ■ 5.0 DISCUSSIONS

### ■ 5.1 Barrier 1 And 4: Inadequacy of Knowledge And Skills Related To Decontamination Procedure

Barrier 1 and 4 are related to knowledge and skill on radiation decontamination procedure. The first barrier is stated as ‘Victims with radiation contamination should be decontaminated first, even though their health condition is critical (B19)’; while the fourth appears as ‘Victims exposed to radiation are not required to undergo decontamination process before treatment given (B1)’. Their priority was proven by person-item map of Rasch analysis and descriptive analysis. These analyses suggested that majority respondents lack specialized knowledge and skills related to radiation decontamination procedure.

Similar finding was obtained by Watt et al. (2010). Focusing on pandemic events, they found that the lack of knowledge amongst Australian emergency medical personnel has negative implications to preparedness. These include knowledge on infection transmission, and procedures for protection and decontamination (Watt et al., 2010). Watt et al. (2010) reported that the lacking was significantly associated to incorrect perception on pandemic risk. In achieving an effective response to a widespread outbreak of infectious disease, Watt et al. (2010) believed that education and training in pandemic preparedness play a crucial role to improve respondents’ knowledge and perception.

Szarpak and Kurowski (2014) did not identify dominant barrier to preparedness, but evaluated knowledge of healthcare personnel in Poland about response operation in chemical contamination event. The study found that majority of respondents had very low level of knowledge on all life-saving procedures regarding chemical contamination including decontamination procedure (74.9%), use of specific antidotes (86.3%), and recognition of clinical symptoms (85.9% - 89.8%). In order to prevent the interference, Szarpak and Kurowski (2014) recommended healthcare personnel to improve knowledge in terms of decontamination procedure through theoretical and practical training.

### ■ 5.2 Barrier 2: Inadequacy Of Knowledge On Radiation Emergency Response Operation

Based on item statement (B14: I have adequate knowledge about radiation emergency response operation), Rasch analysis suggested that this item as the second largest barrier to preparedness. It was then proved by descriptive analysis which reported that majority of respondents lack knowledge on radiation emergency response operation. The lacking is relatively critical because it may prevent healthcare personnel to make relevant or correct decisions about working if radiation emergency strikes. Similar finding was obtained by Corrigan and Samrasinghe (2012) and Duong (2009).

Corrigan and Samrasinghe (2012) found that knowledge inadequacy was one of the major barriers to disaster preparedness amongst healthcare personnel in St Vincent’s Hospital, Australia. The study reported that the average score calculated for disaster knowledge was 3.57 out of 10. This finding was used to demonstrate the

hospital's baseline disaster knowledge prior to allocation of resources and implementation of training to the areas in which they were needed (Corrigan and Samrasinghe, 2012). At the national level, the finding was used as an evidence to formulate specific national standards and guidelines which will be used by individual hospitals in developing capabilities (Corrigan and Samrasinghe, 2012).

Hammad et al. (2011) found that majority of South Australian emergency nurses had low level (less than 50% score) of general disaster knowledge. The main indicators of the lacking were the confusion about surrounding roles and command structure in response operation. Negatively, this knowledge lacking could become barrier to successful disaster response. Hammad et al. (2011) recommended to consider these issues when determining appropriate and effective disaster training and education, so that the nurses have more realistic expectations of disaster response.

### ■ 5.3 Barrier 3: Inadequacy Of Training Related To Radiation Emergency Response

Focusing on the third barrier to preparedness (item D10), the descriptive analysis suggested that majority (60.7%) of respondents lack training related to radiation emergency response. This percentage was possibly higher looking at the 24.1% respondents who are unsure whether they obtained adequate training or not. This finding is in line with previous studies such as Seib et al. (2012) and Biswas et al. (2015). Both studies revealed that inadequacy of training is negatively affecting preparedness of respondents to respond.

As reported by Seib et al. (2012), majority (60%) vaccine providers in California did not participate in any training related to emergency preparedness, therefore refused to provide response if H1N1 influenza pandemic strikes. Their refusal was probably because they had low self-efficacy to confront the disaster (Seib et al., 2012). In order to avert the refusal, Seib et al. (2012) suggested that the right training programmes should be conducted regularly for the right persons. Such training should be able to improve self-efficacy amongst vaccine providers in responding to H1N1 influenza pandemic.

