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Knowledge of hospital disaster preparedness amongst the emergency department personnel of an academic hospital in Johannesburg, South Africa

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CHAPTER 1
INTRODUCTION

1.1 INTRODUCTION

Disasters are catastrophic incidents causing damage to or loss of infrastructure, materials, economy, environment and humans, the extent of which goes beyond the capability of the affected community to manage. They could be natural or man-made and are common occurrences all over the world[1,2]. They result from events such as flooding, wildfire, terrorist acts and biological, chemical, radiological or explosive hazards. Disastrous events with catastrophic consequences occurring around the world within the last ten years include earthquakes in Haiti (2010), a tsunami in Japan (2011), severe flooding in Australia (2011), Thailand (2011) and South Africa (2010, 2011, 2016), Hurricanes in the USA (2012) and the Philippines (2013) and an Ebola outbreak in West Africa (2014)[1]. Increasing population density and development, terrorist activity, areas susceptible to natural catastrophic occurrences, production of hazardous materials, use of nuclear and chemical facilities and climate change are significant factors increasing the probability of catastrophic incidents or disasters occurring in the immediate, near or far future[1,2].

Responding to disastrous events whenever they occur and mitigating their impact requires multijurisdictional and multifunctional approaches. As injuries to persons are a consequence of most natural or man-made disasters the healthcare system within and outside the community often needs to be involved. Thus, hospitals play important and critical roles in responding to and mitigating the impact of disasters occurring within a community[3].

Comprehensive hospital emergency management of a disaster consists of four phases. These are mitigation, preparedness, response and recovery[1, 4, 5].

Mitigation involves measures and activities put in place to lessen the impacts of disaster[6]. Regular risk and vulnerability assessment in the preparedness phase may help identify hazards in advance and implement adequate measures to address these risks and vulnerability thus avoiding their occurrence or lessening their devastating consequences on human lives[1, 7].

Preparedness involves the development of capacity to anticipate and respond to disaster occurrence[8, 9]. Hospital disaster preparedness thus play a vital role in disaster management[1].

Disaster response is the implementation of plans and activities already put in place to deal with a disaster occurrence[6]. This phase tests the adequacy of the preparedness. Responding to a disaster may not be so overwhelming on a hospital

or community if the activities of the preparedness phase have been adequately implemented[1].

The community and its institutions including the hospital and its personnel need to recover after the response phase of a disaster management is over[6]. Recovery ensures that the regular or usual activities of the hospital are restored. This may also involve debrief of personnel and accounts taken of the important lessons learnt from the disaster incident to help strengthen capacity for future occurrences. Recovery may also require some psychological support for the victims, the personnel and the other members of the community[10].

The Emergency Department (ED), usually a unit or department within a hospital setup responsible for receiving and providing immediate and acute care to human victims of disasters, is an important component in the hospital disaster preparedness plan. A comprehensive disaster preparedness plan also requires the collective input of all the hospital's units and departments including the administration, finance, security, procurement and clinical units[1]. This research report will only focus on the role of the emergency department in a hospital preparedness plan.

While there are a number of research articles reporting on hospital disaster preparedness in most of the developed countries there are not so many done in

developing countries like South Africa and the other sub-Sahara African countries. Previous studies indicate a poor knowledge base of basic hospital disaster planning and preparedness amongst the hospital personnel including the Emergency Department which invariably may affect the expected practices[11 - 14]. As the Emergency Department represents the front line to patients resulting from a disaster, their knowledge of disaster preparedness is particularly important.

This study sought to assess the knowledge of hospital disaster preparedness (HDP) among the personnel of the Emergency Department of the Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg which has not been done before. These personnel include the Nursing Staff and the Doctors whose primary working responsibilities are in the ED of the hospital.

1.2 PROBLEM STATEMENT

Morbidity and mortality resulting from disasters can be huge and impactful. Hospitals are expected to play critical roles in mitigating and responding to disasters while still functioning as a safe environment for personnel who are providing essential care to victims of disasters[12, 15, 16]. Emergency Department personnel are usually the frontline staff to receive, triage and provide immediate care to these victims[1, 17]. Thus, such a critical unit of the hospital must be involved with the disaster preparedness planning of the hospital with the personnel of the unit having at least the basic knowledge of what the hospital disaster plan is and how it should be implemented. Currently it is not clear whether the Emergency Department personnel at Charlotte Maxeke Hospital are prepared for any disaster or have the basic knowledge of the hospital's operation disaster plan. Preparing for a disaster cannot be done until the knowledge base has been assessed.

1.3 STUDY OBJECTIVES

The aims and objectives of this study are

1. To describe the demography of the CMJAH ED personnel
2. To describe the knowledge of the CMJAH ED personnel on the possible internal or external hazards the hospital is exposed to.
3. To describe the knowledge of the CMJAH ED personnel on the disaster management operational plan of the hospital.
4. To describe the knowledge and attitude of the personnel towards training as a means of hospital disaster preparedness.
5. To describe the knowledge of the CMJAH ED personnel on the basic instruments, equipment and supplies available in the ED for use during a disaster.
6. To compare knowledge about disaster preparedness between the professions and the sexes.

CHAPTER 2

LITERATURE REVIEW

2.1 DISASTER – DEFINITION

There are no standard definitions for the word disaster. Many of the attempts at defining a disaster have characterized it in terms of the impacts and the resources needed to mitigate these impacts[1]. Some of the definitions provided by individuals and institutions include

An event can be considered a disaster when it overwhelms response capabilities.[1]

An uncompensated major incident where the impact of the event causes so much damage (including number of casualties) that, in mobilizing all the available resources, using all preparedness measures and taking buffering capacity into account, the society (or health care facility) will not be able to cope with the number of casualties – the load exceeds the capacity.[2]

A progressive or sudden, widespread or localized, natural or human-caused occurrence which causes or threatens to cause death, injury or disease; damage to property, infrastructure or the environment; or disruption of the life of a community; and is of a magnitude that exceeds the ability of those affected by the disaster to cope with its effects using only their own resources.[18]

A disaster is declared when there is a serious disruption of the functionality of a community or a society involving widespread human, materials, economic or environmental losses and impacts which exceeds the ability of the affected community or society to cope using its own resources.[8]

Any occurrence that causes damage, ecological disruption, loss of human life, and/or deterioration of health and health services on a scale sufficient to warrant an extraordinary response from outside the affected community or area.[9]

From these definitions disasters can be described as catastrophic incident causing damage to or loss of infrastructure, materials, economy, environment and humans, the extent of which goes beyond the capacity of the affected community to manage. They could be natural or man-made (human-caused) and are common occurrences all over the world[1,2]. Giving consideration to the usually devastating and catastrophic consequences of disaster, preparedness measures in the forms of vulnerability and risk assessment, available resources assessment, capacity building and strengthening and implementation of these measures play a key role in mitigating the impacts and helping the community or society to recover from the disaster.

Why the terms “major incident” and disaster can be used interchangeably, major incident *refers to an event in which the location, number, severity or type of live casualties requires extraordinary resources*[2]. It can be simple in which the infrastructure – electricity, roads, communication lines etc. - remain intact or functional or compound in which the infrastructure is damaged with resultant difficulty in managing the incident. It can also be compensated where the incident can be managed using the existing institutional or societal resources/capacities or uncompensated where the impact of the incident exceeds the existing capacities to manage[2]. Disaster refers to the compound or uncompensated form of major incident[2].

2.2 DISASTER CAUSING EVENTS OR HAZARDS

Some of the hazards, events or incidents with catastrophic or disastrous consequences include events such as

Natural hazards –

- Biological – Disease epidemic e.g. Ebola, Veld fires, Plant infestations
- Geological – Landslides, Volcanic eruptions, Earthquakes
- Hydrometeorological – Floods, Droughts, Desertification, Tropical cyclones, Tornadoes, Tsunami

Technological hazards

- Transport accidents, Industrial pollutions, Power failure, Dam failure, Radio nuclear activities

Environmental Hazards

- Land degradation, Deforestation, Loss of biodiversity

Human-caused Hazards

- Mass gathering events, Wars and civil unrest, Overcrowding, Industrial actions, Terrorism, Mass migration, Unplanned informal settlements etc.

This list of disasters would classify mostly as external disasters which are those occurring in the community but not directly on the hospital facility premises. Internal disasters are incidents such as - prolonged power failures, essential hospital personnel embarking on industrial action or hospital facility's structural collapse - occurring within the hospital premises. However, some disaster\incidents such as disease outbreak, flooding, tsunamis, earthquakes etc. may be both internal and external to the hospital setting[1].

2.3 DISASTER MANAGEMENT

When a disaster occurs, humans are often injured in large numbers and taken to the emergency departments of local hospitals. The size of these events may overwhelm

the resources within that hospital resulting in unacceptable pain, injury or loss of life. Therefore, disaster preparedness should be a major component of the comprehensive hospital emergency management plan for any disaster. The other components/phases are mitigation, response and recovery[1, 4, 5]. In planning any of these phases the hospital would need to address both the possible internal and external disasters.

2.4 DISASTER PREPAREDNESS

Responding to disastrous events whenever they occur and mitigating their impact requires the involvement of multiple components of the healthcare system both inside and outside of the community[3, 19].

Disaster preparedness has been defined as ***the capacity and knowledge developed by governments, professional response organizations, affected communities and individuals to anticipate, respond to and recover from the impact of likely, imminent or current hazards, events or condition***s[8]. It is also ***a program of long-term activities whose goals are to strengthen the overall capacity and capability of a community to manage efficiently all types of disasters and bring about an orderly transition from relief through recovery, and back to sustained development[9].*** For this knowledge to be useful during a disaster it needs to be

structured into a clear disaster plan and disaster preparedness activities so that the community is better prepared and more able to manage disasters in the future.

Hospital disaster preparedness activities include

a. Conducting regular and updated risk assessments to identify and systematically analyze potentially hazardous events in the operation of the facility or in the community either locally, sub nationally or nationally that may make the hospital or the community vulnerable to disaster[19, 20].
b. Regular assessment, review and updating of the capacities available for managing the identified risks. These will help to identify strengths and opportunities or weakness and gaps in the existing capacities.[19]
c. Development and implementation of strategies and plans with which to address the identified risks, enhance the available current capacity and develop needed additional capacity with which to respond and recover from disasters arising from the hazardous events or conditions when they occur.[19]
d. Evidence based operational readiness measures. These measures will include multi-hazard emergency response and contingency plans addressing the risks and needs assessment, incident management protocol, communication and public health measures, clinical management of victims and the respective roles, duties and responsibilities of the personnel involved in responding to the disaster.[19]

e. Regular capacity building and strengthening through training.

The adequacy of any preparedness training will be seen during the response to a disaster. Improved training should lead to an improved response.

