

**EMERGENCY UNIT AND DISASTER PREPAREDNESS:
A STUDY OF MILITARY HOSPITALS IN SAUDI ARABIA**

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ABSTRACT

Background:

The objective of this study is to evaluate the emergency and disaster preparedness of military hospital emergency services, and to further, identify strategies for improvement in disaster preparedness and response. Saudi Arabia is prone to various man-made and natural disasters. Among these is the event of the annual pilgrimage termed Hajj, which annually presents the risk of overcrowding. Many of these disasters have resulted in mass casualties. Consequently, there has been increased emphasis on planning by disaster experts to establish and maintain an organized preparation for a wide range of emergencies. Emergency Medical Services (EMS) play a vital role in disaster management. Both pre-hospital EMS and in-hospital emergency services are considered inefficient and inadequately prepared in disaster response and management. Most importantly, there is limited data on emergency care (EMS and hospital-based) disaster preparedness and responses in Saudi Arabia.

Methods:

We undertook a prospective cross-sectional, descriptive survey-based assessment of disaster preparedness. The research focused on collecting and analysing data through quantitative methods. To review the standard operating procedures (SOP), we sought all disaster plans and SOPs from management and emergency unit leadership at each of the 3 Medical Services Directorate (MSD) hospitals. We then undertook a questionnaire assessment, gathering quantitative data using close-ended questions and open-ended commentary surrounding a hospital's disaster response operating procedures.

Results:

We found a wide variability in the hospitals across the 22 themes in the survey. Most hospital emergency units have a good to excellent disaster plan. There were, however, concerns with the departmental standards with Radiology, Occupational Health, Critical Care, Respiratory Therapy, Pastoral Counselling, and provision made for the preservation of forensic evidence. Internal traffic flow and control issues presented relate to elevators manned and its prioritized usage. It is found that the area demarcated for media liaison needs improvement. Reception of casualties also needs attention and finally, relocation of patients and staff needs prioritisation.

Conclusion:

The study has highlighted several strengths in facility disaster preparedness and further shared the need for rigorous efforts required to improve the situation at some facilities. In general, most hospitals were found to have a good disaster management plan in place, however, a few covered all the recommended areas in sufficient detail.

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GLOSSARY

EC	Emergency Care
EMS	Emergency Medical Services
HAZMAT	Hazardous Material
HMIMMS	Hospital Major Incident Medical Management and Support
ICDM	Intergovernmental Committee on Disaster Management
IDNDR	International Decade for Natural Disaster Reduction
IMC	Inter-Ministerial Committee for Disaster Management
KPA	Key Performance Area
MIMMS	Major Incident Medical Management and Support
NATHOC	National Health Operations Centre
NDMAF	National Disaster Management Advisory Forum
NDMC	National Disaster Management Centre
NDMF	National Disaster Risk Management Framework
NESF	National Emergency Medical Services Strategic Framework
NIDMC	National Interdepartmental Committee on Disaster Management
PHC	Primary Health Care
SATS	South African Triage Scale
SGS	Saudi Geographic Survey
SOPs	Standard Operating Procedures
UN	United Nations
UNDP	United Nations Disaster Management Training Program
UNDRO	United Nations Disaster Relief Organization
VIP	Very Important Person

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND & MOTIVATION

In recent years, there has been a noticeable increase in the occurrence of both natural and man-made disasters worldwide.¹⁻³ Many of these disasters have resulted in mass casualties and injuries.¹⁻³ Consequently, there has been increased emphasis on planning by disaster experts: each nation should establish and maintain preparedness for a wide range of anticipated emergencies.² The changing climate, rapid demographic growth, and significant urbanisation have increased the risks of natural hazards. During the last few decades, the frequency of the occurrence of hazards either natural or human-related has increased.^{4,5} Furthermore, human-related activities such as terrorist attacks, Motor Vehicle Crashes (MVCs), or large public gatherings such as during the Islamic month of Ramadan and Hajj season, increase the hazards.²⁻⁵

Hospitals play an essential role during disasters, particularly in providing life-saving treatment to ill and injured individuals.^{1,6} Some of these services are provided by hospital emergency units; however, emergency medical services (EMS), which utilise ambulances to access patients in the field, are also crucial. This care includes pre-hospital treatment of illnesses, injuries and transportation to definitive care. EMS must be adequately prepared to provide timely responses to victims, even during high-volume cases resulting from disasters.

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1.2. HAZARD IDENTIFICATION

Typically, disasters are considered to be large-scale incidents with earthquakes, tsunamis, floods, and hurricanes being among the most common of the natural disasters; however, the terms are often used interchangeably between events.^{7,8} For simplicity, the term disaster here will be used to describe all major incidents, regardless of its size or cause.

Planning for disasters starts with the identification of hazards. A hazard can be thought of as a potential risk endangering the environment, property, human health, or human mortality. However, if the risk leads to an incident, it is referred to as an emergency or, if the damage is overwhelming, then it is considered a disaster.¹⁻² Human factors, environmental hazards, or natural causes often contribute to such events.^{3,4} Usually, one factor contributes significantly more than the others, despite the considerable overlap between these factors.

Most of the natural hazards can be accurately predicted because they occur repeatedly in the same geographical location and are related to weather patterns or physical and geological characteristics of the area.^{8,9} These are threats to life and property only if they occur in populated or inhabited areas. In recent times, human intervention has increased the frequency and severity of natural hazards.¹⁰ Increasing instances of flood disasters, and casualties from landslides are examples where human involvement has increased the severity of these natural hazards.^{11,12} Preventing damage from natural hazards relies on the strength of the early warning systems in hazard-prone areas; risk awareness and assessment, including hazard analysis and vulnerability/capacity analysis; knowledge development, including education, training, research and information; public commitment and institutional frameworks, including organisational, policy, legislation and community action; *and* application of measures including environmental management, land-use and urban planning, protection of critical facilities, application of science and technology, partnership and networking, and financial instruments.¹³⁻¹⁶

1.3 DISASTERS IN SAUDI ARABIA

Saudi Arabia is relatively prone to different kinds of natural hazards. The north-western region of the Kingdom is prone to earthquakes and volcanic hazards. The inhabited mountainous regions of the southwest area are a common area for landslides.¹⁴⁻¹⁶ The central and western region of the Kingdom is prone to flooding during periods of heavy rainfall. The central and the eastern regions of the Kingdom quite commonly experience dust or sandstorms. In recent years, pollutants have been detected in natural resources, especially groundwater.¹⁷⁻¹⁸ This is especially true around the Wadis and agricultural farms, where the extensive use of fertilisers for increasing agricultural yields, has resulted in polluted aquifers.

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Different government agencies and various universities have been working on these issues, to mitigate these hazards and educate the people.¹⁻³ The Saudi Geographic Survey (SGS) Chair on Natural Hazards established at the King Saud University is one such effort addressing this subject.¹⁶⁻¹⁸

Many regions of the world have seen devastating floods in recent years, as has been the case in Saudi Arabia, despite the dry climate.^{13,14} Due to the 2009 Jeddah flood disaster, more emphasis is being placed on tackling hydrological hazards, as similar events have the potential to affect other major cities of the Kingdom.^{3,6}

Saudi Arabia has suffered from many major incidents, as well as, sudden, unexpected mass casualty events, smaller than those considered disasters, in the last decade.

For example:

- in 2012, a gas tanker explosion in Riyadh kills 22 people and injures 111
- in 2012 a hospital fire in Jazan kills 25
- since late 2007, there have been more than thirty thousand earthquakes recorded in the Harrat Al-Shaqa, Lunayyir, a field of basaltic volcanic flows of Holocene age, located in western Saudi Arabia, northeast of Yanbu. ²⁻⁵
- October 28, 2019, a season of heavy rain in north-eastern Saudi Arabia killed seven people and injured eleven. Besides the deaths and injuries, the floodwater damaged homes, with around 1,176 affected people needing aid. ²⁻⁵
- a recent natural incident report on May 6, 2020, indicates that there was a severe hailstorm blanket in Abha, without casualties or damage to property. ^{4,16}

Although individual disasters are typically unpredictable, advanced disaster response planning can improve outcomes. Currently, disaster planning in Saudi Arabia appears to be undertaken in some detail, but the medical response to disasters is fragmented: typically, there are multiple agencies involved with no central coordination. ²⁻⁶ The same is true within the Saudi Arabian Military, where multiple agencies are involved in a response, and yet each maintains its lines of authority and reporting. ¹⁹⁻²⁰ Although the centralisation of disaster response has been seen increasingly in other countries, there has been no movement towards this in Saudi Arabia, especially within the military.

Moreover, in the military, disaster response strategies are made on an adhoc basis. In terms of activation of resources, the usual decision loop is as follows: a responder has to contact a senior manager in his department, who seeks his manager's approval, and so on up the chain of command until it reaches the General-in-Charge. ^{21,22} The General then contacts his counterpart in another branch of the military to request assistance; if these two individuals are contactable and in agreement, communication must then spread back down both sides to allow the response to occur. Yet, at the scene of a disaster, both units maintain independent line command structures and coordination efforts are minimal. While this is usual in many countries between, for example, police and ambulance services, in the Saudi Arabian

Military, there will be multiple medical services with the potential to respond, and the problem relates to lack of coordination within the health services.²³⁻²⁵

Consider the following example to illustrate the point:

An explosion occurs on a military base. Ambulances from the closest military hospital are the first EMS to be dispatched. The personnel in the ambulance arrive on the scene and make an assessment, which they communicate to their manager at the hospital EMS base. This manager now needs to activate other resources, but, in the absence of a plan or un-updated one, there is no clear line of authority:

- 1. Does he do this through the EU?*
- 2. Does he go directly to the Head of the hospital?*
- 3. Or should he escalate the matter above hospital level, to the Medical Services Directorate (MSD), overall responsible for all health services in the Saudi Arabian military?*

This ambiguity creates confusion for both clinical and non-clinical personnel, delays an effective response, and, presumably, worsens clinical outcomes.

Additionally, if the incident requires support from another military hospital (which is often the case with disasters), this process requires significant time and resource-consuming paperwork, limiting the speed and effectiveness of the disaster response.²²⁻²⁶ These delays present challenges that may worsen the outcome for patients.

1.4 DISASTER PREPAREDNESS

The efficiency of the disaster response system could be improved by adopting a centralised command and control structure – a practice currently employed in many other countries.¹⁻³ Most have adopted the British Major Incident Medical Management and Support (MIMMS) system for the prehospital response, and its sister course, Hospital-MIMMS.^{6,28} MIMMS principles include three layers of command, (Gold – central; Silver – around the scene; and Bronze – at the scene itself), clear line management functions, reporting structures, and priority actions to help ensure a most effective response.^{27,30}

MIMMS improves a health system's resilience, preparing medical staff to manage disasters effectively.⁴ In addition to the actual response, planning and practice are essential in

ensuring that the system can respond effectively when a disaster occurs.^{31,32} Post-response auditing and de-briefing is important in the review of procedures, and to establish grey areas requiring improvement to avoid any further harm or loss of life in similar future responses.²⁰

1.5 DISASTER PREPAREDNESS IN THE SAUDI ARABIAN MILITARY

Anecdotally, the disaster response system within the Saudi Arabian military needs significant improvement. To do this, baseline data is required on the current system, including information on current plans in place; whether existing plans meet international norms; which drills and exercises take place; how response occurs; what works well, and what could be improved.³¹⁻³² On this basis, recommendations for improvements can be made. The purpose of the study, therefore, is to assess disaster preparation and response systems that exist across the Kingdom's military medical services, to identify challenges and strengths in the current system, and to outline potential areas for improvement.

1.6 PURPOSE OF THE STUDY

Given the current gaps in preparedness and response to disasters, we planned this study to improve the emergency response to mass casualty situations and disasters within the Saudi Arabian military health services.

1.7 RESEARCH QUESTION

This study addressed the following question:

What is the level of disaster preparedness of the emergency services at three military hospitals in Saudi Arabia?

1.8 AIM AND OBJECTIVES

The study aimed to assess the emergency unit and disaster preparedness in military hospitals. To achieve this aim, the study has the following objectives:

- i. To describe the level of EMS disaster preparedness in the military hospitals
- ii. To identify and describe the communication strategies of the EMS disaster preparedness plan
- iii. To assess the infrastructure and equipment, training and education of the EMS staff

- iv. To assess the plan for disaster preparedness command and control, monitoring and evaluation, and response strategies of the EMS
- v. To assess the adequacy of the disaster and emergency response and post-disaster recovery plan for the EMS

CHAPTER 2: METHODOLOGY

2.1 METHODOLOGY

The study was a prospective cross-sectional, descriptive, survey-based assessment of disaster response. This research focused on collecting and analysing data through quantitative methods, using the World Health Organization (WHO) Hospital Emergency Unit Assessment Tool (HEAT) questionnaire and a disaster assessment tool developed by the South African National Department of Health, as part of the planning for the FIFA 2010 World Cup. The researcher modified the latter questionnaire to suit the current study.