Biswas et al. (2015) found the involvement of healthcare personnel with inadequate trainings on emergency medical care became a dominant barrier to effective response during the collapsed of a nine storied building in Bangladesh. The finding suggested that training conducted should be comprehensive so that the personnel could handle disaster situation with enough skills. Besides that, it is important to guide personnel to respond to more severe situation than the current actual disaster. This is because severity of a disaster event is unpredicted therefore adequate training could help the personnel to be prepared to respond to the disaster at any difficulty level.

Goodhue et al. (2012) found that majority respondents involving paediatric nurses in the United States had disaster preparedness training, and their participation were associated with an increased likelihood of responding to work during a disaster. They also found that the mean of participation in preparedness training significantly differ according to geographic differences. Based on this relationship, the lack of disaster training would decrease the likelihood. Goodhue et al. (2012) recommended focus on disaster preparedness training because it has been identified as one of the most easily modifiable criteria with the most impact on increasing the likelihood of response during a disaster.

### ■ 5.4 Barrier 5: Fear That Involvement In Response Operation Could Jeopardize Family's Health

The fifth barrier (item C9: I am worried that handling radiation emergency victims could jeopardize my family's health) showed majority of respondents of study feared that their participation in response operation could jeopardize family's health. This is the only item in 'Willing' criteria flagged by Rasch model as barrier to preparedness. Conversely, this barrier could possibly causing unwillingness of respondents to provide respond if radiation emergency strikes. In fact, participation in response operation involving radiation emergency could only affecting family's health if the personnel brought home radiation contamination on their body or clothes. This situation should not happened if the personnel act according to the standard of operating procedure, specifically in terms of decontamination procedure after completing their task. This finding is seen as contradicting item B17, where majority of respondents agreed that they would ensure no radioactive material contaminated their body or clothes after handling contaminated victims. Therefore, the study predicted that their fear was influenced by mistaken or wrong perception towards radiation and their ability to prevent the spread of radiation contamination.

Barnett et al. (2010) found that majority of respondents involving personnel of EMS in the United States were unwilling to report to work in pandemic influenza if the risk of disease transmitted to family existed. Particularly, these coming from the respondents who had low judgment on the threat of influenza and did not convinced to efficacy of response operation that were provided. Unlike radiation emergency, the disease transmission risk always exists in an influenza pandemic but can be dealt with vaccine. Therefore, Barnett et al. (2010) highlighted the importance of educating and instilling confidence in occupational safety so that the personnel could adjust their attitude and belief towards the disaster.

In larger context generally and in context of fear specifically, the findings of this study arrive at the same conclusions as with previous studies on fear and willingness or preparedness to render services in a disaster or dangerous situations. Adams and Berry (2012) also found that fear and concerns for family safety is one of the major conflicts to willingness to report to work in disaster event, particularly to personnel who had multiple responsibilities including to patients (as healthcare personnel) and to family (as spouse or parent). These competing responsibilities produced an ethical dilemma for personnel when disaster strikes, specifically to the situation that put them at risk (Adams and Berry, 2012). Healthcare providers were recommended to provide ethical guidance for the personnel to help them making decision about competing responsibility outweighed another, especially if the response operation is conducted with limited protective resources (Adams and Berry, 2012).

## ■ 6.0 CONCLUSION

Performance quality of emergency medical response operation during disaster majorly depends on preparation made by the responders. The study investigates barrier to preparedness in responding to radiation emergency as one of national prioritized disasters. Expanding works of McCabe et al., barrier to preparedness is measured from the perspective of responders' ability, willingness, and readiness to respond. Conclusively in terms of Malaysian EMS and radiation emergency, the study found that the most dominant barriers to preparedness are the lacking of knowledge, skills and training on response operation, as well as fear of radiation threat. The study persuasively suggests various stakeholders to carry out relevant actions in order to lessen these barriers as part and parcel of capacity building and improving the policy implementation exercise.

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