2.5 GLOBAL PERSPECTIVE ON DISASTER PREPAREDNESS

Following the recognition of the crucial role that preparedness plays in mitigation, response and recovery from disaster, the United Nations (UN) in the early 1990's introduced the International Decade for Natural Disaster Reduction (IDNDR) and international efforts were galvanized towards lessening the impacts of disasters. Some of these included the United Nations Disaster Management Training Program (UNDMTP) developed by the United Nations Disaster Relief Organization (UNDRO)[18].

There are many International agencies, organizations and institutions involved in disaster risk management i.e., preparedness which include those operating at an international level, such as International Committee of the Red Cross (ICRC), United Nations Disaster Management Training Program (UNDMTP), World Health Organization (WHO) and those with a more regional focus such as the African Regional Disaster Risk Reduction Strategy[21].

2.6 SOUTH AFRICAN EXPERIENCE

The presence of a range of hazards places South Africa at risk of experiencing disasters. These hazards include severe storms, cyclones, climate change, droughts, fires in informal settlements, mass gathering events, floods, lack of essential services in many rural settlements and townships etc.

Some disasters occurring in South Africa in the past include the

1. Sharpeville Massacre in 1960
2. Soweto Uprising in 1976
3. Ellis Park Stadium Stampede disaster in 2001
4. Flooding in Cape Town in 2004
5. Table Mountain Fire in 2006

Assessment of this vulnerability led to the promulgation of the Disaster Management Act, 2002 (Act no. 57 of 2002) (DMA 2002) on 15 January 2003[18, 21].

The Act provides for:

1. An integrated and coordinated disaster risk management policy that focuses on preventing or reducing the risk of disasters, mitigating the severity of disasters, preparedness, rapid and effective response to disasters, and post-disaster recovery.
2. The establishment of national, provincial and municipal disaster management centres.
3. Disaster risk management volunteers

The Act specifies the National Disaster Management Framework (NDMF 2005) as the instrument through which consistency across layers of governance, interest groups and organizations can be addressed. This is ensured by the provision of a coherent, transparent and inclusive policy on disaster management.

The key performance areas and enablers as set out in the framework include[21]

1. Integrated institutional capacity for disaster risk management
2. Disaster risk assessment
3. Disaster risk reduction
4. Response and recovery
5. Information management and communication
6. Education, training, public awareness and research
7. Funding arrangements for disaster risk management

After the promulgation of the National disaster plan it became necessary for each facility that would be involved in managing such a disaster to come up with their own disaster preparedness plan. Stander et al. noted in a study done in the Western Cape, South Africa that all health facilities needed to have a disaster plan that is familiar to all staff and that is easily accessible[17].

Thus, all academic hospitals in Gauteng of South Africa are expected to have such a plan. Literature search however showed that only very few studies have been done previously to assess the hospitals' disaster preparedness plan and the

knowledge of the plan by the personnel. These studies also were not specific to the Emergency Department personnel. As this report focusses on the Charlotte Maxeke Academic hospital staff, only the disaster plan for this hospital will be discussed here.

2.7 CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL (CMJAH) DISASTER PLAN

Having considered the significant role the hospital plays in mitigating the impact of disaster and to give impetus to the requirements of the DMA, 2002[18] and NMDF, 2005[21] as a major health institution under the provincial government of Gauteng, South Africa, the CMJAH (formerly known as the Johannesburg Hospital) developed a disaster operation plan. This operation disaster plan states the activities, step-by-step, to be performed during a disaster operation and the specific duties and roles of individual personnel and units designated to perform these activities.

The disaster plan being a bulky document of approximately one hundred pages will not be presented in this report but the key components as it relates to the Emergency Department (ED) are summarized below

Notification, activation and declaration

Personnel on duty in the telephone switchboard room are to notify the Trauma Medical Officer in charge of the Accident service area 163 of the Emergency

Department upon receiving a message of disaster occurrence in the community and to await further instruction from him/her. The instruction from the Trauma Medical Officer in the Accident Service Area 163 of the Emergency Department on the implementation of operation disaster (code red) or disaster standby (code yellow) could be to contact the Duty Clinical Executive on call, the Assistant Director of Nursing (ADN) in charge of the Hospital, the Supervisor-Emergency Admissions, the Senior Security Officer on Duty and to notify the transport department.

The Senior Medical Officer in the Accident service Area 163 of the ED is the only personnel with the authority to declare an operation disaster and this is done in consultation with the Head of Trauma or Duty Consultant, the Duty Clinical Executive and the Area 165 personnel (Medical officer and the Nurses head of shift) on duty. He/she decides on the alert status and the disaster codes – either Green, Yellow or Red and subsequently institutes a call out as per the action card and clears the Emergency Department of all patients. If the disaster results from a radioactive contamination, they need to contact the head of Medical Physics or his deputy.

Having been constituted, the headquarter, which serves as the disaster incident command centre, manned by the Chief Executive Officer (CEO) of the hospital or his/her designate takes over the subsequent management of the disaster operation

by maintaining communications and giving clearance to all designated personnel and areas while also handling public relation matters in respect of the disaster.

Triage and Resuscitation

The designated resuscitation areas in CMJAH are areas 163 and 165 of the Emergency Department. These are to be manned by the resuscitation officers during the operation. The triage officers are the Duty Trauma Consultant and the Head of Medical Emergency Department for surgical and medical disasters respectively. While the resuscitation officers are the Senior Trauma Registrar/Trauma Consultant and the Senior Medical Officer/Medical Registrar for surgical and medical disasters respectively. The resuscitation teams are expected to be formed as personnel become available with each team comprising of a doctor, a nurse and a physiotherapist who serves as the clerk of the team. Having stationed himself/herself at the reception desk of the area 163, the Superintendent on duty is to ensure that the personnel are allocated to specific tasks, the area can receive cases and that the resuscitation area is kept under control. He/she also maintains communication between the Headquarters, the resuscitation area and the triage area and to control all the telephones and radios in the area.

Disaster Codes and Alert Status

The disaster codes and alert status adopted in the operation disaster plan are Code Green meaning no immediate response action is to be taken but to call the priority

list, Code Yellow meaning making a local call out to staff to be on standby while the situation is been monitored and Code Red meaning that operation disaster is implemented immediately.

Disaster Stand down order and post disaster debrief.

The Headquarter manned by the CEO or his/her designates is expected to give the stand down or deactivation order at the close of a disaster operation. The CEO is also expected to ensure a suitable debriefing of staff by 12:00 of the Wednesday immediately post disaster operation before the close of the headquarter.

Timely and appropriately channeled communication within the hospital plays a crucial role in terms of notification, activation and declaration and lack of it may delay resource mobilization and response during the disaster operation[2, 22, 23].

Usage of codes either in the form of colours, alphabets or numerals during disaster operations is a means of categorizing the severity of the disaster and the extent of response needed to be implemented to mitigate its impact while also helping in communicating to the hospital personnel, other responders and the general public about the severity and impact of the disaster[24, 25].

Improvements in the planning and operational procedures can be identified with managed debriefs following a preparedness training exercise or real disaster implementation exercise[24, 26, 27]. Debriefing also serves to reduce distress, restore group cohesion and unit performance, normalize group member reactions and

facilitate recovery after a traumatic or critical incident like a disaster implementation exercise[28].

2.8 THE ROLE OF THE EMERGENCY DEPARTMENT IN A DISASTER PLAN

The Emergency Department (ED) – also referred to as the Accident and Emergency Department - usually a unit or department within a hospital setup responsible for receiving and providing immediate and acute care to human victims of disasters, is an important component in the hospital disaster planning and preparedness[1]. In the build up to the hosting of the 2010 World cup in South Africa – a multicenter mass gathering event – the emergency care system comprising of the hospital-based Emergency Departments and the pre-hospital Emergency Medical Services through the National Emergency Medical Services Strategies Framework (NESF) played significant roles in mitigating the impacts of the expected and actual hazards of the international event[17].

2.8.1 EMERGENCY DEPARTMENT PERSONNEL AWARENESS OF HOSPITAL DISASTER PREPAREDNESS

It is expected that all the personnel of the hospital will be familiar with the contents and provisions of the disaster operation plan as it applies to them and/or the unit/department of the hospital where they primarily work[17, 29]. This is even more important for the personnel in the ED who are the frontline staff to receive, triage and provide immediate care to victims of disaster[1].

There are however contrasting reports on the knowledge of healthcare workers of the disaster management protocols or plans of their hospitals.

Most (92%) surgical registrars in tertiary hospitals of Gauteng province in South Africa had never read their respective hospitals' disaster plan[13] in contrast to 85.3% of nurses in the medical and surgical wards of a central hospital in Johannesburg who had read the disaster protocol of their work place[14]. In Namibia, Ncube and Chimenya found that 63.7% of health workers did not know if their hospital had a disaster plan and 70% did not know any of the components of the hospital plan[30].

About 50% of nurses in Canada described themselves as unprepared for disasters having said that their respective hospitals did not have policies and programs in place for disaster management and that they were not provided with continuing education on disaster preparedness at their respective workplaces[14, 31]. In Italy only 45% of on duty staff of emergency departments knew about an emergency plan, with a worrisome inconsistency in the critical content knowledge of the emergency and disaster plan[12]. These findings go to show that poor or lack of knowledge amongst healthcare workers of hospital disaster or emergency plan is not limited to the developing countries like South Africa, but it is also seen in the developed regions of the world.

2.9 TRAINING IN DISASTER MANAGEMENT

One of the major activities in hospital disaster preparedness is building and strengthening of capacity to manage disasters[19, 32, 33]. Training of the personnel plays a crucial role in enhancing their ability to prepare for the impacts of any disaster[2, 12, 32, 33].

Training can take the form of didactic lectures, tutorials, group discussion, drills and simulation exercises. Emergency medicine residents in Canada reported that simulation training curriculum was felt to be useful and adjudged to be preferable to a didactic training curriculum[34]. Bartley et al in a pre and post interventional study to assess the utility of a simulated disaster exercise and educational process for improving hospital preparedness amongst health workers including the ED personnel in Australia found that the pre-interventional knowledge score was about 18% which was noted to be poor while the post-interventional knowledge score improved to about 50%[35]. Field exercises and workshops were considered more appropriate methods in disaster training than lectures and presentations[36] while tabletop training was also found to be more cost effective in addition to being a useful tool in improving staff knowledge and awareness of emergencies and disasters[23, 37]. These may indicate that training might need to be repeated possibly in differing formats to improve knowledge and preparedness.

When done regularly and at frequent intervals as recommended by the American College of Emergency Physician (ACEP)[38] and required by the Disaster

Management Act 57 of 2002[16] disaster preparedness training will help to keep the hospital personnel and management abreast of reviews and assessments of vulnerability, updated about new developments in disaster management and in tune with current evidence-based practices. Frequent training ensures knowledge and skills retention while also strengthening expertise on the use of basic instruments, equipment and supplies available for use during disaster operation[39]. The South African Disaster Management Act 57 of 2002 requires institutions or organizations such as hospitals to have at least one or two drills annually to ensure compliance with the requirements of the act[18]. Noted from a previous study however was that about 52% of health workers in Johannesburg did not know how frequent disaster drills or simulation exercises should be conducted as means of ongoing training and preparedness[15].