2.2. STUDY SETTING

We contacted eight (n=8) army hospitals eligible for data collection, but only three military (n=3) hospitals consented to participate in our study. They include:

1. Al Kharj Armed Forces Hospital (KAFH)
2. Prince Sultan Military Medical City (PSMMC)
3. Al-Hada Armed Forces Hospital.

Out of the military hospitals in Saudi Arabia, the three military hospitals were purposively selected for this study to suit the objective of this study. They were chosen based on convenience and ease of access. In addition, the military hospitals were selected because they have and provide emergency and disaster responses services in Saudi Arabia. In most cases, the military hospitals are responsible for responding to disasters and emergencies, such as during bomb blasts, floods, droughts, and others. Thus, it was necessary to investigate their level of preparedness in terms of disaster response. Thus, this study reviewed the standard operating procedures (SOP), the researcher sought all disaster plans and SOPs from management and emergency unit (EU) leadership at each of the three military hospitals.

2.3 STUDY DESIGN

The research was divided into two sections, ‘emergency care’ and ‘disaster preparedness’. Each section utilised its relevant tool.

2.3.1. EMERGENCY CARE

Data were prospectively collected using a structured questionnaire using the WHO HEAT. This will be done by the heads of the emergency units, matrons (head nurses), and medical

officers in charge of each of the 3 selected hospitals. The questionnaire has eleven key sub-sections namely:

1. general information
2. command and control
3. communication
4. safety and security
5. triage
6. surge capacity
7. human resources
8. training
9. Logistics
10. equipment and supplies
11. post-disaster recovery

Data were analysed, compared descriptively and for differences in capacity across facility types. Once the survey was completed, a facility-based consensus meeting was organised with senior clinicians and management at each facility to clarify any discrepancies in responses and to agree with the final details.

2.3.2 DISASTER PREPAREDNESS

This study reviewed the standard operating procedures by seeking all disaster plans and SOPs from management and EU leadership at each of the hospitals. This included the review of the existence of the internal disaster plans for internal emergencies; the activation and execution of the disaster preparedness plan; the availability of personnel and resources to facilitate the execution of the disaster plan. The study also reviewed the communications procedures and their efficiencies, and engagement of important personnel during the disaster response.

2.4 STUDY POPULATION

The study population included the staff working at the emergency and disaster response departments in three selected military hospitals in Saudi Arabia. They were selected through convenient sampling methods. This was because the study population was fairly small that could not allow for randomizations of the sample. Thus, the convenient sample was used to derive an adequate sample for this study.

2.5. DATA COLLECTION & MANAGEMENT

The disaster plans for each facility was requested from senior management and evaluated using the disaster planning assessment tool.⁴ At each site, the hospital director and the EU head were contacted by the researcher to request the plans and SOPs. The purpose of the study was made clear and sharing of material was entirely voluntary.

The lead researcher and another independent evaluator (Col. Dr Ziad Kattb who is an emergency physician with disaster medicine expertise within Saudi Arabia) evaluated each facilities plan against the disaster planning assessment tool. All data were entered into encrypted files in Microsoft Excel (© Microsoft, Richmond, WA) for Windows and the data were uploaded on Google forms.

For unclear, missing, or discrepant data, the respondents of this study who had completed the form were contacted and the data re-confirmed.

2.6. DATA ANALYSIS

Basic descriptive analysis was undertaken using Microsoft Excel. We presented frequencies, medians, and ranges for most data. Open-ended commentary was collated by topic and used to describe recurrent issues raised by respondents.

2.7 INCLUSION AND EXCLUSION

The research utilized emergency unit employees, which included the heads of the Emergency Unit, matrons (head nurses), and medical officers, involved in disaster management from the three (3) major hospitals were identified as the respondents of the study. They were selected through convenient sampling methods to get an adequate number of respondents for this study. The study included only those who work at the emergency units from the hospitals. This included those who had worked for more than three months to ensure that those interviewed had adequate experiences to participate in the study. The study included only those who had consented to voluntarily participate in the study.

2.8. ETHICAL CONSIDERATIONS

This study adheres to all applicable ethical considerations. Ethical approvals: First, the researcher obtained ethical approval from the University of Cape Town Human Research Ethics Committee to proceed with the study (EM2019/007). Secondly, permission was

obtained from Prince Sultan Military Medical City, Scientific Research Centre, Institutional Review Board (IRB) approval no. 1401. Thirdly, the research provided all participants with adequate information to achieve well-informed and entirely voluntary consent. To protect the rights to privacy of the respondents, the data gathered were treated with the utmost confidentiality.

2.8.1. DESCRIPTION OF RISKS AND BENEFITS

There were no perceived risks to the hospitals or to individuals for participating. Any units not providing their disaster plans were not prejudiced in any way, nor excluded from participating in further studies. While individuals were not directly benefited, the research should inform improvements in disaster capability for the whole of MSD.

2.8.2 PRIVACY AND CONFIDENTIALITY

All data captured were treated with the utmost confidentiality. The respondents' hospitals were assigned a unique study number known only to the investigators, and all data were managed and reported against this number. Individual hospitals will receive report backs on their plans.

CHAPTER 3: RESULTS

As planned, the research questionnaire was sent to the participants derived from the three hospitals through an online link and forty-four responses were received. Since all the returned questionnaires were complete, there was no requirement for the removal of any incomplete data. The reason for small sample size from Prince Sultan Military Medical City and Al-Hada Armed Forces Hospital is because at the time of data collection from these hospitals, COVID-19 epidemic was at its peak in Saudi Arabia and we received fewer responses. Secondly, the number of eligible respondents was also higher in Al-Kharj Armed Forces Hospital (KAFH) as compared to rest. Based on geographical location of the hospitals included in our study, two hospitals namely; Al Kharj Armed Forces Hospital and Prince Sultan Military Medical City were grouped into “Central Region”, whereas Al-Hada Armed Forces Hospital was located in the “Western Region” of Saudi Arabia.

Table 1: Submitted Responses

Hospital	No. of responses	Emergency Unit	Disaster Team
Al Kharj Armed Forces Hospital (KAFH)	35	26	9
Prince Sultan Military Medical City (PSMMC)	5	4	1
Al-Hada Armed Forces Hospital	4	2	2
Total	44 (100%)	32 (72.7%)	12 (27.3%)

Table 1 shows that out of 44 responses, 32 (72.7%) were from the EU and 12 (27.3%) were from the Disaster Team. For the Central region, total responses were 40 (91%) and out of these 30 (68%) from the EU and 10 (23%) were from the Disaster Team. In the Western region, total responses were 4 (9%) and out of these 2 (4.5%) from the EU and 2 (4.5%) were from the Disaster Team.

3.1 DISASTER PREPAREDNESS AND EMERGENCY MANAGEMENT

Out of the 44 respondents, 97.7% of them indicated that their hospitals have disaster plans in place; 97.5% of the responses from the Central Region, and 100% of responses from the Western Region reported having disaster plans. All the respondents (100%) reported having a dedicated multidisciplinary disaster planning committee. Of all the respondents, 93.2% were

administrative members and controlling staff in both regions; 92.5% of the respondents were from central and 100% of the respondents were from the western region.

93.2% of the respondents reported that their respective hospitals have a collaborative relationship with other health services (which include local EMS, emergency management, red crescent, and health department). 92.5% of the responses in the Central Region reported having good relations with local agencies, whereas in the Western region 75% of the respondents reported having good relations with the local agencies. Detailed plans for internal and external disasters were available in 93.2% of responses (92.5% central, 100% western region) which shows that good plans are available. The majority (95%) of the respondents addressed how the hospital manages a mass casualty incident where routine emergency resources and facilities are inadequate.

90.9% of the responses (92.5% in the central, and 75% in the western region) indicated having the plan widely distributed and readily available throughout the hospital/healthcare facility. Chief executive responsibilities are well set in the plan, as reported by 97.7% of the respondents from all the hospitals, which was reaching almost 100% in responses from the Western region. 97.7% of respondents indicated a good mechanism for the hospital to communicate with external agencies; (Western region 100%, Central region 97.5%).

The latest version of the disaster plan was available to the user as reported by 88.6% of the respondents. 90% of responses in the central region reported having good version access, as opposed to 75% responses in the Western region. What constitutes a major incident for that specific hospital was specified in 97.7% of responses, and 88.6% of responses have included an assessment of local hazards and risks in their planning. 90.9% of the respondents reported that they manage a mass casualty incident despite inadequate routine emergency resources and facilities; in the Western region, 75% of the respondents reported that their hospitals will manage mass casualty incidents. 100% of respondents reported the inclusion of specific procedures for dealing with a chemical/biological or radiation incident in their planning.

Table 2: Foundation of Disaster Preparedness and Emergency Management

Answered as Yes (%)			
Question	Total	Central	Western
1) Does the facility have a disaster plan?	97.7	97.5	100
2A) Is there a disaster planning committee?	100	100	100
2B) Is it multi-disciplinary and include administrative members?	93.2	92.5	100
3A) Is there currently a collaborative relationship as part of the planning operating with: - Local EMS	93.2	95	75
3B) Local Red Crescent	90.9	90	100
3C) Local Emergency Management	93.2	92.5	100
3D) Local Health Department	86.4	87.5	75
3E) Does the plan detail actions to be taken for both internal and external disasters?	93.2	92.5	100
4) Does the plan detail how it links with the local EMS Agencies and local Emergency Management agencies?	95.5	95	100
5) Is the plan widely distributed and readily available throughout the hospital/healthcare facility?	90.9	92.5	75
6) Does the plan set out the responsibilities of the chief executive?	97.7	97.5	100
7) Does the plan set out the mechanism for consultation across the Trust and with external agencies?	97.7	97.5	100
8) Have the plan version controls within it to ensure that the user has the latest version?	88.6	90	75
9) Does the plan state the circumstances that would constitute a major incident for the hospital?	97.7	97.5	100
10) Does the plan provide an assessment of local hazards and risks?	88.6	90	75
11) Does it address how the hospital will manage a mass casualty incident where routine emergency resources and facilities are inadequate?	90.9	97.5	75
12) Does it cover specific arrangements for dealing with a chemical / biological / radiation incident	100	100	100

3.2 CAPABILITY IN HANDLING COMMUNICABLE DISEASES

Table 3 presents the data on hospital emergency care ability in handling communicable diseases. In terms of a baseline established for numbers of patients seen in the facility EU, outpatient clinics, or via direct admission, stratified according to clinical symptoms, the data shows 100% of all the respondents reported having these above-mentioned facilities.

A database of its emergency care capability and additional capacity that has not been well established was reported by 84.1% of all respondents (97.5% responses in the Central region but only 75% responses for the Western region).

90.9% of the respondents reported having a current process to evaluate and track 100% of all microbiology results and stratify according to organism; 97.5% of responses were from Central and only 75% responses were from the Western region. 100% of all respondents reported having a process to notify infection control 24 hours a day/7 days a week in their hospitals. 97.7% of the responses reported that their hospitals' plans do specify the number and location of isolation or protective environment rooms.

Table 3: Hospital Emergency Care Capability in Handling Communicable Diseases

Answered as Yes (%)			
Question	Total	Central	Western
13A) Does the facility currently have: A baseline established for numbers of patients seen in the facility Emergency unit, outpatient clinics, or via direct admission, stratified according to clinical symptoms?	100	100	100
13B) Does the facility currently have: A database of its emergency care capability and additional capacity?	84.1	97.5	75
14) Is there currently a process to evaluate and track 100% of all microbiology results and stratify according to the organism?	90.9	97.5	75
15) Does a process exist to notify infection control 24 hours a day/7 days a week?	100	100	100
16) Does the plan specify the number and location of isolation or protective environment rooms? Are their locations identified in a document readily available to the disaster coordinator or command team? Are isolation facilities monitored to insure adequate airflow?	97.7	97.5	100

3.3 PROCESS OF IDENTIFICATION OF AUTHORIZED PERSONNEL

The majority (90.9%) of respondents reported that their hospitals have a designated Disaster Coordinator; 92.5% and 75% of the responses were from Central and Western areas, respectively. 90.9% of the respondents reported that they had a designated Medical Commander and identified a key person as a Disaster Manager in their disaster plan (90.9%), and 88.6% of the respondents reported their hospital had a notification system in place to alert Staff. 75% of the responses from the Western region indicated their hospitals were less likely to have a notification system in place to alert staff.

