A SURVEY ON KNOWLEDGE, ATTITUDE & CONFIDENCE LEVEL OF DISASTER MANAGEMENT AMONG DOCTORS IN TERENGGANU.

Dr Muhamad Sukri Mustafa

MMed Emergency Medicine

Department of Emergency Medicine

School of Medical Sciences, Universiti Sains Malaysia

Health Campus, 16150 Kelantan, Malaysia

Background: Disasters are unpredictable events that kill and affect people, demolish properties and disrupt environment. During such events, doctors play a vital role in dealing with the victims. It is crucial for doctors especially doctors working in emergency department to be prepared in facing the aftermath of disasters.

Objectives: The aim of this study was to evaluate the level of knowledge, attitude and confidence level of disaster management among doctors working in emergency department.

Methodology: This is a cross-sectional study using convenient sample conducted in all emergency department in Terengganu. A questionnaire was designed based on National Security Council under Directive No. 20, hospital disaster plan and review of relevant literature. It was edited by two emergency physicians and pre-test was conducted in HUSM to validate and test the reliability of the questionnaire. All doctors working in emergency department in Terengganu were included in this study. The study was conducted from January 2014 till March 2014. The questionnaires were circulated with help from representative from each hospital. It was anonymous and no time limit. The questionnaires were then collected and coded accordingly. Statistical analysis was used using SPSS version 21.

Result: A total of 92 doctors were analyzed. Average age was 28 years and 62% of doctors were from emergency department with in-house emergency physician. 28% of respondent had attended disaster drill previously and only 13% of doctors who had experienced in dealing with real disaster. The mean knowledge, attitude and confidence level were 72.14, 75.20, and 16 percent, respectively. Previously attended disaster drill was found to significant factors for good knowledge ($p=0.000$) and increase confidence level ($p=0.03$). Service duration and duration of working in emergency department were also found to be significant factors affecting knowledge ($p=0.008$) and attitude ($p=0.000$) towards disaster management.

Conclusion: We concluded that the knowledge regarding disaster management among doctors in Terengganu was at an average level. However, the majority of emergency doctors were found to have positive attitude towards disaster management. Despite this, self reported confidence was poor among doctors working in emergency department. Our results also suggest that advanced life support (e.g. TLS, ATLS) and frequent involvement in disaster drills are important for effective management of disaster in the future.

Dr Nik Ariff Nik Mohamad: Supervisor

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LIST OF ABBREVIATIONS

ACLS	Advanced Cardiac Life Support
ATLS	Advanced Trauma Life Support
CBRNe	Chemical, Biological, Radiological, Nuclear and explosion
DMRC	Disaster Management & Relief Committee
ED	Emergency Department
EMS	Emergency Medical Services
EP	Emergency Physician
GLM	General Linear Model
HSNZ	Hospital Sultanah Nur Zahirah
HUSM	Hospital Universiti Sains Malaysia
JCAHO	Joint Commission Accreditation of Health Care Organization
KAC	Knowledge, Attitude, Confidence
MCI	Mass Casualty Incident
MO	Medical Officer
NMRR	National Medical Research Registration
NSC	National Security Council

OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
START	Simple Triage And Rapid Treatment
TLS	Trauma Life Support
UCSI	University College Sedaya International
UNISZA	University Sultan Zainal Abidin
WHO	Word Health Organization

ABSTRAK

KAJIAN MENGENAI PENGETAHUAN, SIKAP DAN KEYAKINAN DIRI MENGENAI PENGURUSAN BENCANA DALAM KALANGAN DOKTOR DI TERENGGANU.

Pengenalan

Bencana merupakan sesuatu kejadian yang tidak dapat dijangka yang boleh mengakibatkan kehilangan nyawa, kemusnahan harta benda dan kerosakan alam sekitar. Doktor memainkan peranan yang penting ketika berlakunya sesuatu bencana untuk memberi rawatan kepada mangsa. Persiapan bagi menghadapi bencana adalah sesuatu yang amat penting terutamanya bagi doktor yang bekerja di jabatan kecemasan.Tujuan kajian ini dijalankan adalah untuk mengetahui tahap pengetahuan, sikap dan keyakinan diri dalam pengurusan bencana dalam kalangan doktor yang bekerja di jabatan kecemasan.

Metodologi

Kajian ini ialah kajian “cross-sectional”. Soalan kajian dibuat adalah berdasarkan Majlis Keselamatan Negara di bawah Arahan bernombor 20, pelan tindakan bencana hospital dan beberapa artikel yang berkaitan. Soalan kajian kemudiannya disemak oleh dua orang pakar perubatan kecemasan dan ujian awal dilaksanakan di HUSM untuk memastikan kesesuaian, konsistensi dan ketepatan soalan. Semua doktor yang bekerja di jabatan kecemasan di Terengganu telah dijadikan respondan dalam kajian ini. Kajian dijalankan dari bulan Januari 2014 sehingga bulan Mac 2014. Soalan kajian diedarkan melalui bantuan wakil dari setiap hospital. Soalan kaji selidik ini dibuat secara tanpa nama dan tiada had masa diperuntukkan. Setelah siap, soalan dikutip dan dilabelkan

dengan kod bagi setiap hospital. Analisa statistik kemudiannya dijalankan menggunakan program SPSS versi 21.

Keputusan

Seramai 92 orang doktor terlibat sebagai respondan dan datanya telah dianalisa. Purata umur ialah 28 tahun dan sebanyak 62% doktor adalah dari jabatan kecemasan yang berpakar. 28% doktor pernah meghadiri latihan bencana dan hanya 13% doktor mempunyai pengalaman bekerja dalam bencana yang sebenar. Purata markah untuk pengetahuan, sikap dan tahap keyakinan diri ialah sebanyak 72.14%, 75.2% dan 16% setiap satu. Pernah menghadiri latihan bencana merupakan faktor yang kukuh dalam meningkatkan tahap pengetahuan dan keyakinan diri. Manakala tempoh perkhidmatan dan tempoh bekerja di jabatan kecemasan juga merupakan faktor yang kukuh dalam mempengaruhi sikap dan tahap pengetahuan terhadap pengurusan bencana.