Disaster management training could be internal or external[17, 34, 40]. An internal training is done mainly by or for the personnel of the hospital or its units such as the ED or security unit, logistics and transportation unit, communication and public relations unit, administrative unit, clinical and pharmaceutical units. This may be in the form of face-to-face training or simulation exercises. External training, however, in addition to the units of the hospital also involves institutions and agencies such as the Fire Department, Police Services, the Emergency Medical Services (EMS) and Hazardous materials/decontamination team from outside of

the hospital[17]. This is to ensure appropriate intra and interagency collaboration during a disaster response[41]. Examples of external training include field exercises and drills.

Some disaster management training/educational programs include those developed by the Advanced Life Support Group UK which are available locally in South Africa and internationally. These are the Major Incident Medical Management and Support (MIMMS) and Hospital Major Incident Medical Management and Support (HMIMMS) courses[42]. MIMMS is meant for individuals with a medical, nursing or paramedic background focusing on how to deliver needed care to multiple casualties especially in the prehospital settings while HMIMMS course details the management of major incidents or disaster in the hospital setting. These courses are delivered using a combination of methods including online readings, face-to-face lectures, workshops, skill stations, tabletop and practical exercises without casualties[42]. In the USA the National Disaster Life Support Foundation also offers the Basic Disaster Life Support, the Advanced Disaster Life Support, Core Disaster Life Support and other related courses[43]. Other educational/training programs with elements of disaster management training include the Advanced Trauma Life Support (ATLS)[44], fire simulation exercise and Prehospital Life Support course. Levels of training on hospital disaster preparedness amongst healthcare workers revealed varied findings. Only about 25% of the nurses in Johannesburg had

attended a course of training in disaster management[14] while 58.9% of health professionals in Yemen reported not to have received any form of training in emergency and disaster preparedness[36]. Most of the ED personnel in Israel however reported that they were adequately drilled with a resultant strong to very strong relationship between the drills and preparedness for emergencies or disaster incidents[45]. Niska and Burt in 2005 reported that most hospitals in the USA (75%) have had their key personnel trained in implementation of incident command system and in identification of biological hazards (89%) and had conducted internal mass casualty drill with improved level of preparedness since the September 11 event although only 7% of the hospitals had conducted drills involving severe epidemics for key personnel[46]. Cliff also reported that 91% of rural acute care hospitals in the USA have had their staff trained in a hospital-wide all-hazards exercises and drills[33]. Levels of development and previous disaster experiences may be attributable to the varied prevalence in training for disaster preparedness between the hospitals in the developing and developed regions of the world.

Training plays a crucial role in ensuring and enhancing the willingness of hospital's personnel to prepare, respond, participate and implement the hospital's plan or protocol in disaster operation[2, 15, 47]. Most of healthcare professional in Yemen displayed a positive attitude towards disaster management training with the

more experienced noted to be more eager to have training activities instituted in their working places[36]. Most health workers (over 80%) of hospitals in New York, USA, were willing to report to duty during disasters caused by mass casualty incidents or environmental disasters having been exposed to training related to these types of disaster-causing hazards while only 20% were sure of their ability and were willing to report to duty during disaster events caused by highly infectious or radiation agents[11]. Willingness of health personnel towards disaster preparedness training can be indicative of their attitude towards hospital disaster preparedness. Personnel willing to be trained can be assumed to have a positive attitude while those not willing to be trained a negative attitude.

2.10 KNOWLEDGE OF THE AVAILABLE EQUIPMENT AND SUPPLIES

Prior knowledge of what resources are available, where they are stored and how they can be used and deployed in disaster operation is crucial in disaster preparedness[2], especially when it comes to the Emergency departments. Often disasters occur suddenly and unpredictably causing disruption of the normal regular day to day activities of the community and the health facilities[17]. A lack of familiarity with equipment such as personal protective equipment (PPE) by emergency personnel may not only affect performance and functioning but may also compromise safety and security of the personnel during disaster response[2, 48]. Other resources such as triage tags and action cards are crucial to ensuring

effective response during a disaster. Triage tags are aids used to label, identify or sort disaster victims based on the severity of their injuries and the need for or likely benefit from emergency transport or care[2, 49 - 51]. While action cards are the assigned job cards describing the duties of each hospital staff member and step by step instructions on what to be done in the event of an internal or external disaster operation implementation[2, 30]. Hospital responders especially the emergency department personnel, are expected to be familiar with these equipment and aids knowing their functions and usages during a disaster response[2]. Lack of knowledge about what they are, their functions and how they could be deployed during a disaster response may be a pointer to poor or inadequate preparedness.

Information about the knowledge, attitudes and practices of disaster preparedness of the staff of emergency departments is essential when planning training or even assessing capability. Literature search revealed a lack of published reports or studies done in South Africa specifically aimed at the ED personnel and this lack of information may lead to critical failures during a disaster.

The aim of this study is to assess the knowledge of hospital disaster preparedness (HDP) among the personnel of the Emergency Department of the Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg. These personnel include the Nursing Staff and the Doctors whose primary working responsibilities are in the Emergency Department of the hospital.

CHAPTER 3
METHODOLOGY

3.1 STUDY DESIGN

The study design for this research study was a prospective observational cross-sectional design.

3.2 STUDY SITE

The study site was the Emergency Department of the Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg, South Africa (CMJAH). CMJAH is located in Parktown, Johannesburg, South Africa. It is a highly specialized tertiary/quaternary hospital providing specialized care to patients, training to different levels of health workers while also serving as a research centre. Being a highly specialized tertiary/quaternary facility, it serves as a major referral centre for the regional hospitals and the neighboring provinces[52]. It also serves as one of the teaching hospitals for the University of the Witwatersrand's Faculty of Health Sciences in the training of both undergraduate and postgraduate students in all areas of the health profession[52].

As it is a highly specialized centre and due to its physical location, the hospital has witnessed both internal and external disasters in the past which included the hospital's roof collapse of 2017[16] and the Ellis Park structural disaster of 2001 in

which an estimated 43 people were crushed to death and an estimated 250 were injured during a mass gathering event.

CMJAH has an Emergency Department which comprises of the Adult Medical Emergency Section, Paediatric Emergency Section and the Trauma Section. These sections are code-named Areas 165, 161 and 163 respectively. Some of the services offered in the Emergency Department include[53, 54].

1. Triage using the validated and nationally adopted South African Triage Scale
2. Definitive clinical services with trained nurses, medical officers, registrars and specialist consultants.

3.3 SAMPLE POPULATION

The study population was 130 health care workers comprising all the nurses and doctors whose primary duties or responsibilities are in the Emergency Department – including paediatric, adult medical and trauma sections - of the Charlotte Maxeke Johannesburg Academic Hospital, Johannesburg (CMJAH).

3.4 SAMPLE SIZE

The sample size was determined using the formulae[55] below.

Unlimited population: $n = \frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2}$

Finite population: $n' = \frac{n}{1+\frac{z^2 \times \hat{p}(1-\hat{p})}{\varepsilon^2 N}}$

Where

n is the sample size for an unlimited population
n' is the sample size for a finite population N
z is 1.96 at 95% confidence interval
$\hat{p}$ is 0.92 (population proportion from a previous study)[15]
$\mathcal{E}$ is 0.05 (margin of error)
N is 130 (Population size)

From the formulae above $n = 113$ and therefore $n' = 60$

A sample size of 60 was used in the study.

3.5 SAMPLING TECHNIQUE

A probability sampling technique – multistage sampling technique – was employed in this study. In the first stage, the sample size of 60 (46% of the study population) was stratified into two groups – the nurses and the doctors. Then simple random sampling technique was used to select a proportionate number (46%) in each group. That is, 37 in the nurses' group and 23 in the doctors' group in the second and final stage. All the nurses and doctors working in the Emergency Department had an equal chance of being randomly selected to be part of the study.

3.6 INCLUSION CRITERIA

1. Nurses and doctors who work in the Emergency Department of CMJAH

3.7 EXCLUSION CRITERIA

1. Nurses and doctors whose work responsibilities and duties are not primarily in the Emergency Department.

3.8 DATA COLLECTION AND ANALYSIS

3.8.1 RESEARCH INSTRUMENT

The focus of the study was the knowledge of the ED personnel of CMJAH about the functional aspect of Hospital Disaster Preparedness (HDP) and their attitude towards it. The current level of knowledge of the hospital's operation disaster plan was assessed using a questionnaire (Appendix I) with open-ended questions based on key roles expected to be performed by the ED personnel according to the plan. The key elements that were assessed included:

1. Demographic details of the personnel which were sex, age, profession and number of years of work experience in the ED.
2. The knowledge of the possible hazards that place the hospital at risk of having to implement the hospital disaster plan.
3. The knowledge of the hospital's operation disaster plan in the areas of
    a. Disaster notification
    b. Disaster Declaration
    c. Disaster Alert Status Codes
    d. Triage and Resuscitation
    e. Disaster Stand down order and post disaster debrief
4. The knowledge of the personnel on the availability of medicines, instruments and other equipment to be used in a disaster operation.

5. The knowledge and attitude of the personnel towards training as a means of hospital disaster preparedness.

The nurses were met during the morning change-over meetings while the doctors were met during the weekly unit meetings. During these meetings, the purpose of the study was clearly explained to them before they were all invited to participate. Sample size of sixty (60) including nurses and doctors were selected. Thirty-seven nurses were randomly selected using the daily duty register and twenty-three (23) doctors were randomly selected using the weekly meetings attendance list. This was done after the necessary approval was obtained from the hospital's management and the leadership of the CMJAH Emergency Department.

An information sheet (Appendix II) containing the details of the study objectives, assurances of anonymity of the respondents and confidentiality of any information given, invitation to participate voluntarily and consent to participate was attached to each questionnaire. The contacts details of the researcher and the supervisor were also included in the information sheet.

Once personnel had agreed to participate and signed the consent form, they were given a hard copy of the questionnaire which they completed. The self-administered questionnaires were collected from the participants immediately after completion. Administration of the questionnaire and data collection was done in the month of July 2019.

3.8.2 DATA ANALYSIS

In section **A** the responses to the demographic question on sex and profession were coded as “A” and “B” while the age and years of work in the Emergency Department were entered as nominal data as stated.

The number of responses to the other sections of the questionnaire were assessed according to whether the response was correct or incorrect**. Section C** was subdivided into subsections which were: knowledge of notification, knowledge of alert code status, knowledge of triage and resuscitation and knowledge of stand down and debriefing. The composite score for each of these subsections was then computed. The percentage correct score was subsequently categorized as poor if less than one-third (< 33.3%), fair if between one-third (33.3%) and two-third (66.7%) and good if greater than two-third (> 66.7%)[47].