The majority of respondents (95.5%) reported having a plan that includes lines of authority, role responsibilities, and provide for succession. 93.2% of respondents felt that the relevant personnel were familiar with the plan, and 95.5% of respondents reported having action cards for all personnel involved in disaster response. 88.6% of the respondents indicated having

designated how people will be identified within the facility. Only 75% of responses from the Western region reported having designated how people will be identified within the facility.

Table 4: Process of Identification of Authorised Personnel During Disaster

Answered as Yes (%)			
Question	Total	Central	Western
17) Is there an individual designated as a disaster coordinator on a 24-hour per day basis?	90.9	92.5	75
18) Has the facility designated a medical commander who will be responsible for the hospital's medical responses during the time the plan is activated?	90.9	90	100
19) Have other key position holders who have a role in disaster management been identified? This should be identified in the disaster plan.	90.9	90	100
20) Is a notification system in place that can alert personnel to a potential disaster situation?	88.6	90	75
21) Does the plan include lines of authority, role responsibilities, and provide for succession?	95.5	95	100
22) Are those who are expected to implant and use the plan familiar with it?	93.2	92.5	100
23) Have action cards been developed for all personnel involved in disaster response?	95.5	95	100
24) Does the plan designate how people will be identified within the facility (e.g., staff, news media, visitors)?	88.6	90	75

3.4 ACTIVATION OF THE HOSPITAL DISASTER PREPAREDNESS PLAN

93.2% of the respondents specified the circumstance necessary to activate their hospital disaster plan and 95% of respondents reported having guidelines and procedures for activation of different stages established and roles outlined with each stage. Also, 86.4% of the respondents reported having set out the mechanism for informing upwards that the plan has been activated (87.5% from the central region and 75% responses from the western region).

Table 5: Activation of the Hospital Disaster Preparedness Plan

Yes Answer (%)			
Question	Total	Central	Western
26) Does the plan specify the circumstances under which the plan can be activated?	93.2	95	75
27) Have activation stages been established and roles outlined with each stage? Alert: Disaster situation possible: there is an increased level of preparedness. Stand by: Disaster situation probable: available for immediate deployment. Call out: Disaster situation exists deployment. Stand down: Disaster situation is contained	95.5	100	50
28) Does it set out the mechanism for informing upwards that the plan has been activated?	86.4	87.5	75

3.5 DISASTER PREPAREDNESS AND EMERGENCY ALERTING SYSTEM

88.6% of responses reported that their hospitals provide for their emergency plan to be activated within 1-2 hours during normal as well as off-hours (75% responses were from the western region hospitals and 90% of the responses were from the central region hospitals). 90.9% of respondents specified how notifications in the hospitals would occur and 86.4% have the plan specify the chain of command to notify internal staff and appropriate external personnel indicating the status of the facility. Central region hospitals response measures on this 85%.

95.5% of the respondents reported having a detailed system for recalling staff back on duty and a similar percentage of hospitals have alternative systems of notification that considers people, equipment, and procedures. 100% of the responses indicated an emergency plan in hospitals with a mechanism for recruiting staff according to their skill levels and availability.

Table 6: Disaster Preparedness and Emergency Alerting System

Answer as Yes (%)			
Question	Total	Central	Western
29) Does the plan provide for activation within 1 – 2 hours during normal as well as off-hours?	88.6	90	75
30) Does the plan specify how notification within the facility will be carried out?	90.9	90	100
31) Does the plan specify the chain of command to notify internal staff and appropriate external personnel indicating the status of the facility?	86.4	85	100
32) Does the plan detail responsibility to initiate a system for recalling staff back on duty?	95.5	95	100
33) Does the plan provide for alternative systems of notification that considers people, equipment, and procedures?	95.5	97.5	75
34) Does the plan provide mechanisms to ration staffing	100	100	100

according to their skill levels and availability?			
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3.6 HOSPITALS DISASTER PREPAREDNESS AND RESPONSE

100% of respondents reported having available internal disaster plans, and the majority of respondents (93.2%) reported having developed plans to respond to an external disaster. Moreover, 90.9% of respondents reported having developed plans to provide equipment and personnel in response to external disasters. 93.2% of the responses had provisions for activating a disaster medical team in response to both internal and external disasters. 88.6% of responses had a mechanism to integrate and manage unexpected volunteers and responders to medical services who wish to help but the Western region has a mechanism in only 50% of responses.

The majority of the respondents indicated having a standard operating procedure in each department to reflect how the facility will continue to provide services in a timely and/ 24-hour period, with Emergency, Nursing, Pharmacy and Security at 100% of the responses; Laboratory and Mortuary at 97.7% of the responses; Administrative, Infection Control/Hospital Epidemiology, Biomedical Engineering, and Maintenance and Engineering at 93.2% of the responses; Food and Nutrition and Housekeeping at 90.9% of the responses; Central Supply and Social Services at 81.8%; Radiology, Critical Care and Respiratory Therapy at 79.5% of the responses; overall Occupational Health at 75% of the responses (in which 77.5% responses from the central region and with 50% responses from the western region); and finally overall Pastoral Counselling was indicated in 65.9% of the responses, in which Central region was at 70% (of the responses), and the Western region at 25% (of the responses).

93.2% of the respondents reported having a separate EU entrance for contaminated patients, with only 50% responses from the western region hospitals. 86.4 - 87.5% of the respondents reported having a dedicated facility, area, or portable device for decontamination, a hot and cold-water supply to the decontamination area, and water run-off from the decontamination area contained, with this being 75% responses from the Western region. In 88.6% of the responses, the ventilation system in the EU is isolated from the rest of the facility, with this being 75% of responses from in the western region. 100% of all the responses acknowledged having a communication method established within the EU so communication can be

established and maintained with the local EMS Agencies, Disaster Management, and the local Health Department.

100% of the respondents reported having an arrangement for keeping staff informed of the incident response. 97.7% of the responses indicated a discussion on jurisdictional control and staff are informed of the hierarchy if outside law enforcement assistance is requested or required. 97.7% of the responses had set out arrangements for accommodating the ambulance liaison officer, with this figure being only 75% responses from the western region. 95.5% of the respondents reported having arrangements set out for accommodating the police documentation team, with this figure being only 50% responses from the western region. 90.9% of the respondents reported that their emergency department does cover special arrangements needed if children are involved in an incident. 86.4% of the respondents reported having arrangements set out for deployment of a mobile medical team to the scene of an incident along with arrangements and facilities for decontamination of casualties where potential contamination is identified before entry into the hospital, with this percentage dropping to 50% responses from the western region. 84.1% of the respondents reported that their emergency departments had provision for additional mortuary facilities, with only 82.5% responses from the central region. 77.3% of the respondents had a provision made for the preservation of forensic evidence, with 80% responses from the central region compared to 50% responses from the western region.

Table 7: Hospitals' Disaster Preparedness and Response

Answer as Yes (%)			
Question	Total	Central	Western
35) Has the facility developed internal disaster plans for internal emergencies (Including a hospital fire, bomb threat, evacuation)?	100	100	100
36) Has the facility developed internal plans to respond to an external disaster? Does this plan indicate how the hospital will respond to an abnormally large (greater than >10% of the beds) influx of patients?	93.2	92.5	100
37) Has the facility developed plans indicating how it will be able to supply resources and personnel in response to an external disaster? Is there an evaluation of current supply and equipment levels that are kept on hand during normal facility operation?	90.9	95	50
38) Have provisions been made for activating a disaster medical team in response to both internal and external disasters?	93.2	92.5	100
39) Does the plan include procedures for incorporating and managing volunteers and unexpected medical services	88.6	92.5	50

responders who want to help?			
40) Has each department developed standard operating procedures to reflect how the facility will continue to provide services in a timely and 24-hour manner? These services may include:			
40A) Administrative	93.2	92.5	100
40B) Emergency	100	100	100
40C) Nursing	100	100	100
40D) Radiology	79.5	82.5	50
40E) Infection Control / Hospital Epidemiology	93.2	95	75
40F) Occupational Health	75.0	77.5	50
40G) Laboratory	97.7	100	75
40H) Pharmacy	100	100	100
40I) Critical Care	79.5	77.5	100
40J) Central Supply	81.8	82.5	75
40K) Maintenance and Engineering	93.2	92.5	100
40L) Biomedical Engineering	93.2	97.5	50
40M) Respiratory Therapy	79.5	80	75
40N) Security	100	100	100
40O) Food and Nutrition	90.9	90	100
40P) Housekeeping	90.9	92.5	75
40Q) Social Services	81.8	82.5	75
40R) Pastoral Counselling	65.9	70	25
40S) Mortuary	97.7	100	75
41A) In the Emergency unit section of the plan, are the following detailed? Is there a separate entrance to the Emergency unit for contaminated patients, if necessary?	93.2	97.5	50
41B) Is there a dedicated facility, area, or portable device for decontamination, if necessary?	88.6	90	75
41C) Is there a hot and cold-water supply to the decontamination area?	86.4	87.5	75
41D) Can water run-off from the decontamination area be contained?	86.4	87.5	75
41E) Can the ventilation system in the Emergency unit be isolated from the rest of the facility, if necessary?	88.6	90	75
41F) Is a communication method established within the Emergency unit so communication can be established and maintained with the local EMS Agencies, Disaster Management, and the local Health Department?	100	100	100
42) Has jurisdictional control been discussed and staff informed of the hierarchy in the event outside law enforcement assistance is requested or required?	97.7	100	75
43) Has it set out the arrangements for accommodating the ambulance liaison officer?	97.7	100	75
44) Have arrangements been set out for accommodating the police documentation team?	95.5	100	50
45) Have arrangements been set out for deployment of a mobile medical team to the scene of an incident?	86.4	90	50
46) Does it include arrangements for keeping staff informed	100	100	100

of the incident response?			
47) Does it make provision for additional mortuary facilities?	84.1	82.5	100
48) Is provision made for the preservation of forensic evidence?	77.3	80	50
49) Does it cover special arrangements needed in the event that children are involved in an incident? (Especially uninjured or minor injured children)	90.9	90	100
50) Does it cover arrangements and facilities for decontamination of casualties where potential contamination is identified before entry to the hospital?	86.4	87.5	75
51) Are there set out arrangements for accessing stocks of antidotes/vaccines?	86.4	90	50

3.7 HOSPITAL DISASTER OPERATIONS CENTRE

86.4% of the responses indicated where the Hospital Disaster Operation Centre is to be located, 87.5% responses were from Central region hospitals and 75% responses were from the western region. 81.8% of the responses indicated an alternate determined location. 82.5% responses were from central region hospitals and 75% responses were from the western region. 90.9% of the respondents reported that their hospitals had procedures for the Operation Centre specify a chain of command and communication channels for the key position holders within the Operation Centre. 92.5% responses were from the central region hospitals and 75% responses were from the western region.

95.5% of the respondents reported that their facilities had provisions made for alternative communication arrangements in the event of hospital communication system failure or overload. 97.7% of the responses indicated having a special communication network established and tested that will maintain communication between the facility and the local Disaster Management, with this figure being 75% responses from the western region hospitals.

84.1% of the respondents reported having a provision designated (e.g., space, equipment, communications) for extra people who may come to the hospital to provide services (e.g., volunteers and outside agencies) should assistance be requested by the local, or other agencies responding for disaster assistance (87.5% responses from the central region hospitals and 50% responses from the western region hospitals).

In 90.9% of the responses indicated a plan contains arrangements for promptly alerting and establishing a control team, 92.5% of responses were from central region hospitals and 75%

responses were from western region hospitals. 88.6% of respondents reported having re-allocated communication lines/telephones, known to those departments, with 92.5% responses from the central region hospitals and 50% responses from the western region hospitals.

Table 8: Hospital Disaster Operations Centre

Answer as Yes (%)			
Question	Total	Central	Western
52) Does the plan indicate where the Hospital Disaster Operation Centre is to be located (with preference given to an area away from the Emergency Unit)?	86.4	87.5	75
53) Has an alternate location been determined?	81.8	82.5	75
55) Do the procedures for the Operation Centre specify a chain of command and communication channels for the key position holders within the Operation Centre?	90.9	92.5	75
56) Is there provision for alternative communication arrangements in the event the hospital communication system fails or is overloaded?	95.5	95	100
57) Have special communication networks been established and tested that will maintain communication between the facility and the local Disaster Management?	97.7	100	75
58) Have provisions been designated (e.g., space, equipment, communications) for extra people who may come to the hospital to provide services (e.g., volunteers and outside agencies) should assistance be requested by the local, or other agencies responding for disaster assistance?	84.1	87.5	50
59A) Does the plan contain arrangements for promptly alerting and establishing a control team?	90.9	92.5	75
59B) pre-allocated communication lines/telephones, known to those departments?	88.6	92.5	50

3.8 DISASTER PREPAREDNESS AND EMERGENCY SECURITY PROTOCOL

All the responses (100%) had a method to close down their facility to control access and exits. 97.7% of the responses reported having steps in place to minimise and control points of access and egress in buildings and areas without the utilisation of lockdown procedures, with only 75% responses from the western region hospitals. Most (93.2%) respondents reported having a defined plan to control vehicular and pedestrian traffic in the event of a major incident, with only 50% responses from the western region hospitals.