Kesimpulan

Sebagai kesimpulan, tahap pengetahuan terhadap pengurusan bencana dalam kalangan doktor di Terengganu adalah sederhana. Walau bagaimanapun, majoriti doktor mempunyai sikap yang bagus terhadap pengurusan bencana. Selain itu, tahap keyakinan diri terhadap pengurusan bencana dalam kalangan doktor yang bertugas di jabatan kecemasan adalah rendah. Keputusan kajian ini mencadangkan doktor yang bertugas di jabatan kecemasan perlu menghadiri banyak latihan bencana dan menghadiri kursus bantuan hayat seperti kursus asas trauma dan kursus pengurusan trauma peringkat tinggi supaya dapat menguruskan bencana dengan baik pada masa hadapan.

ABSTRACT

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Background

Disasters are unpredictable events that kill and affect people, demolish properties and disrupt environment. During such events, doctors play a vital role in dealing with the victims. It is crucial for doctors especially doctors working in emergency department to be prepared in facing the aftermath of disasters. The aim of this study was to evaluate the level of knowledge, attitude and confidence level of disaster management among doctors working in emergency department.

Methodology

This is a cross-sectional study using convenient sample conducted in all emergency department in Terengganu. A questionnaire was designed based on National Security Council under Directive No. 20, hospital disaster plan and review of relevant literature. It was edited by two emergency physicians and pre-test was conducted in HUSM to validate and test the reliability of the questionnaire. All doctors working in emergency department in Terengganu were included in this study. The study was conducted from January 2014 till March 2014. The questionnaires were circulated with help from representative from each hospital. It was anonymous and no time limit. The questionnaires were then collected and coded accordingly. Statistical analysis was used using SPSS version 21.

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A total of 92 doctors were analyzed. Average age was 28 years and 62% of doctors were from emergency department with in-house emergency physician. 28% of respondent had attended disaster drill previously and only 13% of doctors who had experienced in dealing with real disaster. The mean knowledge, attitude and confidence level were 72.14, 75.20, and 16 percent, respectively. Previously attended disaster drill was found to significant factors for good knowledge (p=0.000) and increase confidence level (p=0.03). Service duration and duration of working in emergency department were also found to be significant factors affecting knowledge (p=0.008) and attitude (p=0.000) towards disaster management.

Conclusion

We concluded that the knowledge regarding disaster management among doctors in Terengganu was at an average level. However, the majority of emergency doctors were found to have positive attitude towards disaster management. Despite this, self reported confidence was poor among doctors working in emergency department. Our results also suggest that advanced life support (e.g. TLS, ATLS) and frequent involvement in disaster drills are important for effective management of disaster in the future.

1. INTRODUCTION

1.1 Disaster overview

Disasters are unpredictable events that kill and demolish properties and disrupt environment. Disasters have claimed millions of lives and cost billions of dollars worldwide in the past few decades. Recent examples of large-scale disasters include the terrorist attacks of September 11, 2001, the intentional distribution of anthrax in the U.S. in 2001, the 2004 Pacific Ocean tsunami, and the 2010 earthquake in Haiti. Emergency physicians frequently have extensive responsibilities for community and hospital-level disaster preparedness and response (Tintinalli & Stapczynski, 2011).

Disaster is defined as a sudden ecological phenomenon with sufficient magnitude to require external assistance (Brian S. Sorensen, 2011). Alternatively, disaster is defined as a sudden extraordinary event that brings great damage, loss, destruction and injury to people and their environment (Stanhope & Lancaster, 2013). The Joint Commission Accreditation of Health Care Organizations (JCAHO) has a somewhat different definition, which states a disaster is an imbalance in the availability of medical care and a mal-distribution of medical resources versus casualties within a community. In Malaysia, disaster is a sudden event, very complex in nature and causing fatality, lost of properties or environment and causing morbidity to the local society as defined by the National Security Council (NSC) under directive no. 20.

Since independence, Malaysia has progressed and developed at an unprecedented rate and has transformed herself from an agrarian to an industrialized nation. According to Malaysia Statistics Department, Malaysia has 29.95 million citizens in 2013 comprising of 15.43 million males and 14.51 million females. Corollary to the industrialization, disasters associated with development and technology have become more apparent. Malaysia has experienced various magnitudes of disasters ranging from biological, structural collapse, fires and explosions, landslides and meteorological incidents. A list of notable disasters in Malaysia is shown in Table 1.1.

Table 1.1: Notable disasters in Malaysia

Date	Disaster	Casualties
19 October 1968	Collapse of 4-Storey Building, K.L	7 Dead 11 Injured
January 1971	Monsoon flood spilled over to West Coast of West Malaysia	24 Dead National Emergency Declared
31 July 1988	Collapse of Sultan Abdul Halim Jetty, Butterworth, Penang	32 Dead 1 674 Injured
22 September 1989	Fire at Sek. Agama Rakyat Taufiqiah Khairiah Al-Halimiah, Yan, Kedah	27 Dead 6 Injured
7 May 1991	Fire and Explosion of Bright Sparklers Fireworks Factory, Sg. Buloh, Selangor.	22 Dead 103 Injured
5 April 1992	Fire at Sultan Abdul Aziz Shah International Airport, Subang, Selangor.	3 Dead
20 Jun 1992	Choon Hong III Ship, Explosion and Fire, Port Klang, Selangor.	10 Dead
11 Dec 1993	Collapse of Highland Towers Condominium, Hulu Klang, Selangor.	48 Dead
4-7 Dec 1994	Landslides in Cameron Highlands	7 Dead
30 Jun 1995	Landslide, off Genting Highland Road, Pahang.	20 Dead 22 Injured