3.8.3 SIGNIFICANCE LEVEL

Frequencies and percentages were used to describe respondent characteristics. Numerical variables were described using means and standard deviations of the quantitative data obtained. The statistical significance of differences ($p \leq 0.05$) in the knowledge of the personnel – when comparing along demographic variables sex (female and male) and profession (nurses and doctors) was tested using the two-sample Wilcoxon rank-sum (Mann-Whitney) test with the means of the composite scores of correct answers to the variables.

3.8.4 SOFTWARE

The data generated from the coded responses was entered onto a Microsoft Office Excel spreadsheet (Version 2010, Microsoft Corporation, Redmond, Washington USA) and subsequently analyzed with IBM SPSS Version 25.0. (IBM, Armonk, New York, USA).

3.9 ETHICS

Ethical approval for the study was obtained from the Human Research Ethics Committee of the University of the Witwatersrand (M190423) (Appendix III). Permission to conduct the study in the Emergency Department of the Charlotte Maxeke Johannesburg Academic Hospital was obtained from the Chief Executive Officer (CEO) of the hospital (Appendix IV).

Participation of the study population in the study was voluntary, anonymous and independent with the confidentiality of information provided by the participants who consented to participate in the study ensured by making sure that the completed questionnaires and the raw data generated were available only to the researcher and the supervisors.

CHAPTER 4

RESULTS

4.1 DEMOGRAPHY

The response rate was 85%. Of the respondents 64.7% (n=33) were females and 33.4% (n=17) were males while 60% (n=30) were nurses and 40% (n=20) were doctors (Table 4.1). 80% of the Nurses and 84% of the Doctors were less than forty years of age with a mean(SD) of 34.0(9.39) while 64.3% of the Nurses and 68.5% of the Doctors have had five or less years of experience in the Emergency Department with the mean(SD) of 4.8(6.06)**.**

Table 4.1 Demographic Characteristics of the ED Personnel

Characteristics (% (n))	Nurses	Doctors
Sex	**N=30**	**N=20**
Female	**80.6 (24)**	**45 (9)**
Male	**19.4 (6)**	**55 (11)**
Age (years)	**N=30**	**N=19**
≤ 40	**80 (24)**	**84 (16)**
≥ 41	**20 (6)**	**16 (3)**
Experience in ED (years)	**N=28**	**N=19**
0 – 5	**64.3 (18)**	**68.5 (13)**
6 – 10	**28.6 (8)**	**21 (4)**
≥ 11	**7.1 (2)**	**10.5 (2)**

4.2 KNOWLEDGE OF HAZARDS PLACING CMJAH AT RISK OF DISASTER PLAN IMPLEMENTATION

On the knowledge of CMJAH geographic location and possible hazards that place the hospital at the risk of implementing its disaster plan 74.5% (n=38) of the respondents were able to give at least one example of possible internal or external hazards. These are as listed in the table 4.2 below

Table 4.2: Knowledge of hazards

HAZARDS PLACING CMJAH AT RISK OF DISASTER	RESPONDENTS n=38 (%)
Internal Hazards	
Non-functional equipment	12 (31.6)
Building collapse	9 (23.7)
Staff not knowing what to do in the event of a disaster	5 (13.2)
Loss of power supply	3 (7.9)
Patient overcrowding	3 (7.9)
Closeness to densely populated areas	3 (7.9)
Lack of water supply	2 (5.3)
Reduced number of staff on duty	2 (5.3)
Bomb threats	2 (5.3)
Crash of aerial flying objects into the hospital	1 (2.6)
Riots	1 (2.6)
Fire in hospital	1 (2.6)
External Hazards	
Multiple motor vehicular crashes	8 (21)
Fires	8 (21)
Floods	5 (13.2)
Train accidents or collisions	4 (10.5)
Infectious diseases outbreak e.g. Ebola	3 (7.9)
Proximity to venues of mass gathering events	3 (7.9)
Terrorism	2 (5.3)
Proximity to mining and other industrial sites	1 (2.6)
Civil unrest	1 (2.6)

KNOWLEDGE OF THE EXISTING CMJAH OPERATION DISASTER PLAN NOTIFICATION

According to the existing CMJAH operation disaster plan the telephonist on duty should receive the first message of an external disaster occurrence. Very few respondents knew that the Trauma Medical Officer in the area 163 is the personnel with the authority to declare an operation disaster having consulted with the personnel in the area 165 and the duty consultant. The route of communication from the Trauma Medical Officer in area 163 and through to the Duty Superintendent was known by only few of the respondents (Figure 4.1).

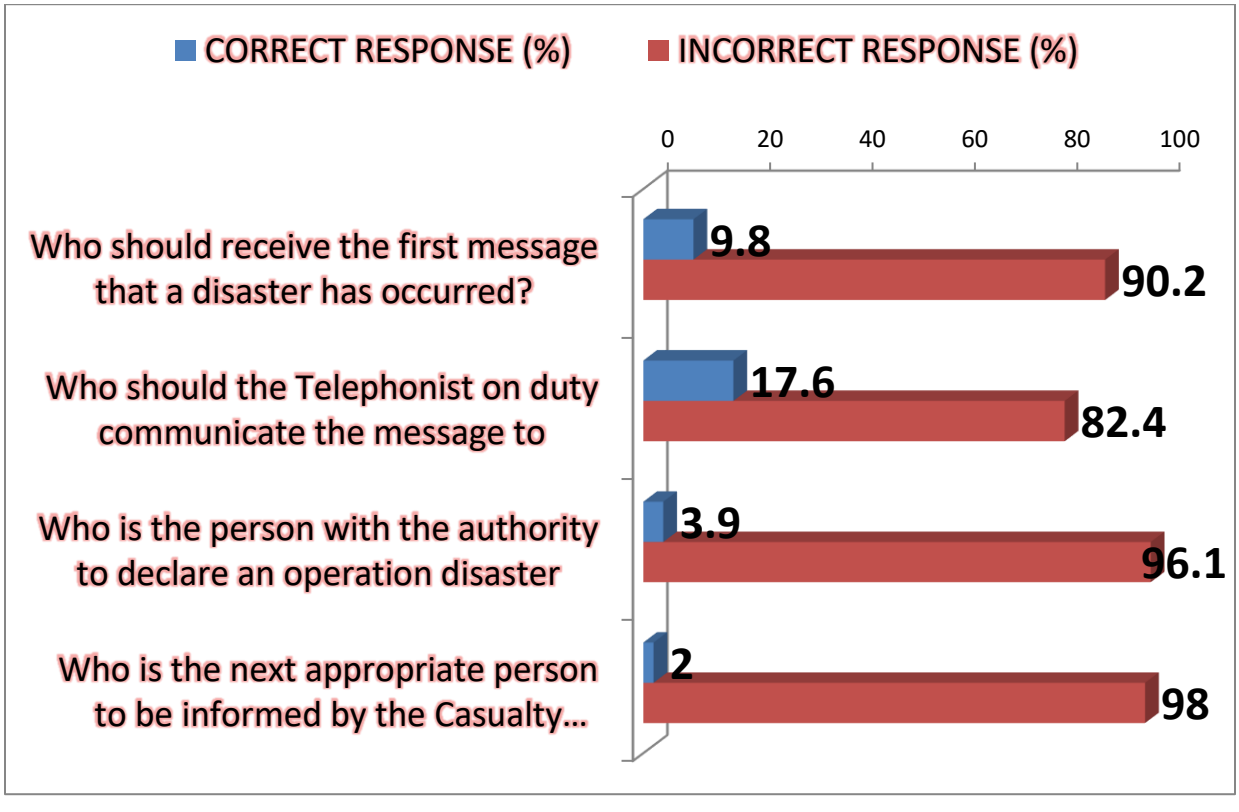


Figure 4.1: ED Personnel's knowledge of the existing CMJAH Operation Disaster Plan Notification

Very few of the emergency department personnel knew what the code green alert status, code yellow alert status and code red alert status meant which are no immediate response or action to be taken but to call the priority list, making a local call out to staff to be on standby while the situation is been monitored and immediate implementation of operation disaster respectively (Figure 4.2). Only one-third knew that the immediate step to take when code yellow or red alert status is raised is to clear the Emergency Department of existing patients to create bed spaces for the incoming victims of the disaster.