86.4 - 88.6% of respondents reported having the arrangement to meet and escort responding emergency service personnel, ability to communicate with individuals immediately outside the facility in the event lockdown is initiated, and the facility security plan recognises the extent of the security problems for the individual facility. This figure drops to only 75% responses from western region hospitals. More than 97.7% of the respondents reported having established processes to credential healthcare workers from outside the individual

network to facilitate safe and qualified patient care, with this being only 75% responses from the western region hospitals.

Table 9: Hospital Disaster Preparedness and Emergency Security Protocol

Yes Answer (%)			
Questions	Total	Central	Western
60) Does the facility have the ability to lock down so entry and exit to all parts of the facility can be controlled? Has this process been tested?	100	100	100
61) Have steps been taken to minimize and control points of access and egress in buildings and areas without the utilization of lock down procedures?	97.7	100	75
62) Is there a plan to control vehicular traffic and pedestrians?	93.2	97.5	50
63) Have arrangements been made to meet and escort responding emergency service personnel?	86.4	85	100
64) Does the facility have the ability to communicate with individuals immediately outside the facility in the event lock down is initiated?	88.6	90	75
65) Does the facility security plan recognize the extent of the security problems for the individual facility?	88.6	90	75
66) Does the facility have an established process to credential healthcare workers from outside the individual network to facilitate safe and qualified patient care?	97.7	100	75

3.9 HOSPITAL COMMUNICATIONS SYSTEM

81.8% - 97.7% of the respondents reported that the disaster plans in their hospitals had contingency plans should the existing communication system fail, although the western region hospitals had 75% of the responses regarding the contingency plans in place. In 86.4 - 88.6% of the respondents, there are organised runners, as a messenger system back-up for communication and power system failures; a plan has been developed to utilise runner personnel and they have been provided with schematic area layout maps showing key areas for disaster operations, except in the Western region, where this figure drops to 50% responses.

In 90.9 - 97.7% of the respondents reported that their emergency departments had established communication networks with the local EMS Agency and Disaster Management and have arrangements for recording messages received on management decisions, and actions taken during a major incident in place.

Table 10: Hospital Communications System

Yes Answer (%)			
Question	Total	Central	Western
67) Is there provision for alternative communication arrangements in circumstances where the communication system fails/overloads (e.g., unlisted numbers, pay phones, walkie-talkie sets)?	81.8	82.5	75
68) Is there an organized runner, messenger system as a backup for a communication system and power failures?	88.6	90	75
69) Has a plan been developed to utilize runner personnel and have they been provided with schematic area layout maps showing key areas for disaster operations?	86.4	90	50
70) Has the facility established communication networks with the local EMS Agency and Disaster Management?	97.7	97.5	100
71) Are cover arrangements for recording messages received, management decisions, and actions taken during a major incident in place?	90.9	90	100

3.10 HOSPITAL INTERNAL TRAFFIC FLOW AND CONTROL

The control of internal traffic flow for the movement of patients through corridors and staff movement throughout their areas has been detailed in 85.5% of responses. 88.6% of the respondents reported having: egress routes for patients and staff for evacuation purposes; movement routes designated within the hospital and traffic flow charts prepared and posted. This figure drops to 50% responses from the western region hospitals. In 79.5% of the responses, plans to manage, control and prioritise elevator usage, with this figure being 50% responses from the western region hospitals.

Table 11: Hospital Internal Traffic Flow and Control

Yes Answer (%)			
Question	Total	Central	Western
72) Have provisions been made for internal traffic that allows for the movement of patients through corridors and staff movement throughout their areas?	95.5	97.5	75
73) Have egress routes for patients and staff been provided for evacuation purposes?	88.6	90	75
74) Will elevators be manned and controlled?	79.5	80	75
75) Has elevator usage been prioritized (e.g., casualties, supplies)?	79.5	82.5	50
76) Have movement routes been designated within the hospital and have traffic flow charts been prepared and posted?	88.6	92.5	50

3.11 HOSPITAL EXTERNAL TRAFFIC FLOW AND CONTROL

The majority of hospitals have considered the impact of external traffic on the flow into the hospital grounds as well as possible exit points. This includes half of the central region hospitals and all other hospitals region. The majority (84.1-97%) of the responses reported having specified areas for ambulances, supply vehicles, authorised personnel, authorised vehicle parking, visitors to proper entrances and emergency parking for key personnel. In 88.6% of all respondents reported that arrangements have been made for police support to maintain order in the vicinity of the facility and the plan includes a method to impact the management of vehicle and people convergence upon the facility, except with in the western region hospitals with 50% responses.

Table 12: Hospital External Traffic Flow and Control

Yes Answer (%)			
Question	Total	Central	Western
77) Have arrangements been made for both vehicular (including helicopter) and people entrance to and exit from the hospital premises?	86.4	87.5	75
78A) Have the following been established: A) Uninterrupted flow of ambulances and other vehicles to casualty sorting areas or emergency room entrances	93.2	92.5	100
78B) Access and egress control of authorized vehicles carrying supplies and equipment to a dock area	90.9	92.5	75
78C) Authorized vehicle parking	97.7	97.5	100
78D) Direction for authorized personnel and visitors to proper entrances	90.9	90	100
78E) Emergency parking for key personnel	90.9	92.5	75
78F) Are these areas accessible for large disaster vehicles such as disaster busses?	84.1	85	75
79) Have arrangements been made for police support in maintaining order in the vicinity of the facility?	88.6	92.5	50
80) Does the plan include a method to impact the management of vehicle and people convergence upon the facility?	88.6	92.5	50

3.12 HOSPITAL VISITOR POLICY DURING DISASTER

In 90.9% of responses, there is an area to re-unite discharged patients and uninjured patients with their family and provision has been made to handle medical and emotional situations resulting from the anxiety and shock of the disaster situation, with this figure being 75% of responses from the western region.

88.6% of the respondents reported having provision to establish; waiting areas, with supportive counselling, away from the Emergency unit to minimise unwanted access of relatives and friends of disaster victims. 88.6% of respondents had provision for a position holder to control and take care of housekeeping issues that arise due to visitors, and the plan contains arrangements for dealing with VIP visits following a major incident. 84.1 - 86.4% of the respondents reported having a plan to include a mechanism to deal with anticipated increases in visitors and curious onlookers seeking to gain entrance during disasters, and an area of privacy to inform family members of their loved one's death.

Table 13: Hospital Visitor Policy During Disaster

Yes Answer (%)			
Question	Total	Central	Western
81) Does the plan include a mechanism to deal with anticipated increases in visitors and curious onlookers seeking to gain entrance during disasters?	86.4	90	50
82A) Has a provision been made to establish: Waiting areas, with supportive counselling, away from the Emergency unit to minimize unwanted access to the relatives and friends of disaster victims?	88.6	92.5	50
82B) Area to re-unite discharged patients and uninjured patients with their family	90.9	92.5	75
82C) Area of privacy to inform a family member of their loved one's death	84.1	85	75
83) Has a provision been made to handle medical and emotional situations resulting from the anxiety and shock of the disaster situation? This includes dealing with the worried well.	90.9	92.5	75
84) Has a position holder been designated to control and take care of housekeeping issues that arise due to visitors?	88.6	90	75
85) Does the plan contain arrangements for dealing with VIP visits following a major incident?	88.6	87.5	100

3.13 MEDIA PROTOCOL: INFORMATION DISSEMINATION PROCESS

Only 68.2% of respondents reported having allocated a specific area in the hospital to house the media, with this figure being only 25% responses from the western area. Only 63.6% of the responses had a position holder designated to control and take care of the housekeeping needs of the media. 70.5-75% of respondents reported having plans to designate an internal spokesperson as a media contact; the plan determines the communication tree connecting the internal spokesperson with the external spokespersons for Disaster Management or other lead

agents and has provisions to identify the procedures for handling requests for information from the media.

Table 14: Hospital Media Protocol: Information Dissemination Process

Yes Answer (%)			
Question	Total	Central	Western
86) Do the media have a designated area?	68.2	72.5	25
87) Has this been located as not to be in close proximity to the Emergency unit, Command Centre, and waiting area for relatives, family, and friends?	75.0	77.5	50
88) Has a position holder been designated to control and take care of the housekeeping needs of the media?	63.6	65	50
89) Does the plan designate an internal spokesperson as a media contact?	70.5	72.5	50
90) Does the plan determine the communication tree connecting the internal spokesperson with the external spokespersons for Disaster Management or other lead agency?	70.5	72.5	50
91) Have provisions been made to identify the procedures for handling requests for information from the media?	75.0	75	75
92) Have locations been identified for press briefings?	63.6	65	50

3.14 RECEPTION OF CASUALTIES AND VICTIMS

The majority of respondents reported that their hospitals had a precise plan of action whereby at short notice (within 1 hour), multiple casualties can be received and identified, triaged, personnel are familiar with triage tags, Registered, treated in designated treatment areas, admitted or transferred, transported as needed, pre-numbered system be used, Routes to designated areas from triage area marked for untrained porters and admission wards versus distribution to empty beds.

An average of 88.25% of the respondents agreed that their hospital had plans to provide for clearance of all non-emergency patients and visitors from the emergency unit upon confirmation of a disaster, cancellation of all elective admissions and elective surgery, determination of rapidly available or open beds, determination of space that can be converted to patient care areas, determination of several patients who can be transferred or discharged and plan to assemble discharged patients, screen/re-evaluate them, record all information/ plan transport and accommodation.

90.9% of the respondents reported that their facility had receiving and sorting area that is accessible and near the areas of the hospital in which definitive care will be given. The

majority of the respondents reported that their hospital plan was in place to cancel surgeries and rearrange the equipment for the large influx of patients.

97.7% of the respondents reported having a plan to segregate/isolate disaster victims from the rest of the hospital if those victims are contaminated (e.g., hazardous materials) and the plan considers the need for a single-entry point for all casualties of the incident.

Table 15: Reception of Casualties and Victims

Answered as Yes (%)			
Question	Total	Central	Western
93A) Is there a precise plan of action whereby at short notice (within 1 hour), multiple casualties can be received and: A) Identified	90.9	92.5	75
93B) Triage	100	100	100
93C) Personnel are familiar with triage tags	90.9	90	100
93D) Registered	100	100	100
93E) Treated in designated treatment areas	95.5	100	50
93F) Admitted or transferred	88.6	90	75
93G) Transported as needed	95.5	100	50
93H) A pre-numbered system be used	81.8	82.5	75
93I) Routes to designated areas from triage area marked for untrained porters	81.8	85	50
93J) Admission wards versus distribution to empty beds?	90.9	92.5	75
94A) In the confirmation notification of a disaster, does the plan provide for: A) Clearance of all non-emergency patients and visitors from the emergency unit	93.2	92.5	100
94B) Cancellation of all elective admissions and elective surgery	88.6	90	75
94C) Determination of rapidly available or open beds	90.9	92.5	75
94D) Determination of space that can be converted to patient care areas	81.8	82.5	75
94E) Determination of the number of patients who can be transferred or discharged	97.7	100	75
94F) Plan to assemble discharged patients, screen/re-evaluate them, record all information/ plan transport and accommodation	77.3	80	50
95) Is the receiving and sorting area accessible and in close proximity to the areas of the hospital in which definitive care will be given?	90.9	92.5	75
96) Is the reception area equipped with portable auxiliary power for illumination and other electrical equipment, or can power be supplied from hospital emergency power (generator) circuits?	90.9	92.5	75
97) Does the reception area allow for retention, segregation and processing of incoming casualties?	88.6	90	75
98) Are sufficient equipment, supplies, and apparatus available, in an organized manner, to permit prompt and efficient casualty movement?	93.2	92.5	100
99) Can radiological monitors and radiation detection instruments	86.4	85	100

be assigned to the area if required?			
100A) Has a provision been made for a large influx of casualties to include such factors as A) Bed arrangements	84.1	82.5	100
100B) Personnel requirements	88.6	87.5	100
100 C) An extra resource such as interpretive services, linen, pharmaceutical needs, dressings, etc?	93.2	92.5	100
101) Are the medical records and admission departments organized to handle an influx of casualties	88.6	90	75
102) Is there a system for retention and safe-keeping of personal items removed from casualties?	88.6	90	75
103) Is there a plan to segregate/isolate disaster victims from the rest of the hospital if those victims are contaminated (e.g., hazardous materials)?	97.7	100	75
104) Does the plan consider the need for a single-entry point for all casualties of the incident?	97.7	100	75
105) Does it identify the receiving wards that may need to be used?	88.6	90	75

3.15 HOSPITAL EVACUATION

88.6% of respondents reported that their hospitals had a clear plan in place to facilitate the quick discharge of patients or to transfer existing patients to other local health facilities. 97.7% of the respondents reported having a portfolio responsible for the removal and control of patient records and documents.