15 July 1996	Tourist Bus Accident, landslide at Km 15, Genting Highland, Pahang.	17 Dead
29 August 1996	Mudslide at the Aborigines' Village in Pos Dipang, Kampar, Perak	44 Dead 30 Homes Destroyed
26 December 1996	Tropical Storm GREG (Typhoon), Keningau, West Coast of Sabah	230 Dead 4925 Homes Damaged.
1-30 April 1997	Enteroviral Outbreak, Sibu, Sarawak.	25 Dead
July- October 1997	Country Wide Haze in Malaysia And Haze Emergency in Environmental Damage, Sarawak	Health Problems & Economic Losses
24 December 1997	Fire and Explosion, Shell SMDS, Bintulu, Sarawak.	12 Minor Injuries Extensive property damage and losses
March-September 1998	Water Supply Crisis in Klang Valley	1.8 Million Residents Affected
4 February 1999	Kg. Gelam Landslides	17 dead
October 1998 - June 1999	Japanese Encephalitis (JE) In Perak, Negeri Sembilan and Melaka.	Outbreak 101 dead 190,965 Pigs Culled
28 January 2002	Ruan Changkul Simunjan, Sarawak Landslide	16 dead
26 December 2004	Tsunami (States of Penang, Kedah & Perlis)	68 Dead 276 Injured

1.2 Types of disaster

Disasters are divided into two basic groups: natural and man-made disaster. Among the natural disasters are earthquakes, volcanoes, hurricanes, floods and fires. Among man-made disasters are war, pollution, nuclear explosions, fires, hazardous materials exposures, explosions and transportation accidents. The Word Health Organization began using the term “complex humanitarian disaster” after the fall of the Soviet Union to refer to a specific type of man-man disaster: combination of civil strife and conflict leading to a mass exodus of people and the events that follow, such as disease and destruction of property (Zibulewsky, 2001).

Worldwide, a major disaster occurs daily, and natural disasters needing international assistance occur weekly. Over the past 20 years, 3 million deaths and 50 billion dollars in property losses have been attributed to disasters (Zibulewsky, 2001). Floods are the most common of all natural disasters and generally cause greater mortality than any other type of natural hazard. Floods is defined as the condition that occurs when water overflows the natural or artificial confines of a stream, river, or other body of water, or accumulates by drainage over low-lying areas (Hogan & Burstein, 2007). Floods account for 50% of disasters and deaths related to disasters. The worst natural disaster in recorded history was the flood of the Yellow River in China in 1887 where 900,000 people died, and 2 million were left homeless. The Johnstown flood, which killed 2200 people, was the worst flood in the USA. The main causes of mortality and morbidity from floods were drowning, hypothermia, and trauma. Although floods can be extensive, only 0.2% to 2% of people involved in a flood require medical care (Zibulewsky, 2001). Floods are also primary hazard in Malaysia, ranking in the top

deciles for most of the western half of the country. Landslides and droughts are also significant though their effects are limited to much smaller areas in the eastern regions. Over the past four decades, Malaysia has sustained more than USD 100 million in total estimated damages due to floods and landslides (Singh & Subramaniam, 2009). However, Malaysia geographically and tectonically was still considered to be safe from severe hazardous threats such as those attributed to plate tectonic movements, atmospheric low-pressure systems and volcanic eruptions (Rahman, 2012).

Hazardous materials represent a complex and potentially significant hazard for emergency health care workers. Emergencies involving exposures to hazardous materials are relatively rare events, but they still represent one of the most common man-made disasters that occur in the community setting. Hazardous material are substances, which because of their chemical, physical or biological properties pose a potential risk to life, health, the environment or property when not properly contained. These substances include materials that are explosive, flammable, combustible, corrosive, reactive, poisonous, biological, or radioactive. They can be solid, liquid, or gaseous. If the material is intended to be used and is hazardous, it is a Hazardous material.

Hazardous materials are used in the production and manufacture of almost every product that people consume, wear or use. As a result of their wide availability, the potential for exposure is significant. In early 1999, the Environmental Protection Agency (EPA) estimated that approximately 850,000 facilities in the United States were working with hazardous or extremely hazardous substances. Many of these sites are located in urban areas. Approximately 60500 accidents with hazardous material occur

nationwide annually, with more than 2550 resulting in casualties (Smithson, A. A, 2000). This number probably underestimates the true scope of the problem. The United States produces more than 60000 chemicals. The Occupational Safety and Health Administration (OSHA) estimates that 575,000 chemicals can be found in the workplace (Lerman & Kipen, 1990), 53,000 of which are potentially hazardous (Simonowitz, 1993). The 1984 industrial accident in Bhopal, India, caused more than 2500 deaths and 200,000 injuries from methyl isocyanate exposure. A natural emission of carbon dioxide in Lake Nyos, Cameroon, was responsible for 1700 chemical asphyxiant deaths. Chemical terrorism can occur through acts of willful deployment, as with the sarin release in the Tokyo subway in 1995 in which 12 people died and 5500 sought medical attention. The emergency physician is more likely to encounter the accidental release of a chemical in an industrial or transportation accident. In 2005, a freight train collision in Graniteville, South Carolina, caused the release of chlorine gas that resulted in nine deaths and 511 ED visits. Each year, there are 15,000 episodes in which hazardous chemicals are accidentally released in the U.S (Tintinalli & Stapczynski, 2011). In the Hazardous Substances Emergency Events Surveillance (HSEES) report, the most common complaints from exposed victims at fixed facilities events were respiratory (32%), eye irritation (13%), dizziness or other central nervous system symptoms (12.5%), headache (12%), gastrointestinal symptoms (10%), and burns (8%). Most of the victims (54%) were transported from the scene of exposure to receive assessment and treatment at the hospital (down from 84% in 1996). Only 8.7% of those treated at the hospital were admitted and only 2% died.

