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Discussion Workshop on the 2014 Flood in Kelantan: Strategies and Recommendations Towards A Sustainable Hospital

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ABSTRACT

Background: Floods are considered as a main disaster in Malaysia with Kelantan to be recorded as a state that is affected by floods almost every year. The 2014 flood was the most significant and largest recorded flood in the history of Kelantan. Hospital Universiti Sains Malaysia (HUSM) was the only hospital that was able to withstand the flood and had to manage cases from other hospitals throughout Kelantan. The strategies and recommendations rose from the 2014 flood were highlighted from the HUSM perspectives to reduce the future flood impact, leading to sustainable development. These strategies have been mapped with Disaster Risk Management for Sustainable Development (DRM-SD) Model with the elements of prevention, preparedness, response, recovery and governance.

Methods: A one-day workshop acted as a platform to gather a total of 55 hospital staffs as a focus group to discuss the issues related to the 2014 flood as the major concern for the hospital preparedness. The discussions were based on topic of prevention, preparedness, response, recovery and governance.

Results: A total of 51 recommendations associated with the 2014 flood have been identified. This study is imperative as a guideline for the hospital to develop future preparedness strategies and to ascertain, which interventions require priority.

Conclusion: HUSM was the only hospital that was able to withstand and survive in the disaster, but several critical matters are worth to be addressed for future disaster risk reduction in hospital. The most important topics in this specialty include disaster prevention and preparedness, as well as the creation of a properly designed and effective disaster response and recovery plan and overseen by the effective governance.

Keywords: *Flood, Disaster Management, Sustainable Development, Hospital Preparedness*

1. Introduction

Floods are an annual disaster in Kelantan state on the east coast of Peninsular Malaysia. The 2014 flood, also known as 'Bah Kuning", was the largest recorded flood in Kelantan history in which 202,000 victims were displaced (Su-Lyn, 2015). The 2014 flood incident had caused huge financial losses where the estimated loss to hospitals and clinics amounted to RM281 million (Bernama, 2015; Ministry of Health Malaysia). During the incident, Hospital Universiti Sains Malaysia (HUSM) was the only fully functioning hospital in the state and had to handle cases from

the hospitals and clinics throughout Kelantan (Utusan, 2015).

HUSM has encountered some critical problems in managing the 2014 flood such as a surge of patients, staff shortage, handling patients who were transferred by helicopter and coordinating the volunteers (Baharuddin et al., 2015). Thus, in-depth understanding of the issues and challenges faced by HUSM in addressing the 2014 flood is significant for hospital preparedness to lessen the impact of future flood disaster, particularly in Kelantan. Building a resilient hospital and that is able to withstand during the disaster is critical to ensure the safety of lives as well as the property of the parties involved for sustainable development.

1.1. The 2014 Flood

The heavy rains that began on 17th December 2014 had triggered the worst flood ever for the past three decades in Malaysia (Hamzah, 2014). The rainfall of 1295 mm recorded during that period was equivalent to the amount of rain usually seen in a span of 64 days and had led to flash flood. As in Kelantan, the flood took the lives of 21 people and caused 26,721 to evacuate from 7,633 families been placed in 115 evacuation centres (AFP, 2014; Sapa-dpt, 2014). The flood had also affected the hospitals in the state. The inflow of floodwater into hospitals had disabled various service facilities in the hospitals. As a result, Hospital Kuala Krai, Hospital Tanah Merah, Hospital Pasir Mas and Hospital Raja Perempuan Zainab II were unable to provide optimal services. Making the situation worse, three hospitals except Hospital Pasir Mas were to work without electricity and operated only by using power generators (Noor Hisham, 2014). This situation has certainly affected some critical care units in the hospitals such as an Intensive Care Unit (ICU), Critical Intensive Care Unit (CICU) and also the operation theatre where these units use electricity to enable machines which use oxygen and water pressure to function.

Hospital Kuala Krai completely paralysed because it was inaccessible by land, while the helicopters were also unable to land because there was no landing facility. The only available access to the hospital was through boats. Moreover, the back-up generators in Hospital Kuala Krai were flooded because they were located in low places. Hospital staffs were also absent from duty because turbulent waters invaded low-lying areas and closed major traffic routes to access the hospital. Due to that, the hospital had to think of alternative ways to tackle the staff shortages.

Furthermore, the communication systems were down and there were lack of medical supplies and clean water in these affected hospitals. The patients in critical conditions were transferred to the only hospital that was still functioning namely Hospital Universiti Sains Malaysia (HUSM), Kubang Kerian, Kelantan. It came to a point where even HUSM itself was no longer able to accommodate all the patients seeking medical attention.