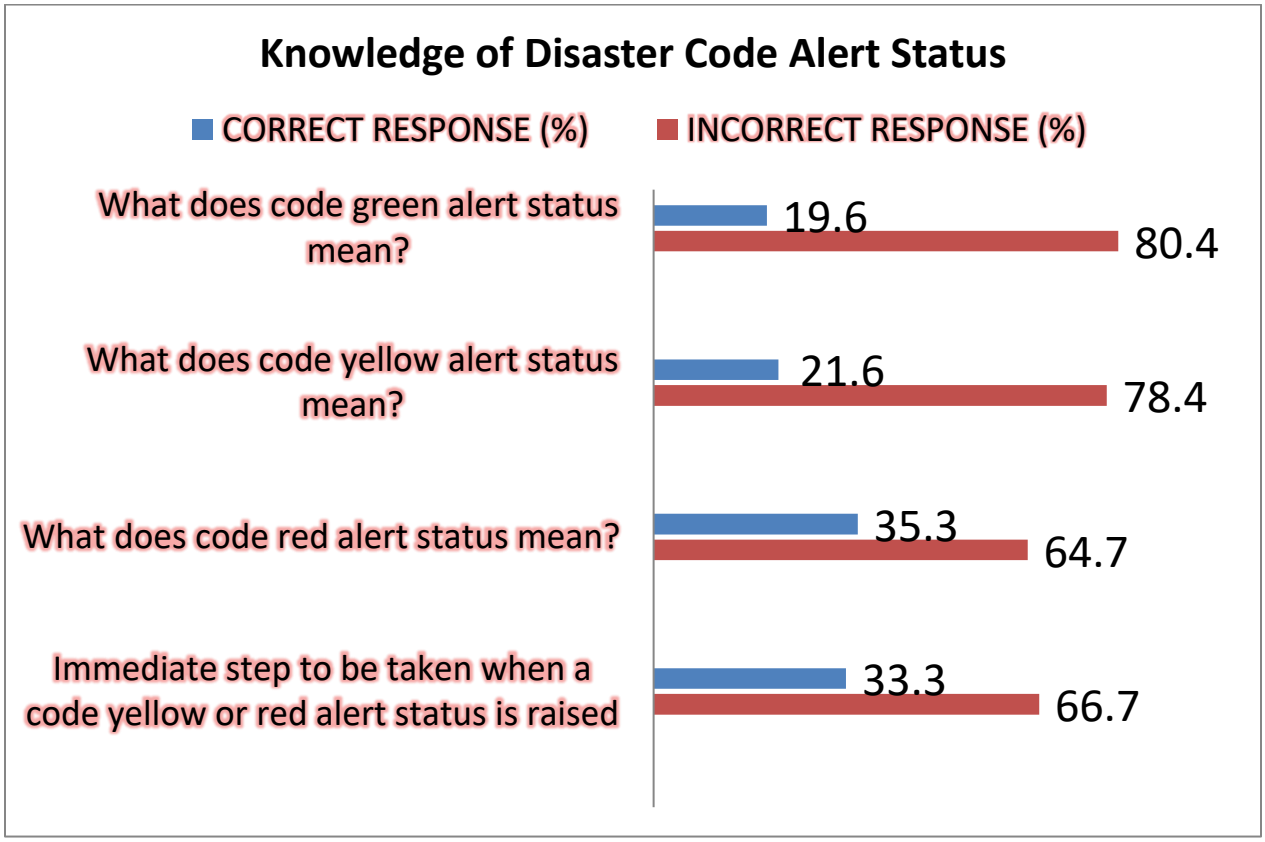
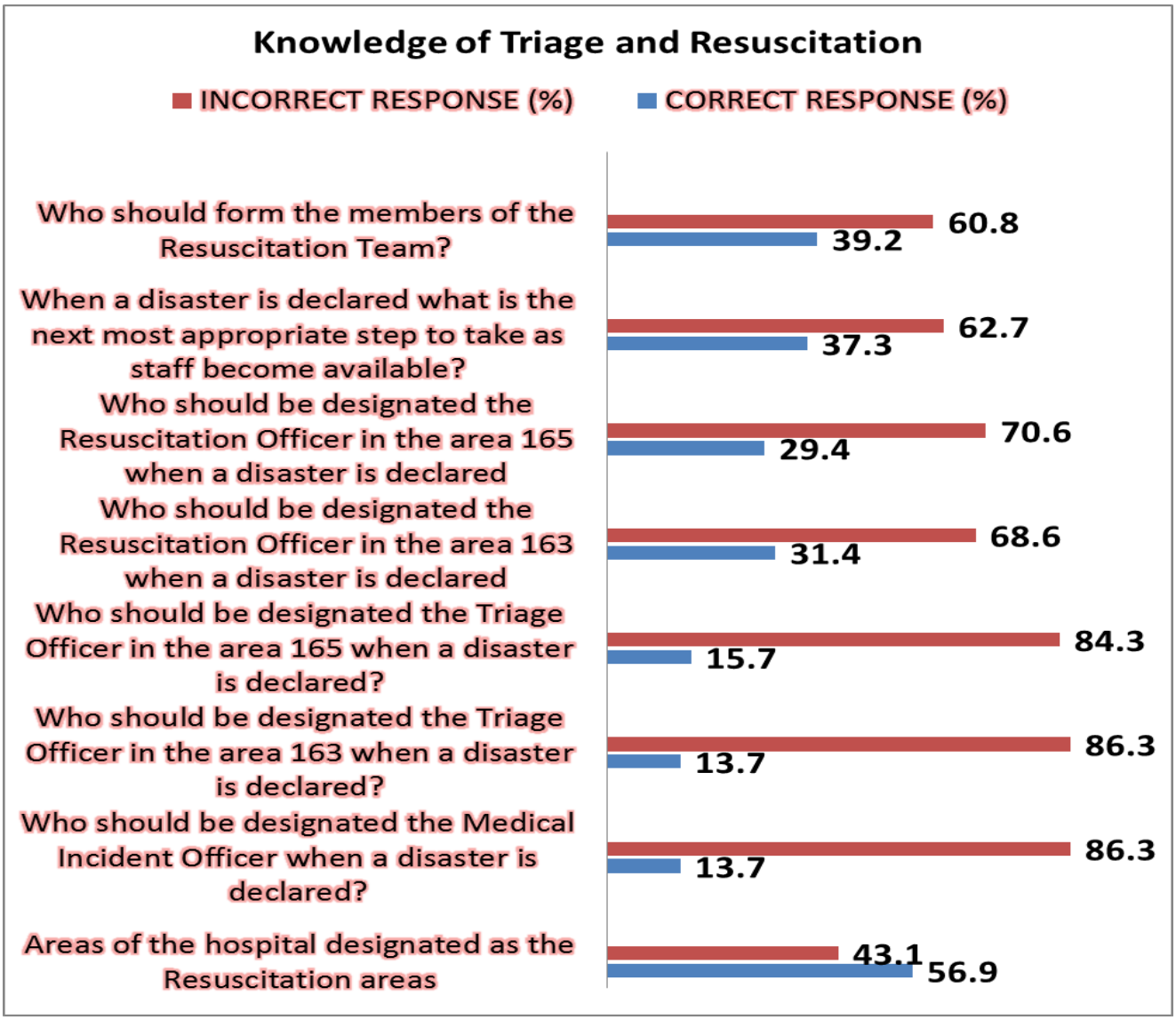


Figure 4.2: ED Personnel's Knowledge of the CMJAH Operation Disaster Codes Alert Status

More than half of the respondents knew that areas 163 and 165 are the designated resuscitation areas but only 1/3 knew the steps involved in creating a resuscitation team and the roles played by the members of that team. Even less (<20%) knew about the triage and medical incident officer roles.

Figure 4.3: ED Personnel's Knowledge of Triage and Resuscitation According to the Existing CMJAH Operation Disaster Plan.



Only a few of the respondents knew that the headquarters manned and led by the Chief Executive Officer (CEO) or his/her designate is expected to give the "stand down" order at the end of a disaster operation. However, none of the respondents knew that the personnel are expected to be debriefed by 12 o'clock on the Wednesday immediately after the closure of a disaster operation and less than 5% knew that the debriefing should be done by the hospital CEO (Figure 4.4).

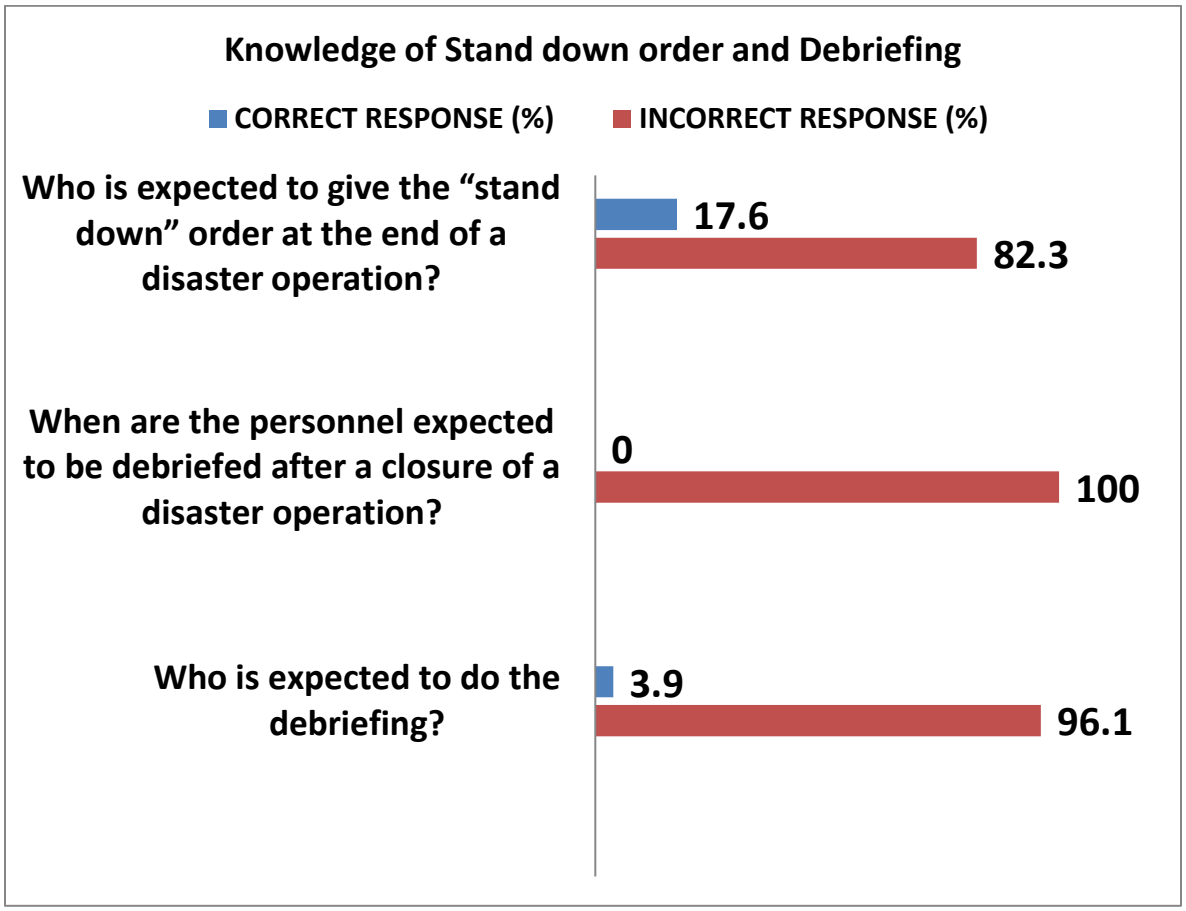


Figure 4.4: ED Personnel's Knowledge of the Stand down Order and Debriefing According to the Existing CMJAH Operation Disaster Plan

4.4 KNOWLEDGE OF THE AVAILABILITY OF MEDICINES, SUPPLIES, INSTRUMENTS AND OTHER EQUIPMENT FOR USE IN A DISASTER OPERATION

Almost half of the respondents knew and gave examples of additional equipment, instruments and treatment modalities that should be available once a disaster is declared (Figure 4.5). About one-third of the respondents knew where additional equipment, instruments and medicine that could be used in the event of a disaster are stored and knew what triage tags and action cards are.