1.3 Disaster management

Malaysia has an integrated disaster management system to deal with the most kind of disaster anticipated. This integrated system is known as the Directive No. 20: The Policy and Mechanism on national Disaster Management and Relief. The directive tried to create systematic coordination among agencies involved in disaster management as well as relief and rehabilitation. This directive was issue by National Security Council (NSC) of the Prime's Minister Department in 1997. The objective of Directive No. 20 is to provide a policy guideline on the disaster management and rescue on the land in accordance to disaster level. It is also to provide a mechanism for management that decides on the roles and responsibilities of agencies that are involved in combating disaster. Through this directive, the disaster management is controlled in accordance with level of disaster. There are three level of disaster as classified according to NSC:

Level I Disaster

An under controlled local disaster that has no potential for further outbreak. This is expected to be less complex and may result in small loss of lives and properties. This type of disaster will not be detrimental to the daily routines of the people at large. Authorities at the district level will have the capacity to control and manage the situation through the agencies of the DMRC (disaster management and relief committee) with restricted helps from outside.

Level II Disaster

This will be a more serious disastrous event happening in a larger area or exceeding two districts and has potential for an outbreak. There may be potential for heavy loss of life

and properties. This event would normally impede daily activities of the local people arising from demolition of infrastructure. Naturally, it is more complex from Level I Disaster and poses a lot of difficulty in terms of search and rescue. The local DMRC would handle this situation without or with limited outside helps.

Level III Disaster

Originated from level II Disaster and is characterized by extreme complexity or the disaster has taken place through wide area or exceeding two districts. This will be handled by the authorities at the federal level without or with assistance from overseas.

The Directive 20 is no doubt is an effective mechanism in disaster management and relief effort but the problem with Malaysia is that this mechanism is not being put to extreme test as Malaysia is lucky to be located in a relatively safe part of the world away from many major natural disaster (Rahman, 2012). During the disaster, incident command and triage are essential tools for effective disaster management. Incident command is a system management tool that transforms existing organizations across planning, operations, logistics, and finance/administration functions for integrated and coordinated response. There is an incident commander who has responsibility for the overall response to ensure the safety of responders, save lives, stabilize the incident, and preserve property and the environment. Triage is a system decision tool used to sort casualties for treatment priority, given casualty needs, resources, and the situation. The triage goal is to do “the best for most,” rather than “everything for everyone.” Effective triage is an iterative process done across all settings of casualty care. Assessment of victim during disaster is based on primary and secondary survey (Trauma, 2008).

1.4 Hospital preparedness

Preparedness is defined as an umbrella strategy that involves forecasting and taking precautionary measures prior to an imminent threat (Seyedin, Ryan, & Sedghi, 2011). Health emergency and disaster preparedness includes getting ready (readiness), anticipating consequences or impacts from hazards or emergencies (foresight), planning for a variety of scenarios (anticipatory planning), and taking the necessary measures in order to avoid or reduce risk (precautionary action). A common perception is that preparedness is only for response; however, preparing for recovery after a disaster or emergency is no less important (Singh & Subramaniam, 2009).

During times of disaster, hospitals play an integral role within the health-care system by providing essential medical care to their communities. Any incident that causes loss of infrastructure or patient surge, such as a natural disaster, terrorist act, or chemical, biological, radiological, nuclear, or explosive hazard, often requires a multijurisdictional and multifunctional response and recovery effort, which must include the provision of health care. Without appropriate emergency planning, local health systems can easily become overwhelmed in attempting to provide care during a critical event. Limited resources, a surge in demand for medical services, and the disruption of communication and supply lines create a significant barrier to the provision of health care. To enhance the readiness of health facilities to cope with the challenges of a disaster, hospitals need to be prepared to initiate fundamental priority action (Brian S. Sorensen, 2011).

Hospitals are complex and potentially vulnerable institutions, dependent on external support and supply lines. In addition, with the current emphasis on cost-containment and efficiency, hospitals frequently operate at near capacity. During a disaster, an interruption of standard communications, external support services, or supply delivery can disrupt essential hospital operations and even a modest unanticipated rise in admission volume can overwhelm a hospital beyond its functional reserve. Employee attrition and shortage of critical equipment and supplies can reduce access to needed care and occupational safety. Even for a well-prepared hospital, coping with the consequences of a disaster is a complex challenge. Amid these challenges and demands, the systematic implementation of priority actions can help facilitate a timely and effective hospital-based response (Brian S. Sorensen, 2011).

In many provinces, hospitals were found not to have specific disaster plans for natural disaster that have a low frequency of occurrence (e.g. earthquakes and floods), novel infectious disease or terrorism attacks (particularly biological, nuclear and radiation attacks) (Hui, Jian-Shi, Xiong, Peng, & Da-Long, 2007). Moreover, the health facilities in many regions have a low level of essential preparedness in relation to disaster vulnerability analysis, disaster stockpiles, coordination with other institutions, emergency training in disaster first-aid, rescue, and the use of specialized supplies (Zhong, Clark, Hou, Zang, & FitzGerald, 2014). 30 hospitals in Federal Management Agency (FEMA) Region III are found not to be prepared to handle disaster events, especially in areas such as mass decontamination, mass medical response, awareness among healthcare professionals, health communications and facility security (Treat et al., 2001).

Hospital emergency preparedness has come under scrutiny (Russ & Jones, 2005). Recent events have brought disaster medicine into the public focus, both government and communities expect hospitals to be prepared to cope with all types of disaster (Bartley, Stella, & Walsh, 2006). Health professionals, including doctors will need to be personally and professionally prepared to respond to any type of emergency events. All agencies now recognize that a response to any sort of emergency requires and interagency, interdisciplinary response and that nearly all emergencies have potential health consequences (Hemat A. E. *et* al., 2011). Doctors will continue to be key players in the local and national level emergency response through the 21st century.

Doctors working in emergency department are usually the first team to respond when disasters occur. It is important to know how competence they are in managing disaster. Not many studies have been done previously on the competency of emergency doctors in managing the disaster in Malaysia, no such studies have been published yet. Due to lack of local data regarding disaster management in Malaysia, we design this study to determine the level of knowledge, attitude and confidence level of disaster management among doctors working in emergency department in Terengganu. Hopefully this study will give an overview status regarding disaster management among doctors working in Emergency Department in Terengganu and to look into the competence of our emergency doctors in dealing with disaster.