As in the previous flood disasters, HUSM received patients from the maternity ward and critical cases from Hospital Raja Perempuan Zainab II only. However, in 2014, the hospital received patients from all district hospitals in Kelantan, as other hospitals were incapable to provide full services. The situation in HUSM became even more severe when HUSM experienced blood bank shortages due to overwhelming demands. The financial losses to hospitals and clinics were estimated up to RM281 million (Bernama, 2015; Utusan, 2015). Table 1 illustrated flood cases that impacted hospital globally.

Table 1. The hospital affected by flood cases

Events	Year	Losses
Midwest Flood, USA	1993	Affected 6 hospitals.
The Gujarat Earthquake, India	2001	Devastated 227 healthcare facilities.
The Algerian Earthquake	2003	Destroyed 50% of health facilities.
The Southeast Asia Earthquake and Indian Ocean Tsunami	2004	Destroyed 42 hospitals and 195 healthcare facilities.
Hurricane Ivan	2004	Caused severe damaged to several hospitals in Grenada, Jamaica and Cayman Islands.
The Pakistan Earthquake	2005	Destroyed 50% of health facilities.
Peru, Pasco Earthquake	2007	Lost 97% of its hospital beds.
China's Wenchuan Earthquake	2008	Destroyed 52% of health facilities.
Vietnam Flood	2008	Damaged 61 hospital provinces.
Fuji Rains	2009	Flooded health facilities and devastate infrastructure.
Great East Japan Earthquake and Tsunami (GEJET)	2011	Destroyed 80% of hospitals in Fukushima, Miyagi and Iware, caused 11 hospitals to collapse and partial collapse of 200 hospitals in Tokohu, Japan.
Kelantan Flood, Malaysia	2015	Flooded health facilities and devastate infrastructure of 4 hospitals in Kelantan, Malaysia.

Understanding the issues in managing 2014 flood, which highlighted from the HUSM perspectives are crucial as it can help the affected hospitals to develop future preparedness strategies and to ascertain which interventions require priority to reduce the future flood impact. Thus, the overall purpose of the study is to identify what are the issues faced by the HUSM staff as well as their recommendations as related to the 2014 flood.

2. Method

2.1. Research methodology

"Disaster Risk Management for Sustainable Development (DRM-SD) – Flood Disaster workshop" organized by the Centre for Global Sustainability Studies (CGSS), USM, from August 4 – 5, 2015 at Universiti Sains Malaysia (USM), Kelantan acted as a platform to obtain the data for this study. The approval to conduct the programme was obtained from the hospital director with a strong support from the USM Vice Chancellor and CGSS director. The respondents of this study were the HUSM staffs from the various departments with a total number of 55 staffs. The respondents were grouped based on the 5 pillars in DRM-SD Model namely prevention, preparedness, response, recovery and governance in a session called World Café and being facilitated by one facilitator per group. The respondents were asked about the 2014 flood issues according to the pillar assigned to them. After one hour, the respondents were rotated where they were asked about the issues based on the current pillar. A total of 5 rotations were done to the World Café session, which allows them to view the issues raised by the previous group. In addition, the respondents were allowed to add any relevant issues during the rotation session. Finally, the issues discussed in the World Café session were presented.

2.2. The DRM-SD Model

This workshop was organized based on the five pillars proposed in Disaster Risk Management for Sustainable Development (DRM-SD) Model developed by Koshy et. al (10). The DRM-SD Model has outlined 5 pillars for risk reduction for resilience and sustainable hospital management, which involves prevention, preparedness, response, recovery and governance. The terms in the model are explained as follows:

(i) Prevention - Any action that reduces flood risk, which is the most important stage of the DRM-SD cycle. It involves the identifying and addressing of the root cause of the problem. It may include environmental protection, public health measures, engineered approaches, proactive policies and implementation, aimed at flood resilient communities and societies. Prevention activities focus on the agent.

(ii) Preparedness - It is an act or a process of change (modification, adjustment, transformation) by which the flood risk on people and the environment is reduced to acceptable levels. Preparedness activities focus on the likely victims.

(iii) Response – It is the activities to reduce the risk as much as possible as well as bringing any inevitable disaster under manageable limits. The delivery of emergency assistance must be quick and effective as to minimize loss of life and property, and this involves: (a) rapid assessment of needs, (b) coordination of relief efforts, (c) quick dispatch of rescue teams, (d) dispatch of relief goods and medical supplies, followed by accurate assessment of damage leading to restoration work. Response activities focus on the victims. (iv) Recovery – The main effort in recovery is to achieve the sustainable development, which means to meet present and future needs in an environmentally and socio-economically viable way. Recovery refers to activities involved in returning the society to the predisaster status and so on. Recovery activities focus on the public.