Table 16: Hospital Evacuation

Yes Answer (%)			
Question	Total	Central	Western
106) Is there an organized discharge routine to handle large numbers of patients upon short notice?	88.6	90	75
107) Is it detailed that a position holder is responsible for the removal and control of patient records and documents?	97.7	100	75

3.16 RELOCATION OF PATIENTS AND STAFF

95.5% of respondents reported that their hospitals had satellite locations that have been pre-determined and confirmed for the housing of patients; appointed staff in the event of an evacuation; have transportation pre-designated for the movement of people, and has provision for the movement of patient records and documents. 90.9% of respondents reported that their hospital has provision for the movement of patients and staff to an immediate area of safe refuge within the hospital in the event of an evacuation or staff and patient relocation with a sequence for patient transfers along pre-established routes.

86.4 - 88.6% of the respondents reported having transportation resources identified for patients requiring to be moved in hospital beds, on ventilators and connected to specialised equipment, there being a schedule plan managing moving times, assigned personnel including professional staff assignment, priority of patients when moving to specific locations and provision been made for immediate refuge, care and comfort for the patients and staff on the hospital grounds during inclement and winter weather. 79.5% of respondents reported having procedures established for the orderly disposition of patients to their homes, if applicable.

Table 17: Relocation of Patients and Staffs

Yes Answer (%)			
Question	Total	Central	Western
108) Has a provision been made for the movement of patients and staff to an immediate area of safe refuge within the hospital in the event the area must be evacuated or staff and patients relocated?	90.9	92.5	75
109) Have arrangements been made with other healthcare facilities for the relocation of patients should the facility be unable to support patient care?	81.8	82.5	75
110) Have satellite locations been pre-determined and confirmed for the housing of patients and staff in the event of an evacuation?	95.5	100	50
111) Have transportation requirements been pre-designated for the movement of people?	95.5	100	50
112) Have transportation resources been identified for patients that must be moved in hospital beds, on ventilators, and connected to specialized equipment?	88.6	92.5	50
113) Has a provision been made for the movement of patient records and documents?	95.5	100	50
114) Is there a time sequence built into the plan designating appropriate moving times, assigned personnel including professional staff assignment, and priority of patients when moving to specific locations?	88.6	92.5	50
115) Is there a sequence for patient transfers along pre-established routes?	90.9	92.5	75
116) Are procedures established for the orderly disposition of patients to their homes, if applicable?	79.5	85	25
117) Has a provision been made for immediate refuge, care and comfort for the patients and staff on the hospital grounds during inclement and winter weather?	86.4	90	50

3.17 HOSPITAL OUT OF COMMUNICATION OR CUT OFF FROM RESOURCES

In the event of a breakdown in channels of communication or services to the hospitals concerned, 93.2% of responses acknowledged position holders responsible for auxiliary power, rationing of food and water, waste and garbage disposal, with rest and rotation of staff, rationing of medication and supplies, medical gas supply, laundry, and staff and patient morale. On average 90.9% of the responses agreed on having generators in place and on average 94% of responses agreed on having food and water rationing and waste and garbage disposal in place.

Table 18: Hospital out of communication or cut off from resources

Yes Answer (%)			
Question	Total	Central	Western
118A) In the event the hospital/healthcare facility is completely out of communication or cut off from resources, has the plan assigned position holders responsible for the following A) Auxiliary power	88.6	92.5	50
118B) Rationing of food and water	95.5	97.5	75
118C) Waste and garbage disposal	100	100	100
118D) Rest and rotation of staff	86.4	87.5	75
118E) Rationing of medication and supplies	90.9	90	100
118F) Medical gas supply	93.2	92.5	100
118G) Laundry	90.9	90	100
118H) Staff and patient morale	100	100	100
119) Has consideration been given to the utilization of patients and visitors to assist staff with duties?	97.7	100	75
120A) A Generators: A) Are critical areas identified?	93.2	92.5	100
120A) B Generators: B) Are power points supplied by the generator marked?	90.9	90	100
120A) C Generators: C) What is the duration the generator can function before additional fuel is required?	88.6	92.5	50
120B) A Food & Water: A) Has the time the hospital can be self-sufficient on its own water reserves/tanks and food resources been pre-determined?	97.7	97.5	100
120B) B Food & Water: B) Can the water tanks be filled from a portable source such as a tanker or by?	90.9	90	100
120B) C Food & Water: C) Are there boreholes close to the hospital?	97.7	97.5	100
120B) D Food & Water: D) Can mass food freezer facilities be supplied by portable generators/ connections available/ parking space?	90.9	92.5	75
120B) E Food & Water: E) Is rationing of water planned?	93.2	92.5	100

3.18 EQUIPMENT, SERVICES, FACILITY, AND LABORATORY ASSESSMENT

100% of the respondents reported that their hospital had the following pieces of equipment readily available within the facility: Ventilators (adult), IV pumps, suction machines, beds, linen, spinal boards, stretchers, and wheelchairs. 88.6% of the respondents reported having IV poles and 68.2% of the respondents reported having ventilators (neonates) and incubators.

97.7% of the respondents reported having plans that include measures to ensure the ability to provide hand washing/hand sanitising measures. 93.2% of the respondents reported having a current level of medical supplies maintained and readily available within the facility (days), particularly items that provide personal protection (i.e., masks, gloves, eye protection) and local suppliers of medical equipment identified and 24-hour contact numbers for these suppliers. 90.9% of the respondents reported having a current level of linen maintained and readily available (days), the facility can shut down air intakes and the plan includes measures to ensure adequate amounts of personal protective equipment.

Table 19: Equipment, Services, Facility, and Laboratory Assessment

Yes Answer (%)			
Question	Total	Central	Western
121A) Current number of the following pieces of equipment readily available within the facility: A) Ventilators (adult)	100	100	100
121B) Ventilators (neonate)	68.2	65	100
121C) Incubators	68.2	65	100
121D) IV pumps	100	100	100
121E) IV poles	88.6	87.5	100
121F) Suction Machines	100	100	100
121G) Beds	100	100	100
121H) Linen	100	100	100
121I) Spinal boards	100	100	100
121J) Stretchers	100	100	100
121K) Wheelchairs	100	100	100
122) Current level of medical supplies maintained and readily available within the facility (days), particularly items that provide personal protection (i.e., masks, gloves, eye protection)	93.2	92.5	100
123) Are local suppliers of medical equipment identified? Are there 24-hour contact numbers for these suppliers?	93.2	92.5	100
124) Current level of linen maintained and readily available (days)	90.9	90	100
125) Does the facility have the ability to shut down air intakes?	90.9	90	100
126) Does the plan include measures to ensure the ability to provide hand washing/hand sanitizing measures?	97.7	100	75
127) Does the plan include measures to ensure adequate amounts of personal protective equipment?	90.9	92.5	75

3.19 PHARMACEUTICALS

Almost 100% of respondents reported having adequate stocks of basic emergency drugs (atropine, morphine, adrenaline, and bronchodilators) and intravenous resuscitation fluids. 97.7% of respondents reported having plans to identify and established relationships with another facility outside the immediate region as a means to identify potential sources of needed pharmaceuticals as well as equipment, supplies, and staff. 95.5% of hospitals have a pharmaceutical allocation plan that makes provision for prophylaxis of caregiving staff and their immediate family. 90.9% of respondents agreed on having a plan to identify pharmaceutical warehouses within the local areas and the plan outlines how pharmaceuticals can be procured, transported, and delivered to the facility while within a secure environment.

Table 20: Pharmaceuticals

Yes Answer (%)			
Question	Total	Central	Western
128A) What is the current level of stock for the following pharmaceuticals: A) Atropine	100	100	100
128B) IV fluids	100	100	100
128C) Morphine	100	100	100
128D) Bronchial dilators	100	100	100
129) Does the pharmaceutical allocation plan make provision for prophylaxis of caregiving staff and their immediate family?	95.5	97.5	75
130) Has the plan identified and established relationships with another facility outside the immediate region as a means to identify potential sources of needed pharmaceuticals as well as equipment, supplies, and staff.	97.7	100	75
131) Does the plan identify pharmaceutical warehouses within the local areas?	90.9	92.5	75
132) Does the plan outline how pharmaceuticals can be procured, transported, and delivered to the facility while within a secure environment?	90.9	92.5	75

3.20 HOSPITAL POST DISASTER RECOVERY PROTOCOL

86.4% of respondents agreed on having plans to designate who will be in charge of recovery operations. 100% agreed that their hospitals had plans to make provision for the following during recovery: inventory and re-supply, hazard removal and clean-up, garbage and waste disposal, as well as, utility and equipment servicing. 90.9-93.2% of respondents reported that

their emergency preparedness plans had: documentation, financial matters, and record preservation.

81.8-86.4% of respondents agreed that their facilities had plans to address the following programs: Critical Incident Stress Debriefing Program, Employee Assistance Program, Group/Individual counselling services, and a Family Support Program.

Table 21: Hospital Post Disaster Recovery Protocol

Yes Answer (%)			
Question	Total	Central	Western
133) Does the plan designate who will be in charge of recovery operations?	86.4	87.5	75
134A) Does the plan make provision for the following during recovery? A) Documentation	90.9	92.5	75
134B) Financial matters	93.2	92.5	100
134C) Inventory and re-supply	100	100	100
134D) Record preservation	90.9	92.5	75
134E) Clean-up	100	100	100
134F) Hazard removal and clean-up	100	100	100
134G) Garbage and waste disposal	100	100	100
134H) Utility and equipment servicing	100	100	100
135A) Does the plan address the following programs? A) Critical Incident Stress Debriefing Program	86.4	87.5	75
135B) Employee Assistance Program	84.1	87.5	50
135C) Group/Individual counselling services	88.6	90	75
135D) Family Support Program	81.8	82.5	75

3.21 PERSONNEL EDUCATION AND TRAINING ON DISASTER PREPAREDNESS

The majority of hospitals have a dedicated disaster plan training program and educate their new staff as to the institution's disaster plan. 93.2-97.7% of the respondents agreed on having the plan that specifies who is responsible for the training program. The plan includes methods for ramp up and extemporaneous training for new and altered roles. The facility further has ongoing, mandatory disaster training programs and the plans set out appropriate Health and Safety measures that staff should be aware of.

In 86.4-88.6% of the responses, the facility considered adapting disaster procedures for application when dealing with routine procedures so personnel can become familiar with them. The program provides disaster education material at staff orientation to facilitate staff awareness. The program provides ongoing disaster education to facilitate staff awareness and currency of procedures. The program also has inter-organization joint training sessions that deal with common aspects of disaster response.

Table 22: Hospital Personnel Education and Training on Disaster Preparedness

Yes Answer (%)			
Question	Total	Central	Western
136) Does the plan specify who is responsible for the training program?	97.7	100	75
137) Does the plan include methods for ramp up and extemporaneous training for new and altered roles?	93.2	92.5	100
138) Does the facility have ongoing, mandatory disaster training programs?	95.5	97.5	75
139) Has the facility considered adapting disaster procedures for application when dealing with routine procedures so personnel can become familiar with them?	86.4	90	50
140) Does the program provide disaster education material at staff orientation to facilitate staff awareness?	88.6	92.5	50
141) Does the program provide ongoing disaster education to facilitate staff awareness and currency of procedures?	88.6	92.5	50
142) Does the program have inter-organization joint training sessions that deal with common aspects of disaster response?	88.6	92.5	50
143) Does the plan set out appropriate Health and Safety measures that staff should be aware of?	93.2	95	75

3.22 DISASTER PLAN DRILL AND SIMULATIONS

In 88.6% of the responses, the facility program conducts an annual exercise, the exercise ensures all key participants are familiar with the contents of the plan and the exercise ensures all key participants are familiar with the contents of the plan.

90.9% of the respondents reported having a formal critique performed with results distributed to all key individuals and participating groups and 97.7% of the responses identified somebody responsible for ensuring that the plan is updated, distributed, and tested regularly.