2. LITERATURE REVIEW

2.1 Knowledge

Increasingly frequent global disasters are posing threats to human health and life. The WHO has called for countries to have detailed plans at all levels in order to be prepared for disaster that may arise. Doctors working in emergency department are front liner, working both in pre hospital and as well as in hospital settings. In order to contribute to save lives and promoting health under such difficult situations, they need to have the right competencies. One study, completed in 2006 by the City of Fort Worth Public Health Department to assess the disaster preparedness/management competency of its local physicians. The authors used a self-assessment tool and found that their subjects had a very low level of competency. They found that 91% of those physicians surveyed considered their knowledge as "fair-poor." This finding was on both clinical and non-clinical issues (Spranger et al., 2007).

Another study was conducted among community-based physician in two hospitals in United States (western Pennsylvania and Florida) to assess the adequacy of knowledge regarding disaster preparedness and disaster management. This study also revealed a low level of competency among community-based physician with the median score on the self-assessment questions was 49% while the mode was 46% (Bruce, R. G., 2009).

In Iran, A study was done regarding assessment of general physician's knowledge about disaster. Researchers found that physicians in Iran had low knowledge regarding general disaster management, scene triage and hospital disaster team (Kianmehr, Mofidi, & Nejati, 2009). A survey on disaster management among postgraduate students in a private dental institution was conducted in India in 2011. The objective of this study is to assess the knowledge, attitude and behaviour regarding disaster management among postgraduate dental student by using a questionnaire method. A total of 125 of 135 postgraduate students participated in the study. They found that participants had low knowledge score regarding disaster management. The mean knowledge score were 58.74 percent (Rajesh, Chhabra, Shetty, Prasad, & Javali, 2010).

In Malaysia, a study regarding disaster management among emergency nurse and community health nurse was conducted in emergency departments and health clinics in Selangor. They found that both groups of nurses had similar inadequate knowledge towards disaster management (Nurul'Ain Ahayalimudin & Saiboon, 2012). Another recent study among nurses in Saudi Arabia regarding disaster management also revealed low level of knowledge with mean knowledge score of 21.2 (44%) (Ibrahim, 2014).

Another study was conducted among emergency medical services (EMS) in Canada to assess knowledge and practical preparedness training regarding chemical, biological, radiation, nuclear and explosion (CBRNe). The results of this study identify a significant lack of knowledge and preparedness for situations involving a CBRNe agent (Kollek, Welsford, & Karen Wanger, 2009). Another study was conducted in

Poland from October to November 2013. The aim of this study was to assess the knowledge of third year students of nursing and emergency medical services on emergency measures in the event of chemical contamination. An anonymous survey was mailed to 350 randomly selected students of nursing and emergency medical. Return questionnaires were obtained at 82.8%. The survey included questions concerning the process of decontamination, toxidromes knowledge and the use of selected antidotes. Poorly known were all issues to deal with chemical contamination especially decontamination technique (from 5.4% to 32%), the use of antidotes (from 2.9% to 72%), toxidromes knowledge (from 5.0% to 64%). The author concluded that students of medicine do not have enough knowledge for dealing with chemical contamination. (Szarpak, 2013).

2.2 Attitude

One study conducted in a private dental institution in India among 125 postgraduate students regarding disaster management reported that mean attitude score was 34.31 (85.78%) which indicates good attitude towards disaster management (Rajesh et al., 2010). In Saudi Arabia, 252 nurses were examined regarding disaster management, majority of nurses were found to have positive attitude (Ibrahim, 2014). This finding was similar among nurses working in emergency department in Malaysia, but the positive attitude is driven by being involved in disaster response and attending disaster-related education (Nurul'Ain Ahayalimudin & Saiboon, 2012).

Regarding willingness to work during disaster, few literatures reported majority of health care providers were willing to work during disaster but it will be depending on

type of disasters. A study done in New Heaven, USA found that 87% of hospital employees were willing to work after a fire, recue or collapse mass casualty incident. Respondents were otherwise less willing to work in response to a man-made disaster such as biological event (58%), chemical event (58%) or radiation event (57%) than a natural disaster such as in snowstorm (83%), flood (75%), hurricane (78%), earthquake (79%), tornado (77%), ice storm (75%) and flu pandemic (72%) (Cone & Cummings, 2005). However, another survey among emergency physicians at 7 US teaching institutions reported 54.1% of respondents were willing to report for duty in a natural disaster and 91.3% for nonnuclear explosive disaster (Snipes, Miramonti, Chisholm, & Chisholm, 2013). In Australia, 97.7% of emergency nurses were willing to attend their workplace during a disaster (Arbon et al., 2013).

A study conducted in order to assess awareness and training of medical staff in major incident planning and disaster medicine, a telephone survey was conducted throughout South East Thames Region, London. It was found that major incident plans were updated regularly in all the hospitals that were surveyed. Training exercise had been held in 88% of hospitals and majority had tested communications only. All consultants and 77% of doctors knew that their hospital had a major incident plan. However, only 39% of doctors had been given any major incident plan related literature and less than a third of all staff had attended a major incident plan orientation session (Brennan, Sage, & Simpson, 1994).

Although major incidents are uncommon, they required careful planning and preparation if they are to be managed well. In 1990 guidelines were issued for health service arrangements for major incident in British hospitals, (Carley & Mackway-Jones,

1996) examined hospital major incident plans to assess the level of compliance with these guidelines. They found only 4% of hospital emergency plans were fully compliant with health services' guidelines. They also highlighted lack of training experience and confidence among middle grade staff in a projected major incident situation.