(v) Governance – Governance enable the prevention, preparedness, response and recovery part to be carried out efficiently. Standard Operating Procedures (SOPs) for disaster management, and the implementation of which involves human and financial resources must be justified. Governance activities focus on to make it happen. Figure 1 illustrated the DRM-SD Model.

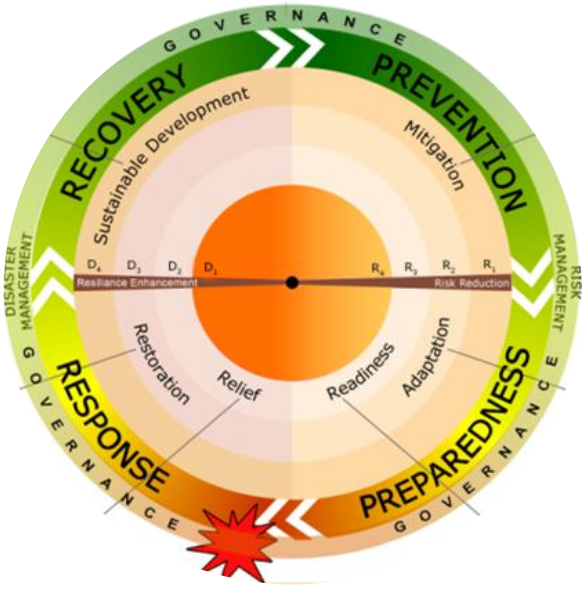

Figure 1. The Disaster Risk Management for Sustainable Development (DRM-SD) Model as proposed by Koshy et al. (2013).

3. Results

3.1. Respondents background

The respondents were the HUSM staffs with a total number of 55 staffs involved in this study. There are 47.3% male (26 staffs) and 52.7% female (29 staffs) participated in this study. Majority of the respondents are from nursing department with twelve representatives and followed by nine respondents from the paramedic department. Meanwhile, the emergency department presents three representatives. Furthermore, there are seven departments with two representatives respectively (health record, social welfare, hemodialysis, food & dietitian, ARASC, INFORMM and centre for health science studies) and another fourteen representatives come from the various departments such as safety, development, student welfare and development, recovery, registry, desasiswa murni, neuroscience research and service centre, radiology, library, PPKT, PPBLT, bursary, forensic and blood bank.

3.2. Proposed action plans

Based on the discussion in the World Café session, listed are the action plans that were proposed to be carried out in the prevention, preparedness, response, recovery and governance phases for flood disaster risk reduction.

(i) Prevention

- Flood Evacuation Centre for staffs and families/liabilities should be held in HUSM and not in the ordinary course of settlement.
- Planning and freezing specific holidays in December and January to ensure at least 90% of the staffs to be present during the occurrence of a disaster.
- Provide opportunities for critical staff to work overtime with an incentive payment.
- Advance purchase for stock usage for a period of 1 to 2 months.
- Sufficient equipment's spare parts for use at any time.
- Service the critical equipment as well as repair out-of-order equipment not later than November.
- Update data on food requirements.
- Install clean water filtration system
- Increase the number of gas tank as well as do advance purchase for gas tank specifically for emergencies purposes.
- Update the data to know the statistics of the drugs and disposable items usage.
- Identify the number of back-up generator that enough to fuel the generator including gasoline during the flood took place.
- Buy two trucks and two amphibian carriers.
- Build a special counter at the Trauma Center to manage the patients' admission from outside hospital.
- Upgrade design of the hospital for disaster resistant.

(ii) Preparedness

- Prepare SOPs in coping with flood situations activities.
- Create "buffer budget" to purchase a hemodialysis treatment facility.
- Increase the capacity of staffs and facilities/requirements to treat patients in the "green zone".
- Increase the hospital staffs' awareness and sensitivity.
- Create awareness among the patients on the hospital status; for example give up-to-date information and signage.
- Add/expand hemodialysis treatment space.
- Disaster training obligatory to all staffs.
- Control the hospital stock supply periodically, especially during the flood season.
- Obtain the blood supply from the external source of hospital/clinic.
- Perform regular maintenance to HUSM water tank system as well as other facilities.
- Organize mega blood donation activities periodically.
- Sufficient supply of clean water during the flood.
- Provide portable gas tank.
- Keep an extra linen stock for patients.
- Hire more staffs in laundry unit.

(iii) Response

- Provide 24-hours outpatient clinic to deal with cold case.
- Add medical and support staffs.
- Admission without referral.
- Transfer human resources from passive area to active area.
- Reduce elective/non-emergency cases to focus on emergency cases.
- Freeze staffs' leaves.
- Encourage staffs to multitask.