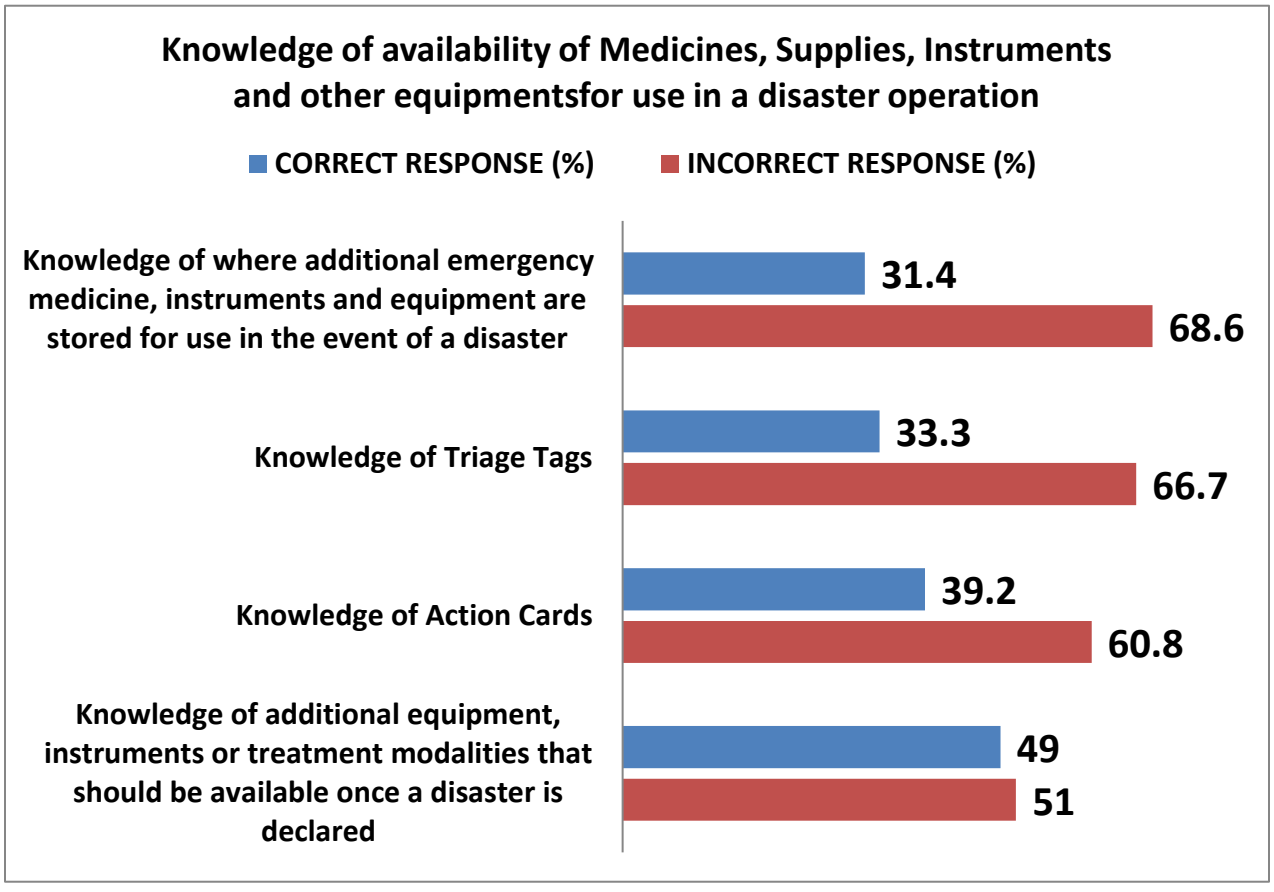


Figure 4.5: ED Personnel's Knowledge of Medicines, Supplies, Instruments and other Equipment for Use in a Disaster Operation

Some of the additional equipment and treatment modalities reported are as stated in the Table 4.3

Table 4.3: Additional equipment and treatment modalities

ADDITIONAL EQUIPMENT AND TREATMENT MODALITIES	RESPONDENTS n=25 (%)
Ventilators	4 (15.7)
Extra medical or resuscitative equipment	4 (15.7)
Protective equipment e.g. facemasks, gloves,	3 (11.8)
Intravenous fluids	3 (11.8)
Emergency drugs	3 (11.8)
Consumables	2 (7.8)
Stationery e.g. Disaster files	2 (7.8)
Designated Resuscitation Areas for Red/Yellow/Green	2 (7.8)
Monitors	2 (7.8)
ICU	1 (3.9)
Radiology	1 (3.9)
Extra beds	1 (3.9)
Emergency bags	1 (3.9)
ICD trays	1 (3.9)
Intubation sets	1 (3.9)
Call centres	1 (3.9)
Theatre	1 (3.9)
Vests	1 (3.9)
Wheelchairs	1 (3.9)
First aid box	1 (3.9)
HAZMAT suits	1 (3.9)
Open disaster wards	1 (3.9)
Xrays	1 (3.9)
Suturing materials	1 (3.9)
Disaster packs	1 (3.9)
Linen	1 (3.9)
BP Machines	1 (3.9)

4.5 TRAINING IN DISASTER MANAGEMENT

One third of the emergency department personnel has had some form of training in disaster management and most considered the training useful. This training and the number of participants are listed in the Table 4.4

Table 4.4 Participants in Disaster Management Training

DISASTER TRAINING	PARTICIPANTS n=17(%)
Disaster management course	17.6
In service training	23.5
Informal training	11.8
Hospital major incident medical management and support (HMIMMS)	17.6
Fire simulation	11.8
Tabletop exercise	5.9
Field exercise	5.9
Advanced trauma life support (ATLS)	5.9

On the knowledge of frequency of and attitude towards simulation and drill as forms of disaster management training less than one-third (21.6%) of the respondents knew that simulations and drills should be conducted every six (6) months. A large percentage (68.6%) of the Emergency Department personnel had a positive attitude towards training as a means of disaster preparedness and were willing to participate in one form of disaster training or the other.

4.6 THE COMPOSITE SCORES OF KNOWLEDGE

The composite scores of the knowledge of the personnel about the hospital's existing disaster plan, availability of medicines, supplies, instruments and other additional equipment that may be required for use in a disaster operation and disaster training are shown in Table 4.5 with the maximum possible scores, the means and the percentage correct scores.

Table 4.5 Composite scores of knowledge of existing CMJAH's disaster plan, availability of additional equipment required during disaster and disaster training. N=51

	MAX. SCORE	MEAN (SD)	CORRECT SCORE (%)
Knowledge of disaster notification	4	0.28(0.49)	8.3*
Knowledge of disaster alert status codes	4	1.12(1.33)	27.5*
Knowledge of triage and resuscitation	8	2.42(2.34)	29.7*
Knowledge of stand down and debrief	3	0.22(0.46)	7.1*
Knowledge of availability and additional equipment required during disaster operation	4	1.56(1.46)	38.2**
Knowledge of disaster training	1	0.22(0.42)	21.6*

SD – Standard Deviation, *Poor knowledge, **Fair knowledge

4.7 SIGNIFICANCE TESTING

The difference between the knowledge of the nurses and doctors and female and male personnel about the hospital's existing disaster plan, availability of medicines, supplies, instruments and other additional equipment that may be required for use in a disaster operation and disaster training using the two-sample Wilcoxon rank-sum (Mann-Whitney) test are shown in Tables 4.6 and 4.7. There were no statistically significant differences between the sexes in any knowledge categories. However, there were statistically significant differences in the mean scores of knowledge of triage and resuscitation (1.27(1.36) vs. 4.15(2.46), p = 0.0001), availability of equipment required during disaster (1.07(1.26) vs. 2.3(1.45), p = 0.0028) and disaster training (0 vs. 0.55(0.51), p = 0.0000) between the nurses and the doctors with the doctors' knowledge been significantly higher.

Table 4.6 The difference in the knowledge of the existing CMJAH's disaster plan, availability of additional equipment required during disaster and disaster training between the female and male personnel.

	Females score mean (SD) (n=33)	**Males score mean (SD) (n=17)**	***p* value**
Knowledge of disaster notification	0.27(0.52)	0.29(0.47)	0.7472
Knowledge of disaster alert codes	1.09(1.38)	1.18(1.29)	0.5642
Knowledge of triage and resuscitation	2.15(2.03)	2.94(2.84)	0.4591
Knowledge of stand down and debrief	0.18(0.39)	0.29(0.59)	0.5956
Knowledge of availability and additional equipment required during disaster operation	1.33(1.47)	2.00(1.37)	0.1072
Knowledge of disaster training	0.18(0.39)	0.29(0.47)	0.3687

p ≤0.05 (Two-sample Wilcoxon rank-sum (Mann-Whitney) test)

Table 4.7: The difference in the knowledge of the existing CMJAH's disaster plan, availability of additional equipment required during disaster and disaster training between the Nurses and the Doctors.

	Nurses score mean (SD) (n=30)	**Doctors score mean (SD) (n=20)**	***p* value**
Knowledge of disaster notification	0.33(0.48)	0.20(0.52)	0.1940
Knowledge of disaster alert codes	1.07(1.41)	1.2(1.24)	0.4240
Knowledge of triage and resuscitation	1.27(1.36)	4.15(2.46)	0.0001*
Knowledge of stand down and debrief	0.20(0.40)	0.25(0.55)	0.9318
Knowledge of availability and additional equipment required during disaster operation	1.07(1.26)	2.3(1.45)	0.0028*
Knowledge of disaster training	0	0.55(0.51)	0.0000*

***p ≤ 0.05 (Two-sample Wilcoxon rank-sum (Mann-Whitney) test*)

CHAPTER 5

DISCUSSION

Most of the ED personnel that participated in this study were females, of younger age (mean (SD) age of 34.0 (9.37) years) and with five or less years of experience in the emergency department. These findings are consistent with the demographics of hospital personnel reported by Ncube and Chimenya[30], Adenekan et al[47] and Ogedegbe et al[56] in Namibia, Nigeria and the USA respectively.

Awareness of the types of events or hazards that place the hospital or the immediate community at the risk of disaster is an important consideration in disaster planning or preparedness[19, 57]. In this study most of the respondents had a good knowledge of events or hazards that place the CMJAH at the risk of implementing the disaster operation plan as they were aware of at least one possible hazard. Of note however are some of the hazards listed by many of the personnel. These are non-functional equipment, poor knowledge of what to do in the event of a disaster, building collapse, patient overcrowding, motor vehicular crashes, fires and floods. This finding is similar to that reported by Ncube and Chimenya who found that most (78%) of the health workers in a tertiary hospital in the northern part of Namibia were aware of disasters which occurred within five (5) years of the study and agreed that the hospital was likely to be affected by disaster[30]. Younger age group, relatively lower years of experience in the ED and

lack of previous participation in disaster training or experience in disaster operation may be the factors responsible for nearly one-fourth of the respondents being unable to indicate at least one hazard.

A significantly high percentage of the personnel did not know about various aspects of the plan. Findings from this study indicating poor knowledge of the components of the hospital's disaster plan are similar to findings from earlier studies by Sahdoe[13] who found that 92% of surgical Registrars had never read their hospitals disaster plan, Bartley et al[35] whose findings revealed a preintervention disaster preparedness knowledge score of health workers of 18% and Ncube and Chimenya[30] who found that 70.6% of health workers in Namibia did not know the components of their hospital's disaster plan. They are however in contrast with the findings of Messe who reported that about 85.3% of nurses in the medical and surgical wards of a public central hospital in Johannesburg indicated that they had read the disaster plan of their working place[14]. These contrasting findings on the knowledge of the hospital disaster plan could imply that most of the Emergency Department personnel were not familiar with the hospital disaster plan and were poorly prepared in contrast to other clinical units' personnel such as the medical and surgical wards. Relatively younger years of professional experience and of work in the hospital and having not participated in disaster operations previously by most of the ED personnel may be attributable to this poor knowledge in contrast

to the good knowledge of hospital disaster plan amongst most of the medical and surgical wards personnel.