Table 23: Disaster Plan Drill and Simulations

Yes Answer (%)			
Question	Total	Central	Western
144) Does the facility program conduct an annual exercise?	88.6	90	75
145) Does the exercise ensure all key participants are familiar with the contents of the plan?	88.6	92.5	50
146) Does the exercise ensure all key participants are familiar with the contents of the plan?	88.6	92.5	50
147) Is a formal critique performed with results distributed to all key individuals and participating groups?	90.9	92.5	75
148) Does it identify somebody responsible for ensuring that the plan is updated, distributed and tested regularly?	97.7	100	75

CHAPTER 4: DISCUSSION

4.1 DISCUSSION

This study is aimed at evaluating the emergency unit and disaster preparedness of selected military hospitals in Saudi Arabia. Except for a study on the improvement of disaster preparedness in emergency units of a military hospital in Tehran in 2016, to the best of our knowledge, to date, Saudi Arabia has not published research on the role of EMS in disaster preparedness in military hospitals. Various studies have surveyed disaster equipment, responsibilities, and responses in hospitals around the world and also in Saudi Arabia.^{7,8,24} Similar to the aforementioned Tehran study, studies within Saudi Arabia have focused on emergency units in one city or at most on one hospital. Adini has proposed the use of the preparedness pyramid which helps define the key components necessary for major incident preparedness.³ This includes: planning and policies, equipment and infrastructure, knowledge and capabilities, and, training and drills.

Though data on Saudi Arabian military hospitals are lacking, one study evaluated disaster preparedness in major private hospitals in Riyadh from 2015-2016. The study found that 92.3% of respondents reported a disaster plan though such plans were weakened by a lack of staff training, education, and simulation in disaster response.³⁴⁻³⁷ In 2017, a published study which was conducted in Makkah assessed the emergency nurse preparedness during mass gatherings in four major hospitals and focused on an emergency nurses' response to the Haj, which is an annual mass gathering or pilgrimage with an estimated two to three million people in a confined area at specific times.³⁸⁻⁴⁰ This study highlighted the importance of the awareness and education of nurses working in emergency units.³⁹

The current research is aimed at evaluating Saudi military hospitals' EMS levels of disaster preparedness and to identify strategies for the improvement of disaster management. Three Saudi military hospitals were selected to participate in this research and respond to the questionnaire. 97.7% of participants from the hospitals reported that they had a disaster plan. Despite the existence of a disaster plan, other studies have identified that most hospitals lacked an established, cooperative relationship with external health authorities, which play an important role in the transfer and treatment of patients in disasters both internal and external to the hospital.^{36,39}

Only 93.2% of respondents specified a difference between external and internal disasters. These same hospitals have not adequately distributed their disaster plans among employees for their effectiveness. Both internal and external disaster assessment requires an integrated multidisciplinary approach, and the disruption of integration in the contingency plan may negatively impact the outcome, especially in hospitals vulnerable to internal. ⁴⁰⁻⁴² It can be deduced that currently there is a 13.6% shortage of collaborative relationships with the local health department both in central and western regions. From about 11.4% of the responses, there was the need for an up-grade of the latest version of the plan and assessment of local hazards and risks in both regions.

All the hospitals designated as disaster responders cover specific arrangements for dealing with a chemical/biological/radiation incident. Pfenninger et al. reported on the relationship between CBRN risk management and disaster preparedness in hospitals; they showed that hospitals with higher risk tend to have poorer plans in place. ³¹ A database of hospital emergency care capability and additional capacity is lacking, especially in the western region.

Awareness of the role of disaster managers in risk management is a critical contributor to successfully mitigating losses and damage caused by a disaster. ¹⁶ Most of the hospitals included in this study had a disaster coordinator, apart from one hospital in the western region. In contrast, there is a lack of medical commanders in the central region. Both regions hospitals have an alert system for staff in the event of a disaster, but in comparison, the western region has a poor alert system. There is no clarity related to how people will be identified within the facility which is a serious challenge to informing staff and stakeholders who could significantly contribute to disaster reduction.

"Emergency planning should be a process, rather than a product or outcome. ¹⁷ Despite specific requirements of hospital disaster plan implementation, half of the respondents in the hospitals of the western region lack clarity in the process of: dividing disasters into stages and inactivation, preparedness and termination procedures. There is a good mechanism for informing higher authorities that the plan has been activated in both regions. There is a lack of belief that activation of the disaster plan can occur within 1-2 hours and that a specified chain of command exists to alert internal staff and appropriate external personnel. The division into stages plays a major role in disaster management as it alerts planners and implementers to the needs, internal and external support, as well as resources required in each

stage of the disaster. The lack of this division of stages in disaster management may lead to failure.¹⁸

All hospitals in this study have a plan for internal disasters, and the majority of hospitals have a plan for external disasters, including the provision of resources and staff. Only 88.6% of respondents reported that their hospitals had had plans that included external resources such as volunteers and unexpected medical services responders, with this figure dropping to only 50% responses in the western region. Volunteers and other medical responders can greatly benefit from disaster management when divided according to their qualifications to reduce hospital staff burden and increase manpower.⁷ Related to manpower there are a few concerns related to the Central Supply and Social Services at 81.8% of the responses; Radiology, Critical Care and Respiratory Therapy (RT) at 79.5% of the responses; overall Occupational Health at 75% in which central region is 77.5% and the western region at 50% of the responses; and finally overall Pastoral Counselling at 65.9% of the responses, in which central region is 70% of the responses in comparison with the western region at 25% of the responses.

As the hospital's gateway to emergency and disaster situations, the emergency unit requires special access to decontamination areas for hazard management; however, only 50% of the responses from the western region had a dedicated area for decontamination. The allocation of the area of decontamination is essential in disaster management.²⁰ In cases of hospitals that lacked decontamination areas, it is unlikely that other disinfection facilities were available in all regions. All the hospitals differed in decontamination arrangements especially in the western regions where there was a lack of decontamination resources. The hospitals also had lacked preservation of forensic evidence and access to stocks of antidotes or vaccinations.

86.4% of the respondents reported having developed standard operating procedures for a Hospital Operations Centre with 81.5% of the respondents acknowledging the existence of an alternative location. Almost all hospitals have alternative communication arrangements if the existing system fails. These same hospitals in both regions had plans to alert and establish a control team. The purpose of the standard operating procedures is “to guarantee that a standardized and uniform set of procedures is applied within the entire system”.²¹ Only 86.4% of the respondents reported having had such SOP's.

100% all the hospitals control entrance and exit to the hospital and can shut down the hospital under any circumstances. The hospitals from the Central region had a good plan to control vehicular traffic and pedestrians in comparison to the western region. There are no good arrangements to meet and escort response by emergency service personnel, especially in the central region.

Dependency on a single communication channel can be very risky, and in the case of disruption, communication and guidance between the operating room and the medical teams and support will break down, creating confusion and chaos that could exacerbate the disaster situation.^{25,26} In this questionnaire, hospitals both in central and western regions lack the alternative to the main communication channel. This dangerous oversight can be remedied by building alternative channels and methods of communication and learning from hospitals that contain these systems. Half of the western region hospitals need to develop runner personnel and schematic maps as an alternative messenger system in case of communication failure.

All the hospitals in both regions control the flow of internal traffic, but they lack control of external traffic to increase the speed of transport, evacuation, and reception of patients. There is also concern related to egress routes. Movement routes have been designated within the hospital and traffic flow charts have been prepared and posted. 50% of the responses are from the western region. There is also concern over how elevators are manned, controlled and its usage prioritized (e.g., casualties, supplies). It is half in the western region.

Most of the hospital lacks the arrangements for police support in maintaining order in the facility and the plan includes a method to impact the management of vehicle and people convergence upon the facility, except the western region with half of it.

In the event of disaster situations, it is anticipated that visitors and families will converge on hospital facilities in search of their relatives or acquaintances.²⁹⁻³² Arrangements for special areas to receive visitors and the provision of psychological, religious information and counselling to alleviate stress and reduces confusion. All of the three hospitals have been identified as having a disaster-prone visitor area, including an area for the VIP reception, with the necessary supportive counselling and a reunification area for discharged patients. Only 50% of responses are from the western region.

With the development and proliferation of media and social networks in the last two decades, the role of the media has become important and effective in directing people and

communicating information during disaster situations.^{5,6} Disaster management stands to greatly benefit from the services of media rather than ignoring it. As a result, 68.2% of the respondents in this study had identified that their hospitals had a designated area for the media, but only a quarter of it was in the western area and fewer hospitals had designated a spokesman for the hospitals. Half of it is in the western region.²² Two thirds of the hospitals had locations identified for press briefings, and it is half in the western region.

This study shows that 90 – 95% of the respondents reported that the hospital-based emergency units had a system for triage, patient identification, patient flow, and patient transport out of the unit within 1 hour. Over 84% of the respondents reported that their hospitals had plans to address the hospital's surge capacity. We had a 100% response from the western region. Most hospitals had an efficient plan to obtain documentation for the disaster victims and had designated areas to attend to the victims with quick access to extra stock and supplies but there is still a deficit in the western region. These are considered as an essential element in the disaster plan, whether in the case of activation or standby stage. However, only 82% of the respondents acknowledged having a clear plan in place to facilitate the quick discharge and transfer of patients to other local health facilities. The goal of an evacuation plan is to mitigate the dangers of patient movement and staff, to a safe and well-equipped area. Therefore, evacuation plans play an important role in disaster preparedness and medical staff should receive proper evacuation training.⁷ Fewer hospitals still lack the plan to assemble discharged patients, screen/re-evaluate them, record all information/ plan transport and accommodation. In the western area it is only half. Most of the hospitals in the central region have procedures established for the orderly disposition of patients to their homes, except in the western region with only 25% of the responses.

In 88.6% of responses, there is a person responsible for operating the reserve power in the hospital in the case of the collapse of communication channels or electrical services. Only 50% of responses are from the western region. 86.4-100% of respondents acknowledge having appointed officials responsible for the rationing of food and water, management of waste and garbage disposal, rotation of staff, and rationing of medication. During disaster situations, it is expected that there will be a significant shortage of resources thereby necessitating preparedness and on-site stocks.²⁷

100% of the respondents reported that their facility had almost had all the equipment readily available within the facility: Ventilators (adult), IV pumps, Suction Machines, Beds, Linen,

Spinal boards, Stretchers, and Wheelchairs. 88.6% of the responses reported that their emergency departments had IV poles. Concerning though is that 68.2% of respondents acknowledged having Ventilators (neonate) and Incubators. 97.7% of the respondents reported having the plan include measures to ensure the ability to provide hand washing/hand sanitizing measures for all. 93.2% of the responses had a current level of medical supplies maintained and readily available within the facility (days), particularly items that provide personal protection (i.e., masks, gloves, eye protection) as well as a database of local suppliers of medical equipment and their 24-hour contract numbers. 90.9% of the responses, have a current level of linen maintained and readily available (days), the facility can shut down air intakes and the plan include measures to ensure adequate amounts of personal protective equipment for all.

Related to pharmaceuticals, almost all the respondents agreed that their hospitals had adequate stock of basic emergency drugs (Atropine, Morphine, Adrenaline, and bronchodilators) and intravenous resuscitation fluids. 97.7% of respondents agreed that their hospitals had a plan identified and established relationships with another facility outside the immediate region as a means to identify potential sources of needed pharmaceuticals as well as equipment, supplies, and staff. 95.5% of respondents acknowledged that their hospital had a pharmaceutical allocation plan to make provision for prophylaxis of caregiving staff and their immediate family if needed. 90.9% of all the respondents agreed that their hospital had a plan to identify pharmaceutical warehouses within the local areas and the plan to outline how pharmaceuticals can be procured, transported, and delivered to the facility while within a secure environment.

The post-disaster phase is an important stage that enables completion, review, and constructive criticism of the plan. ³⁸⁻³⁹ The results of this questionnaire showed that 86.4% of respondents reported that their hospitals had planned clear methods to manage post-disaster recovery stages, though most hospitals do not have Critical Incident Stress Debriefing Program, Employee Assistance Program, Group/Individual counselling services, or Family Support Programs and other issues.

In this study, 97.7% of the respondents agreed that their hospital had a responsible person for disaster training and also shows that almost all the hospitals had a dedicated disaster plan with new staff education and training programs on the institution's disaster plan which is almost 88.6% of respondents acknowledged exercising their disaster plan annually whereas

88.6% of the respondents ensure that all key players are familiar with the plan. Training and simulation of the disaster plan improve disaster preparedness, identifying and correcting potential errors that may occur during the implementation of the disaster plan to avoid any major incident. Training and disaster programs are important to improve disaster response levels but lacking in close to one-third of the hospitals participating in the questionnaire.²⁴

4.2 LIMITATIONS

The following potential limitations to the study have been identified:

Above all, the Covid-19 pandemic had a major impact on data collection, the delay of which necessitated an online data collection strategy. We anticipated that there may be a degree of reluctance or reticence amongst senior employees or managers to disclose or be critical of their disaster plans. To minimise this potential limitation, we ensured that respondents were aware that all responses were anonymised and de-identified for collated reports. This means that our results represent a best-case scenario.