(iv) Recovery

- Disaster recovery related workshops for medical staffs.
- Form a taskforce (psychology) for staffs.

- Support from top management to medical and admin staffs.
- Provide a rest room for staffs to take a rest.
- Sharing Programme – for staffs to share their experiences and to express their feeling.
- Comprehensive health check-up programme for staffs.
- Special provisions for rehabilitation expenses (infrastructure appliances), utility costs, operating costs (allowance for overtime and equipment) and the cost for disposal of clinical wastes and domestic.

(v) Governance

- Update the standard operating procedures (SOP) for patients transfer as well as training, enforcement, monitoring related to it.
- Obtain appropriate vehicle procurement.
- Monitoring and training for competency.
- Establish a committee for procurement and asset management
- Prepare periodic maintenance schedule and practice, and give training for staffs to use the equipment.
- Keep a schedule for transport movement.
- Develop a SOP for handling clinical waste management.
- Periodic monitoring – water usage.

4. Discussion

The 2014 flood was like an eye-opener towards strengthening disaster preparedness in Malaysia. There is no assurance that the 2014 flood will not recur in the future, therefore disaster mitigation and preparedness are without a doubt the best pre-disaster effort which can only be actualized by total understanding and implementation of the risk reduction and resilience enhancement strategy as provided by DRM-SD Model.

Staffs were unable to be present for duty as they were also affected by the flood. The access road to the hospital was disrupted. Furthermore, a number of staffs took leave after flood to settle the personal flood matters (claims, police report, to clean flood waste). A proper planning to cater inadequate staffs' capacity is crucial to ensure continuity of operations during a disaster. Hospital staffs' contact lists should also be updated.

Staff should be present during disaster thus freezing staffs' leaves is one direct solution to it, which in turn leading to the issues of tiredness and overload. Ensuring adequate staff for shift rotations and caring for their welfare will be best to increase their morale and reducing medical errors. Placing the staffs from other department to support the critical areas results delayed routine work, hence increase post-disaster workload.

Pre, during and post disaster training would be beneficial to equip the staff with relevant skill and experience. Staffs that are well versed in disaster will able to manage the disaster more efficiently.

Furthermore, sufficient allocation for budget is crucial for all five phases of managing the flood.

Keeping the Standard Operating Procedures (SOPs) in writing for various level of the disaster management is important and should be enforced, tested and drilled with all personnel involved at regular interval.

An early planning in managing stocks such as supply, food, medicine, medical appliances and clean water is important to avoid supply shortage. An agreement with vendor must be signed to ensure that the supplies are ready to be sent to the hospital when flood warning indicator reaches a certain level.

Hospital must have better coordination with one another as well as with National Blood Centre, and other national blood organizations in ensuring sufficient blood demand during disaster.

Back-up generators, gas tank and water tank are among the crucial equipment identified in 2014 flood. These equipment needs to be added and repair and maintenance must be performed regularly.

5. Conclusion

HUSM was the only hospital that was able to withstand and survive in the disaster, but several critical matters are worth to be addressed for future disaster risk reduction in hospital. The most important topics in this specialty include disaster prevention and preparedness, as well as the creation of a properly designed and effective disaster response and recovery plan and that they are overseen by the effective governance.

6. Limitations and future research

There are several limitations to the current study that need to be addressed. This study examined the 2014 flood issues by focus group with one-hour time provision for each pillar to be discussed, thus limit the freedom for each respondent

to throw the idea for the discussion. Moreover, the issues raised up in the World Café were not discussed comprehensively due to the time limitation. With this in mind, therefore, an indepth qualitative method might be helpful for future research in obtaining detailed and precise data regarding the issues.

Besides, this study took place within Hospital Universiti Sains Malaysia (HUSM), Kelantan, which was the only hospital that was able to withstand and had to manage cases from the other hospitals throughout Kelantan and hence the results cannot be generalised to other hospitals that were badly affected by the 2014 flood. Although the findings of the study have added to the understanding on the disaster management in HUSM, there is a need for further research in comparing these findings with other hospitals in Kelantan, Terengganu and Pahang, which were also involved with the 2014 flood.

Finally, it is appropriate that the similar study be conducted among hospitals in other state in Malaysia since these hospitals rarely and almost never been hit by floods. The level of disaster preparedness and awareness in hospitals in other states might be different, and believed to be lower as compared to the hospitals in the east coast states due to the fact that these hospitals are infrequently exposed to the flood disaster.

7. Ethical consideration

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc) have been completely observed by the authors.

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