2.3 Confidence Level

In the light of recent terrorist events in London, a study conducted to revisit the issue and conducted to telephone survey of relevant parties to investigate whether the situation has changed almost 10 years on. A total of 179 registrars in anaesthesia, accident and emergency medicine, general surgery and trauma and orthopaedics were telephoned in trauma units across the UK and questions about their readiness to respond to a major incident. Major incident co-ordinators for each of the units were contacted, and their planning, readiness, training opportunities, and recent rehearsals were assessed. A total of 179 registrars were contacted in 34 different units throughout Britain. One hundred and forty four responses were obtained. 47% had not read any of their hospitals major incident plan. Only 54% of the registrars questioned felt confident in the knowledge of their specific role during a major incident. Rehearsal of major incident plans varied widely between hospital with 82% of hospital having practised within the past five years but only 35% were planning for a rehearsal in the next twelve months. 25% of hospital that responded did not hold any teaching on major incident planning at their introduction sessions for junior and middle grade doctors. Limitations to improvement of major incident planning included: lack of funds, lack of a designated full time major incident co-ordinator, and lack of technology. There was no significant difference between units within London and those in other regions (Wong et al., 2006).

Another survey was conducted among members of the American Pediatric Surgical Association in 2007. The authors explored four domains in this survey: demographics, disaster experience and perceived preparedness, attitudes regarding responsibility and willingness to participate in a disaster response, and availability to participate in a disaster response. The authors sent 725 invitations and received 265 (36.6 percent) completed surveys. Overall, the authors found that 77 percent of the respondents felt "definitely" responsible for helping out during a disaster but only 24 percent of respondents felt "definitely" prepared to respond to a disaster. Most felt they needed additional training, with 74 percent stating that they definitely or probably needed to do more training. Among experiential factors, the authors found that attendance at a national conference was associated with the highest sense of preparedness. The authors determined that subjects with actual disaster experience were about four times more likely to feel prepared than those with no disaster experience ($p < 0.001$). The authors also demonstrated that individuals with a defined leadership position in a disaster response plan are twice as likely to feel prepared ($p = 0.002$) and nearly five times more willing to respond to a disaster than those without a leadership role (Chokshi, Behar, Nager, Dorey, & Upperman, 2007).

2.4 Hospital disaster plan

One study conducted in United State in 2008 to look for hospital preparedness for responding to public health emergencies, including mass casualties and epidemics of naturally occurring diseases such as influenza. Data are from an emergency response preparedness supplement to the 2008 National Hospital Ambulatory Medical Care Survey, which uses a national probability sample of nonfederal general and short-stay hospitals in the United States. Sample data were weighted to produce national estimates. They found out that nearly all hospitals had response plans for chemical releases, natural disasters, epidemics, and biological incidents. Preparedness for explosive or incendiary incidents was less frequent than preparedness for other types of incidents. While most hospitals had plans for cancellation of elective procedures and admissions, two-thirds had plans for alternate care areas with beds, staffing, and equipment. They also found out one-half of hospitals planned for alternate care areas in inpatient hallways or decommissioned ward space, or for conversion of inpatient units to augment intensive care. One-half of hospitals had adjusted standards of care for allocation of mechanical ventilators for mass casualties. Although over one-half of hospitals had staged epidemic drills, only one-third included mass vaccination or medication distribution. One-half of hospitals planned for advance registration of health care professionals. While most hospitals had memoranda of understanding (MOUs) with other hospitals to transfer adults during an epidemic, fewer hospitals had MOUs for pediatrics and burns. Less than one-half of hospitals accommodated the needs of children and persons with disabilities during a public health emergency.

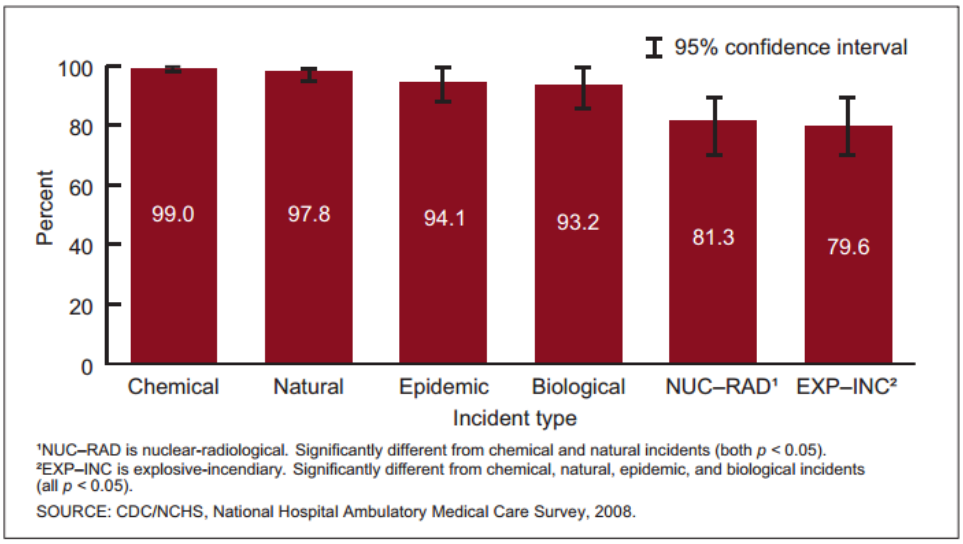

Figure 2.1: Percentage of hospitals with emergency response plans for selected types of incidents: United States, 2008

Another study conducted in 40 hospitals in Federal Emergency Management Agency (FEMA) region III reported that all hospitals in this study do not appear to be prepared to handle weapon of mass destruction events, especially in areas such as mass decontamination, mass medical response, awareness among health care professionals, health communications and facility security (Treat et al., 2001).

Although children are among the most vulnerable in the event of disaster, there are substantial deficiencies in the preparedness plans of pre-hospital emergency medical services agencies in the United States for the care of children in a mass-casualty event. A pilot survey that focused on pre-hospital Emergency Medical Services system preparedness for the care of children in a mass casualty events was conducted in Arkansas, US. Most (72.9%) agencies reported having a written plan for response to a mass-casualty event, but only 248 (13.3%) reported having pediatric-specific mass-

casualty event plans. Most (69%) services reported that they did not have a specific plan for response to a mass-casualty event at a school. Most (62.1%) agencies reported that their mass-casualty event plan does not include provisions for people with special health care needs. Only 19.2% of the services reported using a pediatric-specific triage protocol for mass-casualty events, and 12.3% reported having a pediatrician involved in their medical control. Although most (69.3%) agencies reported participation in a local or regional disaster drill in the past year, fewer than half of those that participated in drills (49.0%) included pediatric victims. (Shirm, Liggin, Dick, & Graham, 2007).