Even if all the facilities have a “good” disaster plan in place according to the assessment, it is not an indication of the degree of preparedness of the facility to respond to a disaster. This has to be communicated back to the MSD and each hospital. Further assessments have to be arranged as a follow-up and gap-closure.

CHAPTER 5: CONCLUSION

This research is unique as it pertains to the military hospitals of the Ministry of Defence in the Kingdom of Saudi Arabia, looking at the issue of disaster management in emergency care. This research is based on a self-reported questionnaire and, therefore, can be considered the best-case scenario.

During the study, we were able to highlight several strengths in facility disaster preparedness, noting that most components of the disaster plans, are in place, although certain aspects are lacking. These include, having an easily accessible plan, staff members that are familiar with it, as well as regular plan simulations and drills. Education and training are vital, as is the exercising of the current plan. Overall, most hospitals had good disaster plans in place, although none covered all the recommended areas in sufficient detail.

CHAPTER 6: RECOMMENDATIONS

In light of the findings in the study, the researcher comes up with the following recommendations related to emergency care:

- i. A strong collaborative relationship must be forged between the hospital emergency care services and the local EMS, especially the Saudi Red Crescent Society.
- ii. A unified emergency and disaster preparedness plan must be widely distributed and readily available throughout the hospital to cater to problems like mass casualty incidents, especially where there are inadequate routine emergency resources and facilities.
- iii. A database of its emergency care capability and additional capacity must be available to every hospital and clinic.
- iv. A notification system that can alert personnel to a potential disaster situation must be in place in every hospital, including the EMS.
- v. A plan to control EMS vehicular traffic and pedestrians during hospital emergencies must be in place.
- vi. Every military hospital should have a plan to utilise runner personnel and provide them with schematic area layout maps that shows key areas for disaster operations.
- vii. Movement routes must be in place within the hospital and traffic flow charts should be prepared and posted in case of emergencies.
- viii. Each hospital must have a media protocol to have an organised communication and dissemination process.
- ix. Trained porters must be assigned to routes to designated areas from the triage area.
- x. Every hospital must have a well-planned and organised evacuation protocol for patients and staff.
- xi. Hospital personnel education and training on disaster preparedness must be upgraded from time to time.

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APPENDICES

APPENDIX 1: DISASTER PLANNING ASSESSMENT TOOL

Foundation on disaster preparedness and emergency management			
Questions	Yes	No	Comments
1) Does the facility have a disaster plan?			
2A) Is there a disaster planning committee?			
2B) Is it multi-disciplinary and include administrative members?			
3A) Is there currently a collaborative relationship as part of the planning operating with: - Local Emergency Medical Services (EMS)			
3B) Local Red Crescent			
3C) Local Emergency Management			
3D) Local Health Department			
3E) Does the plan detail actions to be taken for both internal and external disasters?			
4) Does the plan detail how it links with the local EMS Agencies and local Emergency Management Agency?			
5) Is the plan widely distributed and readily available throughout the hospital/healthcare facility?			
6) Does the plan set out responsibilities of the chief executive?			
7) Does the plan set out the mechanism for consultation across the Trust and with external agencies?			
8) Have the plan version controls within it to ensure that the user has the latest version?			
9) Does the plan state the circumstances that would constitute a major incident for the hospital?			
10) Does the plan provide an assessment of local hazards and risks?			
11) Does it address how the hospital will manage a mass casualty incident where routine emergency resources and facilities are inadequate?			
12) Does it cover specific arrangements for dealing with a chemical/biological / radiation incident			

Hospital emergency care capability in handling communicable diseases			
Questions	Yes	No	Comments
13A) Does the facility currently have: A baseline established for numbers of patients seen in the facility Emergency unit, outpatient clinics, or via direct admission, stratified according to clinical symptoms?			
13B) Does the facility currently have: A database of its emergency care capability and additional capacity?			
14) Is there currently a process to evaluate and track 100% of all microbiology results and stratify according to the organism?			
15) Does a process exist to notify infection control 24 hours a day/7 days a week?			

16) Does the plan specify the number and location of isolation or protective environment rooms? Are their locations identified in a document readily available to the disaster coordinator or command team? Are isolation facilities monitored to insure adequate airflow?			
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Identification of Authorized Personnel			
Questions	Yes	No	Comments
17) Is there an individual designated as a disaster coordinator on a 24-hour per day basis?			
18) Has the facility designated a medical commander who will be responsible for the hospital's medical responses during the time the plan is activated?			
19) Have other key position holders who have a role in disaster management been identified? This should be identified in the disaster plan.			
20) Is a notification system in place that can alert personnel to a potential disaster situation?			
21) Does the plan include lines of authority, role responsibilities, and provide for succession?			
22) Are those who are expected to implant and use the plan familiar with it?			
23) Have action cards been developed for all personnel involved in disaster response?			
24) Does the plan designate how people will be identified within the facility (e.g., staff, news media, visitors)?			

Status of Activation of the Hospital Disaster Preparedness Plan			
Questions	Yes	No	Comments
26) Does the plan specify the circumstances under which the plan can be activated?			
27) Have activation stages been established and roles outlined with each stage? Alert: Disaster situation possible: there is an increased level of preparedness. Stand by: Disaster situation probable: available for immediate deployment. Call out: Disaster situation exists deployment. Stand down: Disaster situation is contained			
28) Does it set out the mechanism for informing upwards that the plan has been activated?			

Disaster Preparedness and Emergency Alerting System of the Hospital			
Questions	Yes	No	Comments
29) Does the plan provide for activation within 1 – 2 hours during normal as well as off-hours?			
30) Does the plan specify how notification within the facility will be carried out?			

31) Does the plan specify the chain of command to notify internal staff and appropriate external personnel indicating the status of the facility?			
32) Does the plan detail responsibility to initiate a system for recalling staff back on duty?			
33) Does the plan provide for alternative systems of notification that considers people, equipment, and procedures?			
34) Does the plan provide mechanisms to ration staffing according to their skill levels and availability?			

Hospitals' Disaster Preparedness / Emergency Response			
Questions	Yes	No	Comments
35) Has the facility developed internal disaster plans for internal emergencies (Including a hospital fire, bomb threat, evacuation)?			
36) Has the facility developed internal plans to respond to an external disaster? Does this plan indicate how the hospital will respond to an abnormally large (greater than >10% of the beds) influx of patients?			
37) Has the facility developed plans indicating how it will be able to supply resources and personnel in response to an external disaster? Is there an evaluation of current supply and equipment levels that are kept on hand during normal facility operation?			
38) Have provisions been made for activating a disaster medical team in response to both internal and external disasters?			
39) Does the plan include procedures for incorporating and managing volunteers and unexpected medical services responders who want to help?			
40A) Has each department developed standard operating procedures to reflect how the facility will continue to provide services in a timely and 24-hour manner? These services may include: A) Administrative			
40B) Emergency			
40C) Nursing			
40D) Radiology			
40E) Infection Control / Hospital Epidemiology			
40F) Occupational Health			
40G) Laboratory			
40H) Pharmacy			
40I) Critical Care			
40J) Central Supply			
40K) Maintenance and Engineering			
40L) Biomedical Engineering			
40M) Respiratory Therapy			
40N) Security			
40O) Food and Nutrition			

40P) Housekeeping			
40Q) Social Services			
40R) Pastoral Counselling			
40S) Mortuary			
41A) In the Emergency unit section of the plan, are the following detailed? Is there a separate entry to the Emergency unit for contaminated patients, if necessary?			
41B) Is there a dedicated facility, area, or portable device for decontamination, if necessary?			
41C) Is there a hot and cold-water supply to the decontamination area?			
41D) Can water run-off from the decontamination area be contained?			
41E) Can the ventilation system in the Emergency unit be isolated from the rest of the facility, if necessary?			
41F) Is a communication method established within the Emergency unit so communication can be established and maintained with the local EMS Agencies, Disaster Management, and the local Health Department?			
42) Has jurisdictional control been discussed and staff informed of the hierarchy in the event outside law enforcement assistance is requested or required?			
43) Has it set out the arrangements for accommodating the ambulance liaison officer?			
44) Have arrangements been set out for accommodating the police documentation team?			
45) Have arrangements been set out for deployment of a mobile medical team to the scene of an incident?			
46) Does it include arrangements for keeping staff informed of the incident response?			
47) Does it make provision for additional mortuary facilities?			
48) Is provision made for the preservation of forensic evidence?			
49) Does it cover special arrangements needed in the event that children are involved in an incident? (Especially uninjured or minor injured children)			
50) Does it cover arrangements and facilities for decontamination of casualties where potential contamination is identified before entry to the hospital?			
51) Are there set out arrangements for accessing stocks of antidotes/vaccines?			

Hospital Disaster Operations Centre			
Questions	Yes	No	Comments
52) Does the plan indicate where the Hospital Disaster Operation Centre is to be located (with preference given to an area away from the Emergency unit)?			
53) Has an alternate location been determined?			
55) Do the procedures for the Operation Centre specify a chain			

of command and communication channels for the key position holders within the Operation Centre?			
56) Is there provision for alternative communication arrangements in the event the hospital communication system fails or is overloaded?			
57) Have special communication networks been established and tested that will maintain communication between the facility and the local Disaster Management?			
58) Have provisions been designated (e.g., space, equipment, communications) for extra people who may come to the hospital to provide services (e.g., volunteers and outside agencies) should assistance be requested by the local, or other agencies responding for disaster assistance?			
59A) Does the plan contain arrangements for promptly alerting and establishing a control team?			
59B) pre-allocated communication lines/telephones, known to those departments?			

Hospital Disaster Preparedness and Emergency Security Protocol			
Questions	Yes	No	Comments
60) Does the facility have the ability to lock down so entry and exit to all parts of the facility can be controlled? Has this process been tested?			
61) Have steps been taken to minimize and control points of access and egress in buildings and areas without the utilization of lockdown procedures?			
62) Is there a plan to control vehicular traffic and pedestrians?			
63) Have arrangements been made to meet and escort responding emergency service personnel?			
64) Does the facility have the ability to communicate with individuals immediately outside the facility in the event lockdown is initiated?			
65) Does the facility security plan recognize the extent of the security problems for the individual facility?			
66) Does the facility have an established process to credential healthcare workers from outside the individual network to facilitate safe and qualified patient care?			

Hospital Communications System Procedure			
Questions	Yes	No	Comments
67) Is there provision for alternative communication arrangements in circumstances where the communication system fails/overloads (e.g., unlisted numbers, payphones, walkie-talkie sets)?			
68) Is there an organized runner, messenger system as a backup for a communication system and power failures?			
69) Has a plan been developed to utilize runner personnel and			

have they been provided with schematic area layout maps showing key areas for disaster operations?			
70) Has the facility established communication networks with the local EMS Agency and Disaster Management?			
71) Are cover arrangements for recording messages received, management decisions and actions taken during a major incident in place?			

Internal Traffic Flow and Control			
Questions	Yes	No	Comments
72) Have provisions been made for internal traffic that allows for the movement of patients through corridors and staff movement throughout their areas?			
73) Have egress routes for patients and staff been provided for evacuation purposes?			
74) Will elevators be manned and controlled?			
75) Has elevator usage been prioritized (e.g., casualties, supplies)?			
76) Have movement routes been designated within the hospital and have traffic flow charts been prepared and posted?			

External Traffic Flow and control			
Questions	Yes	No	Comments
77) Have arrangements been made for both vehicular (including helicopter) and people entrance to and exit from the hospital premises?			
78A) Have the following been established: A) Uninterrupted flow of ambulances and other vehicles to casualty sorting areas or emergency room entrances			
78B) Access and egress control of authorized vehicles carrying supplies and equipment to a dock area			
78C) Authorized vehicle parking			
78D) Direction for authorized personnel and visitors to proper entrances			
78E) Emergency parking for key personnel			
78F) Are these areas accessible for large disaster vehicles such as disaster busses?			
79) Have arrangements been made for police support in maintaining order in the vicinity of the facility?			
80) Does the plan include a method to impact the management of vehicle and people convergence upon the facility?			