Most of the ED personnel did not know the personnel with the authority to notify, declare and activate the disaster plan and the personnel to be in-charge of the intra-hospital operations in contrast with findings by Paganini *et al* in Italy where more than one third of ED personnel knew who was in-charge of disaster notification, declaration and activation[12]. Poor knowledge of notification, declaration, activation and operational processes may result in some confusion at the initial stage of disaster operation plan implementation with personnel not been clear as to what their roles should be and this could cause unnecessary delays in response which may affect patients' outcome and the speed of recovery[2, 47].

Codes (colours, alphabetical or numerical) usage during disaster operations is a means of categorizing the severity of the disaster and the extent of response needed to be implemented to mitigate its impact while also helping in communicating to the hospital personnel, other responders and the general public about the severity and impact of the disaster[24, 25]. Most of the personnel had a poor knowledge of what alert status codes green and yellow meant although many of them had a fair knowledge of alert status code red and immediate step to take when alert status codes yellow and red are raised. This finding about alert status codes may be attributable to the fact that not many of the personnel get to be informed, called in

or directed to be on standby when alert status codes green and yellow are raised but they all get to be called in or told to be on standby when code red alert status is raised during a disaster operation plan implementation. This may also imply that many of the personnel are prepared for a disaster plan implementation when code red alert status is raised in that they knew the immediate step to be taking which is to clear the floor of existing patient so that bed spaces can be created for the incoming victims of the disaster. This finding is important as there are no known previous studies which had reported on the knowledge of alert status codes amongst emergency department personnel or other groups of healthcare workers. Improvements in the planning and operational procedures can be identified with managed debriefs following a preparedness training exercise or real disaster implementation exercise while also serving as a means of recovery for the personnel involved and restoration of group cohesion and unit performance following a disaster incident[24, 27, 28, 58, 59]. However, a large percentage of the respondents in this study had poor knowledge of when the debrief following a disaster plan implementation is expected to be done and who should direct the debriefing session. This may imply that most of these personnel may not be aware of the importance of debriefs, had not participated in debriefing sessions following a disaster plan implementation previously and may not subsequently since they did not know when such sessions are to be held and who should conduct or lead the

debriefing session. Personnel physical and emotional recovery after a distressing disaster experience and the unit's regular functionality restoration may therefore be delayed, if not hampered, when they are not properly debriefed. This finding is of utmost importance in that no known previous studies had reported on the knowledge of when debriefing should be done and who should lead the session after a disaster operation amongst healthcare workers.

Knowledge of where emergency medicines, instruments and equipment are stored from where they can be mobilized for use during disaster operation plan is essential in disaster preparedness[2, 17]. Less than one-third of the respondents in this study indicated that they knew where the stock room or disaster stores were in the Emergency department. Poor knowledge or awareness of where instruments and equipment are kept may imply that the personnel would exhibit poorly coordinated responses during a disaster operation which may result in poor outcome for the disaster victims and also constitute danger or safety hazards to the personnel as previously reported by Adenekan *et al*[47] and Tang Rong[57].

Triage tags are labels used during disaster operation to identify patients and to indicate the priority of need for treatment and transport[2, 49 - 51]. One-third of the ED personnel expressed their knowledge of a triage tag as described or as close to the description above which could be said to be fair.

Action cards are the assigned job cards describing the duties of each hospital staff member and step by step instructions on what to be done in the event of an internal or external disaster operation implementation[2, 30]. This was described as or similar to above by more than one-third of the personnel. These findings are crucial in that no known previous study has reported on the knowledge of instruments such as triage tags and action cards amongst healthcare workers and having fair knowledge of these instruments would indicate that patient's identification, priority of care and knowledge of assigned duties may not be problematic during a disaster operation.

Just about half of the personnel indicated that they knew of additional equipment, instruments or treatment modalities that should be available once a disaster operation is declared. This finding is important in that no previous study was found to have reported on the knowledge of equipment or treatment modalities needed in a disaster operation amongst health workers. This knowledge being fair may be assumed to imply that many of the personnel knew what to do in caring for victims of disaster coming to the department. However, this may not mean that these additional equipment, instruments and treatment modalities were readily available for them to use during a disaster operation since most of them have poor knowledge of where they might be kept. Availability of essential equipment, instruments and treatment modalities needed for functioning during a disaster

response may be an indicator of the institutional commitment to preparedness with the personnel understanding the extent of the availability and functionality[2].

It was observed that the knowledge of the doctors on the availability of emergency medicines, instruments and additional equipment that may be needed in the event of disaster operation declaration is significantly higher than that of the nurses. This may be attributed to the different professional roles expected to be played during triage and resuscitation and may also indicate a differing level of knowledge in the clinical management of the victims of disasters between the doctors and the nurses. Similar or contrasting findings were however not found to have been previously reported.

Only one-third of the respondents have had one form of training or the other in disaster management most of whom found the training to be useful. This is similar to Messe's finding in a study conducted amongst the nurses in the medical and surgical wards of a central hospital in Johannesburg where only about 25% of the nurses reported to have attended a course of training in disaster management[14]. These similar findings also indicate that the need for personnel training in disaster management is crucial for all the hospital units' personnel although they may have varying levels of knowledge of the hospital's disaster plan. This finding however contrasts that among the emergency personnel in Israel most of whom were adequately drilled with the resultant strong to very strong relationship between the

drills and preparedness for emergencies or disaster incidents[45]. That most of the trained personnel found the training they had useful could imply that they were relatively better prepared to function in a disaster operation compared to the others that never had similar training. It is important that hospital staff are trained in disaster management regularly as this will not only enhance their preparedness but also response and recovery from the disaster operation[2, 17].

Less than one-third of the ED personnel indicated that they knew the frequency required for conducting simulation and drills exercises as forms of disaster preparedness and management training. This is similar to Moabi's reported finding amongst health workers of a central hospital in South Arica[15]. If ED personnel have a poor knowledge of when and how frequently disaster simulation and drill exercises should be conducted this may imply that most of them are not aware of such training exercises and they do not participate in them. Also observed was the nurses' knowledge of disaster training as a means of preparedness being significantly lower than that of the doctors.

In terms of the willingness of the ED personnel to participate in disaster management and training over two-third indicated their willingness to participate. This high percentage of the personnel with a positive attitude towards being trained, prepared and responding to disasters whenever they occur was also reported in similar studies done by Moabi[15], Adenekan et al[47] and Ogedegbe et al[56]

in South Africa, Nigeria and the USA respectively. This positive attitude can be fully explored further and built upon by the hospital's management and the ED leadership to get the personnel well trained and prepared for disaster occurrences.

LIMITATIONS

1. **Methodological limitations**[15] - The study design was a prospective observational cross-sectional reflecting the pre-interventional knowledge of the study population about disaster preparedness at the time when the questionnaire was administered. A post interventional survey following an intervention such as group-discussion, tutorial or training on disaster management may however reflect an improved knowledge and attitude towards disaster preparedness[29].

2. **Context limitations**[15]

a. The study's focus was centered on the ED of the CMJAH and the result may not reflect the knowledge of other personnel not in the ED.

b. The study was conducted in a single facility and thus the result may not be generalizable to other health facilities.

3. **Survey Questionnaire limitations**[15] – The study questionnaire focused more on the functional aspect of hospital disaster preparedness. Thus, it is limited in providing results reflecting structural and non – structural aspects of disaster preparedness.

CHAPTER 6

CONCLUSION AND RECOMMENDATIONS

6.1 CONCLUSION

Disasters are catastrophic incidents causing damage to or loss of infrastructure, materials, economy, environment and humans, the extent of which goes beyond the capacity of the affected community to manage. Hospitals within the community play critical roles in responding to and mitigating the impacts of disasters when they occur while also functioning as a safe environment for personnel especially the Emergency Department (ED) Personnel who are providing essential care to victims of disasters[12, 16]. The Emergency Department personnel are expected to be involved with the disaster preparedness planning of the hospital with the personnel having at least the basic knowledge of what the hospital disaster plan is and how it should be implemented. This study sought to assess and describe the knowledge of disaster preparedness amongst the ED personnel of an academic hospital in Johannesburg, South Africa.

Findings from this study revealed that there is poor knowledge of disaster preparedness and that there's little evidence the Emergency Department personnel are prepared for disasters. The poor knowledge of the various aspects of the academic hospital's operation disaster plan by the ED personnel may be attributed to different factors. Some of which may include

1. Inadequate orientation of the ED personnel at the resumption of duty in the ED
2. Lack of regular discussions or tutorials on disaster preparedness and management and disaster course training.
3. High rate of staff turnover in the ED
4. Assumption that only the ED leadership, senior members of staff and management personnel of the hospital are the only ones that should be familiar with the operation disaster plan and its various aspects while the other personnel are expected to only follow directives given by the seniors.
5. Poor attention to the notice boards in the ED on which are placed some of the excerpts from the operation disaster plan to educate the staff on steps to be taken in the events of declaration and implementation of operation disaster.
6. Very long disaster preparedness plan which is not accessible to the average doctor

These factors will require further studies to be ascertained.

It was also revealed from the study that most of the personnel are willing to be trained and be prepared for disaster. Training in disaster management should thus be organized for the ED personnel.

6.2 RECOMMENDATIONS

1. The ED personnel should have training on disaster preparedness and management as part of their initial orientation or induction exercise on resumption of duty in the ED.
2. The management of the respective areas of the ED should design regular training - both didactic and practical - sessions including drills and simulations on disaster preparedness and management as a part of continuing professional development education for the personnel. This could include various aspects of disaster planning – mitigation, preparedness, response and recovery.
3. The hospital management should put into place systems that will ensure regular auditing of the knowledge of the disaster plan, training exercises and real operation disaster plan implementation that will help to identify improvements or otherwise in the planning and operational procedures while also ensuring a regular review, monitoring and updating of the operation disaster plan.
4. It is also recommended that the findings of this study and other similar studies should be presented to the ED personnel and to teach them about the various aspects of the hospital's disaster plan.

5. A summary of the disaster plan with key concepts be given to each personnel as part of the orientation.
6. Further studies to ascertain the veracity of the factors highlighted above that may be responsible for the poor knowledge of the personnel on disaster preparedness should be conducted.

APPENDIX I

DISASTER MANAGEMENT PLAN QUESTIONNAIRE

A. DEMOGRAPHIC QUESTIONS

1. Sex (a) Female (b) Male

2. Age ……. Years

3. Profession (a) Nurse (b) Doctor

5. Years of work in the Emergency Department (ED) ……. Years

B. KNOWLEDGE OF CMJAH GEOGRAPHIC LOCATION AND POSSIBLE HAZARDS

1. Give three (3) examples of possible hazards that places CMJAH at risk of implementing the disaster plan

a. ……

b. ……

c. ……

C. THE FOLLOWING QUESTIONS ARE BASED ON THE INFORMATION IN THE EXISTING CMJAH OPERATION DISASTER PLAN

1. Who should receive the first message that a disaster has occurred? .....

2. Once the person in "C1" above has received the message who should he/she communicate the message to? ……

3. Who is the person with the authority to declare an operation disaster? .....

4. Who is the next appropriate person to be informed when the personnel in "C3" above has been notified of a potential disaster occurrence? .....