The Institute of Medicine has issued two reports over the past 10 years raising concerns about the care of children in the emergency medical care system of the United States. Mailed survey was conducted to all emergency department medical directors in Arkansas. Seventy-two of 80 directors responded (90 percent response rate). Only 13 percent of hospitals reported they have pediatric mass casualty protocols and in only 28 percent of hospitals the disaster plan includes pediatric-specific issues such as parental reunification. Most hospitals hold mass casualty training events (94 percent), at least annually, but only 64 percent report including pediatric patients in their disaster drills. Most hospitals include local fire (90 percent), police (82 percent), and emergency medical services (77 percent) in their drills, but only 23 percent report involving local schools in the disaster planning process. Eighty-three percent of hospitals responding reported their staff is trained in decontamination procedures. Thirty-five percent reported having warm water showers available for infant/children decontamination. Ninety-four percent of hospitals have a plan for calling in extra staff in a disaster situation, which most commonly involves a phone tree (43 percent). Ninety-three percent reported the availability of Ham Radios, walkie-talkie, or Arkansas Wireless

Information Network (AWIN) units for communication in case of land line loss, but only 16 percent reported satellite phone or Tandberg units. Twelve percent reported reliance on cell phones in this situation. This survey demonstrated important deficiencies in the preparedness of hospitals in Arkansas for the care of children in disaster. Although many hospitals are relatively well prepared for the care of adults in disaster situations, the needs of children are different and hospitals in Arkansas are not as well prepared for pediatric disaster care.(Thompson, Lyle, Mullins, Dick, & Graham, 2008).

2.5 Triage

Management of a mass-casualty incident (MCI) relies heavily on triage as one of the critical determinants of the success of a disaster plan. Few studies had mentioned that inappropriate triage can lead to overwhelm of emergency department and medical resources (Madzimbamuto, 2003) and (Zhong et al., 2014). The triage officer is the first to assess the victims when they arrive at scene. The triage officer sorts the casualties into management groups according to their severity of injury (Ashkenazi et al., 2006). In MCIs the overwhelming number of casualties quickly exceeds the ability to treat them. Rapid and accurate triage is a key element to minimise mortality among survivors. Pre hospital triage consists in sorting the patients into groups based on the need for medical treatment and transport. There are two types of triage that are used worldwide, physiological – based triage (PHY) and the anatomy and mechanism of injury – based triage (INJ). The PHY is divided into primary and secondary triage. Primary triage is used on the MCI scene, to give priority for transportation. It is mainly based on physiological assessment of the patients, considering, for example, the

respiratory and pulse rates. Improper triage can lead to misdistribution of patients, some hospitals are overwhelmed while others are left vacant (Zibulewsky, 2001).

The main primary triage instruments are known as simple triage and rapid treatment (START) and the triage sieve, which is used in many countries worldwide and by the North Atlantic Treaty Organization, as a component of the MCI management and support course for healthcare providers (Pelaccia et al., 2009). START triage is based on a rapid assessment of respiration, perfusion, and mental status (RPM) as shown in figure 2.2. This color-coded four-category system is probably the most common disaster or MCI triage system in the United States. “Red” casualties are the first priority and are “most urgent.” Patients classified “Yellow” is the second priority and are “urgent.” “Green” patients comprise the “walking wounded” or “non urgent” and are the third priority. Dead patients and catastrophically injured patients with a negligible chance of survival belong to the “Black” triage category. JumpSTART (figure 2.3) is a modification of the START disaster triage for pediatric patient’s ages 1 to 8 years. (Rothrock & Brennan, 2007).

Secondary triage, such as the triage sort, is used at hospital or in situations where patients must stay on scene for long. They rely on other data such as blood pressure and Glasgow Coma Scale. It consists in the identification of four categories of patients as patients with life threatening injuries are categorised as immediate priorities, patients without life threatening injuries are categorised as delayed priorities, non injured persons who may have psychological trauma are categorised as minor priorities and fatally injured patients are categorised as low priorities. (Pelaccia et al., 2009).