5. What does Code Green alert status mean? .....

6. What does Code Yellow alert status mean? .....

7. What does Code Red alert status mean? …….....

8. What immediate step is to be taken when a code Yellow or Red alert status is raised?

.....

9. Which area of the hospital should be designated as the Resuscitation Area?

…….....

10. When a disaster is declared who should be designated the

a. Medical Incident Officer? .....

b. Triage officer in area 163? .....

b. Triage officer in area 165? .....

c. Resuscitation officer in area 163? .....

d. Resuscitation officer in area 165? .....

11. Once a disaster has been declared what is the next most appropriate step as staff become available? .....

12. Who should form the members of a Resuscitation Team?

…….

13. Who is expected to give the "stand down" order at the end of a disaster operation?

…….

14. When are the personnel expected to be debriefed after a closure of a disaster operation?

……..

15. Who is expected to do the debriefing? …….

D. AVAILABILITY OF MEDICINES, SUPPLIES, INSTRUMENTS AND OTHER EQUIPMENT FOR USE IN A DISASTER OPERATION

1. In the event of a disaster where are additional emergency medicine, instruments and equipment stored in area 161/163/165/167? ……...

2. What are Triage Tags? ……

3. What are Action Cards? ……..

4. What additional equipment, instruments or treatment modalities should be available once a disaster is declared? …….

E. TRAINING IN DISASTER MANAGEMENT

1. Have you received any formal training in disaster management? Yes / No

2. If yes to question “E.1.” above – what type of training? ……..……

3. If yes to question “E.1.” above – did you find it useful? ……....

4. How often should disaster training including simulation and drills occur? ……

5. Would you be willing to participate in a disaster management training exercise? …….

APPENDIX II

INFORMATION SHEET

KNOWLEDGE OF HOSPITAL DISASTER PREPAREDNESS AMONGST THE EMERGENCY DEPARTMENT PERSONNEL OF AN ACADEMIC HOSPITAL IN JOHANNESBURG, SOUTH AFRICA.

Dear Colleague,

My name is Aanuoluwapo Abolarin, a Registrar with the University of the Witwatersrand in the Emergency Medicine Division. I am conducting a research project towards my MMED Emergency Medicine the title of which is *Knowledge of Hospital Disaster Preparedness Amongst the Emergency Department Personnel of an Academic Hospital in Johannesburg, South Africa*.

Morbidity and mortality resulting from disasters can be quite huge and impactful and the Emergency Department (ED) personnel are usually the frontline staff of the hospital to receive, triage and provide immediate care to victims of disasters. The ED must be involved in the disaster preparedness planning of the hospital with the expectation that the personnel of the unit should have the basic knowledge of the hospital disaster plan and how it should be implemented.

The objective of this study is to assess and describe the current knowledge and attitude of the CMJAH ED personnel towards disaster preparedness.

You are hereby invited to participate in this study. Participation in this study by completing the research questionnaire is voluntary. Anonymity and confidentiality will be maintained at all times. No names will be required at any stage during the research. The study number will not be linked back to you as a participant. You may withdraw from the exercise anytime you wish and be assured of the confidentiality of your personal information which will not be given in the research report's write-up.

Kindly note that there is no direct personal benefit or loss attached to your participation in this study. Please be assured that your withdrawal from or refusal to participate in the study and level of knowledge expressed will not in any way affect your employer-employee relationships and your employment status as a staff of CMJAH.

Understanding the current knowledge base of disaster preparedness of CMJAH's ED personnel would help to identify areas of strength and weakness, if any, in the hospital's disaster preparedness. The result of the report will be made available to you on request upon completion.

The study is of a prospective observational cross-sectional design in which there are no interventions expected of you beyond completing the open-ended questionnaire. If however you require any emergency assistance kindly contact me or my supervisor using the contact details provided below.

Completing the questionnaire would not take more than 10 to 15 minutes of your time and you are encouraged to answer the questions as appropriate as possible. Any question left unanswered will be presumed to have been answered as 'I do not know".

Kindly complete the attached consent form below indicating your willingness to participate in the study.

If you have any question or more information about the study or your participation in it kindly contact me and/or my Supervisor on 0736969209 / aanuabolarin@yahoo.com and moodley.pravani@gmail.com respectively.

This study has been approved by the Human Research Ethics Committee (Medical) of the University of the Witwatersrand, Johannesburg ("Committee"). A principal function of this Committee is to safeguard the rights and dignity of all human subjects who agree to participate in a research project and the integrity of the research.

If you have any concern over the way the study is being conducted, please contact the Chairperson of this Committee who is Professor Clement Penny, who may be contacted on telephone number 011 717 2301, or by e-mail on Clement.Penny@wits.ac.za. The telephone numbers for the Committee secretariat are 011 717 2700/1234 and the e-mail addresses are Zanele.Ndlovu@wits.ac.za and Rhulani.Mukansi@wits.ac.za

Thank you for reading this Study Information Sheet.

Dr. Aanuoluwapo A. Abolarin

CONSENT FORM

I hereby consent / do not consent to participate in the above-mentioned study.

Thank you.

…… ……

Signature **Date**

APPENDIX III

UNIVERSITY OF THE WITWATERSRAND JOHANNESBURG

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)

Office of the Deputy Vice-Chancellor (Research & Post Graduate Affairs)

TO: Dr AA Abolann
School of Clinical Medicine
Department of Medicine
Division of Emergency Medicine
Charlotte Maxeke Johannesburg Academic Hospital

E-mail: aanuabolarin@yahoo.com

CC: Supervisor: Drs P Moodley and A Bentley <moodley.pravani@gmail.com> and <HREC-Medical ResearchOffice@wits.ac.za>

FROM: Iain Burns
Human Research Ethics Committee (Medical)
Tel: 011 717 1252

E-mail: Iain.Burns@wits.ac.za

DATE: 2019/06/27

REF: *R14/49*

PROTOCOL NO: **M190423** *(This is your ethics application study reference number. Please quote this reference number in all correspondence relating to this study)*

PROJECT TITLE: *Knowledge of hospital disaster preparedness amongst the emergency department personnel of an Academic Hospital in Johannesburg, South Africa*

Please find attached the Clearance Certificate for the above project. I hope it goes well and that an article in a recognized publication comes out of it. This will reflect well on your professional standing and contribute to the Government funding of the University.

MSWorks2003/Iain0007/Clearcert.wps

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

R14/49 Dr AA Abolarin

HUMAN RESEARCH ETHICS COMMITTEE (MEDICAL)
CLEARANCE CERTIFICATE NO. M190423

NAME: (Principal Investigator)	Dr AA Abolarin
DEPARTMENT:	School of Clinical Medicine Department of Medicine Division of Emergency Medicine Charlotte Maxeke Johannesburg Academic Hospital
PROJECT TITLE:	Knowledge of hospital disaster preparedness amongst the emergency department personnel of an Academic Hospital in Johannesburg, South Africa
DATE CONSIDERED:	2019/04/26
DECISION:	Approved unconditionally
CONDITIONS:	
SUPERVISOR:	Drs P Moodley and A Bentley
APPROVED BY:	CB Penny Dr CB Penny, Chairperson, HREC (Medical)
DATE OF APPROVAL:	2019/06/27

This clearance certificate is valid for 5 years from date of approval. Extension may be applied for.

DECLARATION OF INVESTIGATORS

To be completed in duplicate and **ONE COPY** returned to the Research Office Secretary on the 3rd Floor, Phillip Tobias Building, Parktown, University of the Witwatersrand, Johannesburg.

I/we fully understand the conditions under which I am/we are authorized to carry out the above-mentioned research and I/we undertake to ensure compliance with these conditions. Should any departure be contemplated, from the research protocol as approved, I/we undertake to submit details to the Committee. **I agree to submit a yearly progress report**. When a funder requires annual re-certification, the application date will be one year after the date when the study was initially reviewed. In this case, the study was initially reviewed in **April** and will therefore reports and re-certification will be due early in the month of **April** each year. Unreported changes to the application may invalidate the clearance given by the HREC (Medical).

Principal Investigator Signature _____ Date _____

PLEASE QUOTE THE CLEARANCE CERTIFICATE NUMBER IN ALL ENQUIRIES

APPENDIX IV

GAUTENG PROVINCE
HEALTH
REPUBLIC OF SOUTH AFRICA

CHARLOTTE MAXEKE JOHANNESBURG ACADEMIC HOSPITAL

Enquiries:
Ms. N. Mzila
Office of the Clinical Director
Email: Nowaid.Mzila@gauteng.gov.za
Tell: (011): 488-4812
25/04/2019

Dear Dr. Aanuoluwapo A. Abolarin

STUDY TITLE: Knowledge of Hospital Disaster Preparedness amongst the Emergency Department Personnel of an Academic Hospital in Johannesburg, South Africa.

Permission to conduct the above mentioned study is provisional approved. Your study can only commence once Ethics approval is obtained. Please forward a copy of your Ethics Clearance Certificate as soon as the study is approved by the Ethics Committee for the CEO's office to give you the final approval to conduct the study.

Supported / not supported

Dr. M.I. Mofokeng
Clinical Director
DATE: 26/04/2019

Approved / not approved

Ms. G. Bogoshi
Chief Executive Officer
DATE: 29.04.2019

APPENDIX V

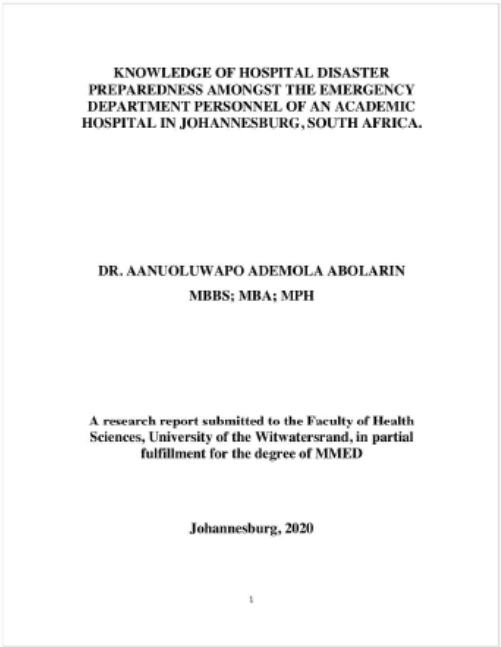
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KNOWLEDGE OF HOSPITAL DISASTER PREPAREDNESS AMONGST THE EMERGENCY DEPARTMENT PERSONNEL OF AN ACADEMIC HOSPITAL IN JOHANNESBURG, SOUTH AFRICA.

DR. AANUOLUWAPO ADEMOLA ABOLARIN
MBBS; MBA; MPH

A research report submitted to the Faculty of Health Sciences, University of the Witwatersrand, in partial fulfillment for the degree of MMED

Johannesburg, 2020

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