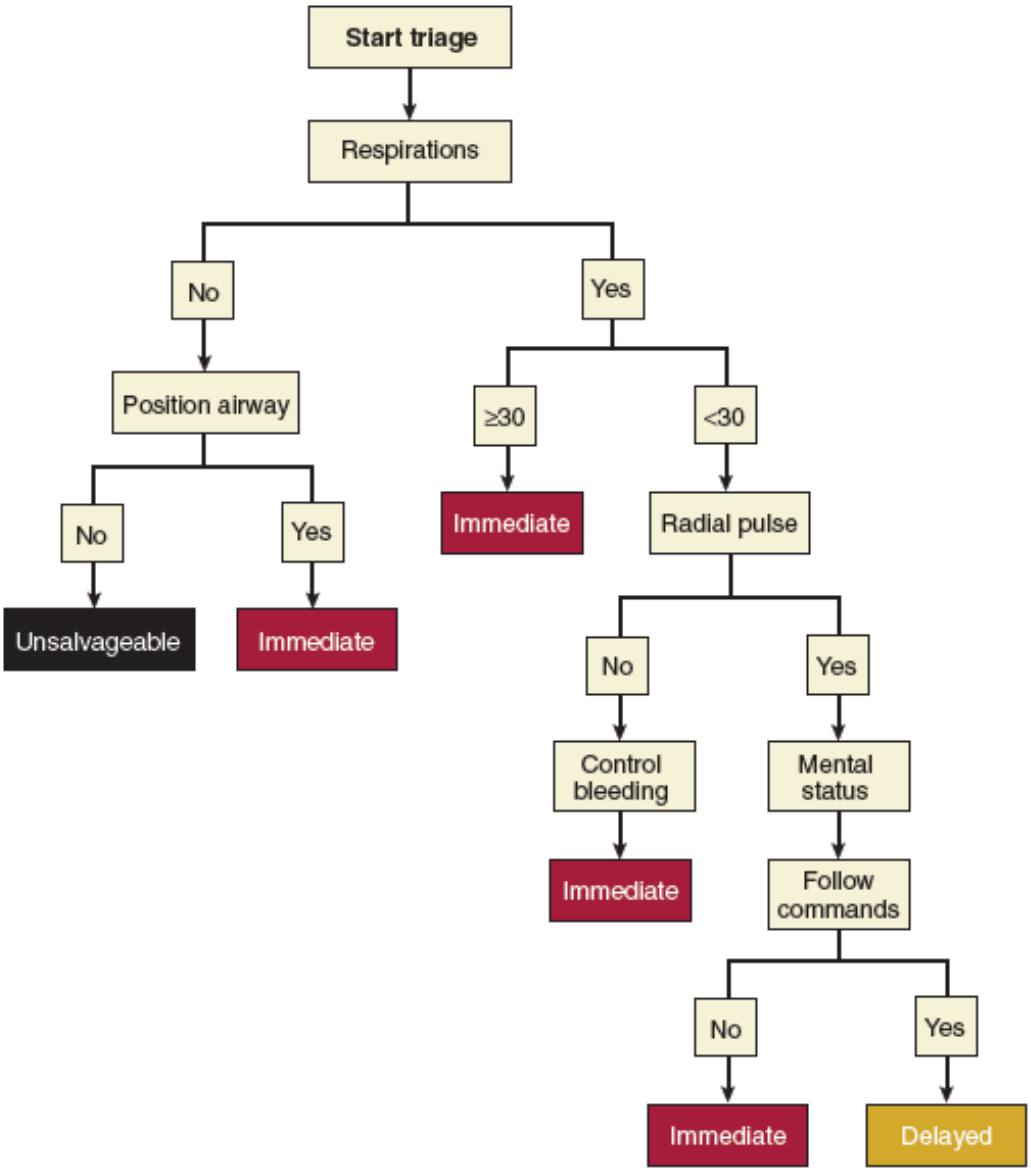

Figure 2.2: Simple Triage and Rapid Treatment (START) tool

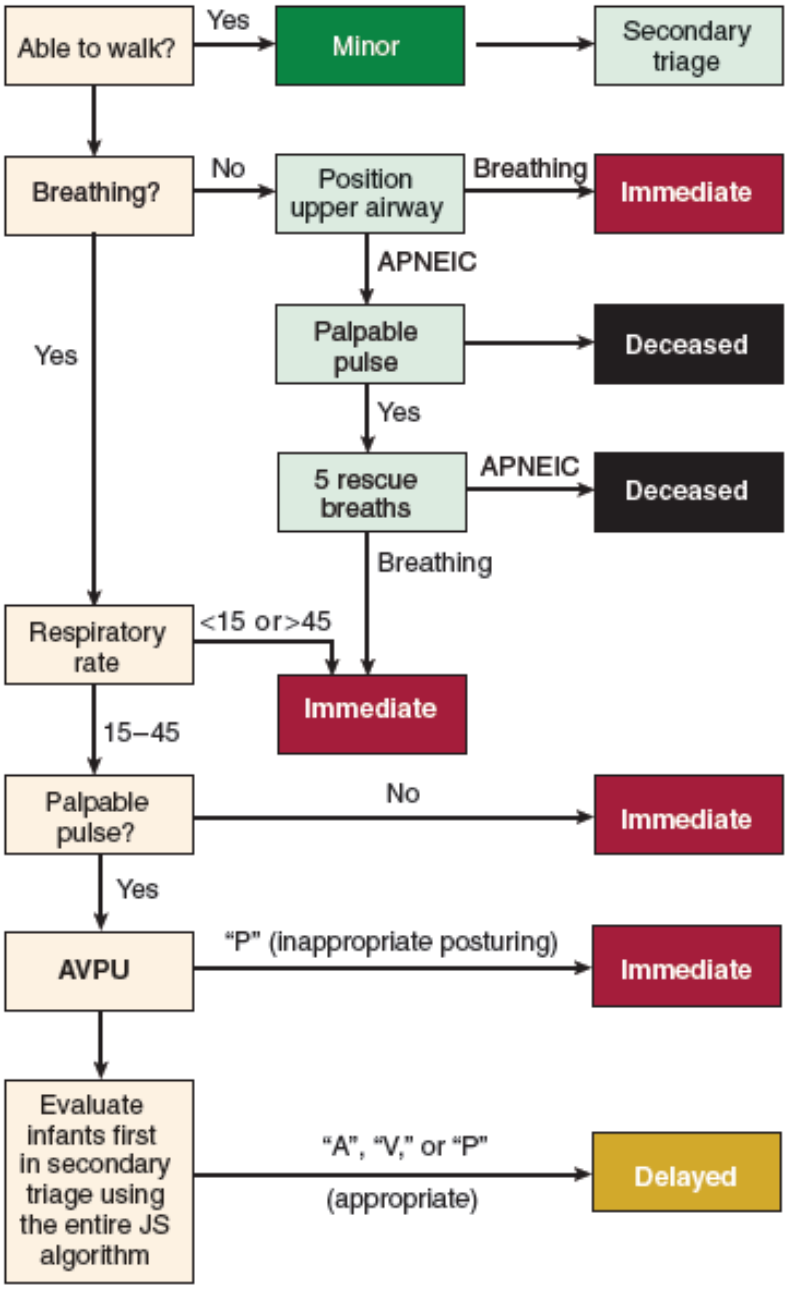

Figure 2.3: JumpSTART pediatric mass casualty incident triage. Abbreviations: AVPU, alert, responsive to voice, responsive to *p*osturing, or unresponsive.