Visitors			
Questions	Yes	No	Comments
81) Does the plan include a mechanism to deal with anticipated increases in visitors and curious onlookers seeking to gain entrance during disasters?			
82A) Has a provision been made to establish: Waiting areas, with supportive counselling, away from the Emergency unit to minimize unwanted access to the relatives and friends of disaster victims?			
82B) Area to re-unite discharged patients and uninjured patients with their family			
82C) Area of privacy to inform a family member of their loved one's death			
83) Has a provision been made to handle medical and emotional situations resulting from the anxiety and shock of the disaster situation? This includes dealing with the worried well.			
84) Has a position holder been designated to control and take care of housekeeping issues that arise due to visitors?			
85) Does the plan contain arrangements for dealing with VIP visits following a major incident?			

Hospital Media Protocol: Information Dissemination Process			
Questions	Yes	No	Comments
86) Do the media have a designated area?			
87) Has this been located as not to be in close proximity to the Emergency unit, Command Center, and waiting area for relatives, family, and friends?			
88) Has a position holder been designated to control and take care of the housekeeping needs of the media?			
89) Does the plan designate an internal spokesperson as a media contact?			
90) Does the plan determine the communication tree connecting the internal spokesperson with the external spokespersons for Disaster Management or other lead agency?			
91) Have provisions been made to identify the procedures for handling requests for information from the media?			
92) Have locations been identified for press briefings?			

Hospital Process of Reception of Casualties and Victims			
Questions	Yes	No	Comments
93A) Is there a precise plan of action whereby at short notice (within 1 hour), multiple casualties can be received and: A) Identified			
93B) Triage			
93C) Personnel are familiar with triage tags			
93D) Registered			
93E) Treated in designated treatment areas			

93F) Admitted or transferred			
93G) Transported as needed			
93H) A pre-numbered system be used			
93I) Routes to designated areas from triage area marked for untrained porters			
93J) Admission wards versus distribution to empty beds?			
94A) In the confirmation notification of a disaster, does the plan provide for: A) Clearance of all non-emergency patients and visitors from the emergency unit			
94B) Cancellation of all elective admissions and elective surgery			
94C) Determination of rapidly available or open beds			
94D) Determination of space that can be converted to patient care areas			
94E) Determination of the number of patients who can be transferred or discharged			
94F) Plan to assemble discharged patients, screen/re-evaluate them, record all information/ plan transport and accommodation			
95) Is the receiving and sorting area accessible and in close proximity to the areas of the hospital in which definitive care will be given?			
96) Is the reception area equipped with portable auxiliary power for illumination and other electrical equipment, or can power be supplied from hospital emergency power (generator) circuits?			
97) Does the reception area allow for retention, segregation and processing of incoming casualties?			
98) Are sufficient equipment, supplies, and apparatus available, in an organized manner, to permit prompt and efficient casualty movement?			
99) Can radiological monitors and radiation detection instruments be assigned to the area if required?			
100A) Has a provision been made for a large influx of casualties to include such factors as A) Bed arrangements			
100B) Personnel requirements			
100 C) An extra resource such as interpretive services, linen, pharmaceutical needs, dressings, etc?			
101) Are the medical records and admission departments organized to handle an influx of casualties			
102) Is there a system for retention and safe-keeping of personal items removed from casualties?			
103) Is there a plan to segregate/isolate disaster victims from the rest of the hospital if those victims are contaminated (e.g., hazardous materials)?			
104) Does the plan consider the need for a single-entry point for all casualties of the incident?			
105) Does it identify the receiving wards that may need to be			

used?			
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Hospital Evacuation			
Questions	Yes	No	Comments
106) Is there an organized discharge routine to handle large numbers of patients upon short notice?			
107) Is it detailed that a position holder is responsible for the removal and control of patient records and documents?			

Relocation of Patients and staff			
Questions	Yes	No	Comments
108) Has a provision been made for the movement of patients and staff to an immediate area of safe refuge within the hospital in the event the area must be evacuated or staff and patients relocated?			
109) Have arrangements been made with other healthcare facilities for the relocation of patients should the facility be unable to support patient care?			
110) Have satellite locations been pre-determined and confirmed for the housing of patients and staff in the event of an evacuation?			
111) Have transportation requirements been pre-designated for the movement of people?			
112) Have transportation resources been identified for patients that must be moved in hospital beds, on ventilators, and connected to specialized equipment?			
113) Has a provision been made for the movement of patient records and documents?			
114) Is there a time sequence built into the plan designating appropriate moving times, assigned personnel including professional staff assignment, and priority of patients when moving to specific locations?			
115) Is there a sequence for patient transfers along pre-established routes?			
116) Are procedures established for the orderly disposition of patients to their homes, if applicable?			
117) Has a provision been made for immediate refuge, care and comfort for the patients and staff on the hospital grounds during inclement and winter weather?			

Hospital out of communication or cut off from resources			
Questions	Yes	No	Comments
118A) In the event the hospital/healthcare facility is completely out of communication or cut off from resources, has the plan assigned position holders responsible for the following A) Auxiliary power			

118B) Rationing of food and water			
118C) Waste and garbage disposal			
118D) Rest and rotation of staff			
118E) Rationing of medication and supplies			
118F) Medical gas supply			
118G) Laundry			
118H) Staff and patient morale			
119) Has consideration been given to the utilization of patients and visitors to assist staff with duties?			
120A) A Generators: A) Are critical areas identified?			
120A) B Generators: B) Are power points supplied by the generator marked?			
120A) C Generators: C) What is the duration the generator can function before additional fuel is required?			
120B) A Food & Water: A) Has the time the hospital can be self-sufficient on its own water reserves/tanks and food resources been pre-determined?			
120B) B Food & Water: B) Can the water tanks be filled from a portable source such as a tanker or by?			
120B) C Food & Water: C) Are there boreholes close to the hospital?			
120B) D Food & Water: D) Can mass food freezer facilities be supplied by portable generators/ connections available/ parking space?			
120B) E Food & Water: E) Is rationing of water planned?			

Equipment, Services, Facility and Laboratory Assessment			
Questions	Yes	No	Comments
121A) Current number of the following pieces of equipment readily available within the facility: A) Ventilators (adult)			
121B) Ventilators (neonate)			
121C) Incubators			
121D) IV pumps			
121E) IV poles			
121F) Suction Machines			
121G) Beds			
121H) Linen			
121I) Spinal boards			
121J) Stretchers			
121K) Wheelchairs			
122) Current level of medical supplies maintained and readily available within the facility (days), particularly items that provide personal protection (i.e., masks, gloves, eye protection)			
123) Are local suppliers of medical equipment identified? Are there 24-hour contract numbers for these suppliers?			
124) Current level of linen maintained and readily available (days)			

125) Does the facility have the ability to shut down air intakes?			
126) Does the plan include measures to ensure the ability to provide handwashing/hand sanitizing measures?			
127) Does the plan include measures to ensure adequate amounts of personal protective equipment?			

Pharmaceuticals			
Questions	Yes	No	Comments
128A) What is the current level of stock for the following pharmaceuticals: A) Atropine			
128B) IV fluids			
128C) Morphine			
128D) Bronchial dilators			
129) Does the pharmaceutical allocation plan make provision for prophylaxis of caregiving staff and their immediate family?			
130) Has the plan identified and established relationships with another facility outside the immediate region as a means to identify potential sources of needed pharmaceuticals as well as equipment, supplies, and staff.			
131) Does the plan identify pharmaceutical warehouses within the local areas?			
132) Does the plan outline how pharmaceuticals can be procured, transported, and delivered to the facility while within a secure environment?			

Post Disaster Recovery			
Questions	Yes	No	Comments
133) Does the plan designate who will be in charge of recovery operations?			
134A) Does the plan make provision for the following during recovery? A) Documentation			
134B) Financial matters			
134C) Inventory and re-supply			
134D) Record preservation			
134E) Clean-up			
134F) Hazard removal and clean-up			
134G) Garbage and waste disposal			
134H) Utility and equipment servicing			
135A) Does the plan address the following programs? A) Critical Incident Stress Debriefing Program			
135B) Employee Assistance Program			
135C) Group/Individual counselling services			
135D) Family Support Program			

Education and Training

Questions	Yes	No	Comments
136) Does the plan specify who is responsible for the training program?			
137) Does the plan include methods for ramp up and extemporaneous training for new and altered roles?			
138) Does the facility have ongoing, mandatory disaster training programs?			
139) Has the facility considered adapting disaster procedures for application when dealing with routine procedures so personnel can become familiar with them?			
140) Does the program provide disaster education material at staff orientation to facilitate staff awareness?			
141) Does the program provide ongoing disaster education to facilitate staff awareness and currency of procedures?			
142) Does the program have inter-organization joint training sessions that deal with common aspects of disaster response?			
143) Does the plan set out appropriate Health and Safety measures that staff should be aware of?			

Exercising the Disaster Plan			
Yes Answer (%)			
Question	Total	Central	Western
144) Does the facility program conduct an annual exercise?			
145) Does the exercise ensure all key participants are familiar with the contents of the plan?			
146) Does the exercise ensure all key participants are familiar with the contents of the plan?			
147) Is a formal critique performed with results distributed to all key individuals and participating groups?			
148) Does it identify somebody responsible for ensuring that the plan is updated, distributed and tested regularly?			

APPENDIX 2: SUBMITTED STUDY PROTOCOL

ASSESSMENT OF DISASTER PREPAREDNESS OF EMERGENCY MEDICAL SERVICES AT A MILITARY HOSPITAL IN SAUDI ARABIA

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BACKGROUND

In recent years, there has been a noticeable increase in the occurrence of both natural and man-made disasters worldwide. ¹⁻³ Many of these disasters have resulted in mass casualties and injuries. ^{3,4} Consequently, there has been increased emphasis on planning by disaster experts: each nation should establish and maintain preparedness for a wide range of anticipated emergencies. ^{2,5} Hospitals play an essential role during disasters, particularly in providing life-saving treatment to ill and injured individuals. ^{6,7} Some of these services are provided by hospital emergency centres (ECs); however, emergency medical services (EMS), which utilize ambulances to access patients in the field, are also crucial. This care includes prehospital treatment of illnesses and injuries and transportation to definitive care. EMS must be adequately prepared to provide timely responses to victims, even during high-volume times such as disasters. ²⁻⁵

Saudi Arabia is prone to various man-made and natural disasters. Overcrowding, such as during the Hajj, has been associated with increased risk of disasters including mass trampling, food and water shortages, and epidemics of respiratory infections. ^{2,3,5,6} In 2016, there were more than 400 deaths during Hajj. ^{6,7} Terrorist attacks, social conflicts, political unrest, and civil wars are other man-made causes of the disaster and mass casualties in Saudi Arabia. ⁴⁻⁸ In 2015, there were nearly 30,000 injuries and 6,000 deaths related to terrorist and socio-political unrest. ⁴⁻⁷ Saudi Arabia is also vulnerable to oil industry-related disasters including oil leakage, accidents in oil wells, explosions, and fires. ⁴⁻⁶ Natural disasters in Saudi Arabia include flooding due to poor drainage systems, resulting in the displacement of families and waterborne diseases. ^{6,7}

Adverse weather-related disasters caused more than 60,000 displacements and about 4,600 deaths in 2016 alone. ⁴⁻⁶ Heavy rainstorms, strong wind, sandstorms, and prolonged drought also produce mass casualties. ⁴⁻⁷

The Saudi government has made significant efforts to expand and enhance the standard of health care delivery. ²⁻⁴ However, evidence demonstrates that pre-hospital care and emergency medical services (EMS) are inaccessible and inefficient, especially in disaster response. ^{4,5,6} Barriers to accessible EMS in Saudi Arabia include limited funding, inadequate resources, insufficient paramedic staff, and geographical constraints. ^{6,7} Similar to prehospital EMS, in-hospital EMS are considered inefficient and inadequately prepared in disaster response and management. ⁴⁻⁶ Most importantly, there is little data on EMS disaster preparedness and response in Saudi Arabia. ^{5,8} Moreover, the existing studies have not identified strategies for enhancing the preparedness of the EMS in various hospitals. ⁶

This study will evaluate the emergency and disaster preparedness of military hospital EMS services, to identify strategies for improvement in disaster preparedness and response.

MOTIVATION

This study is required as it will help to establish the role of EMS in disaster response and help to identify strategies for the improvement of disaster preparedness in Saudi Arabia. First, as a country subject to a wide range of natural and manmade disasters, Saudi Arabia could significantly benefit from an effective EMS system. ²⁻⁷ Military hospitals are always expected to provide adequate EMS to respond to disasters and provide competent and prompt emergency services. Thus, military hospital EMS must have comprehensive disaster plans before disaster occurrence. ^{2,4,7}

Evidence shows that hospitals in Saudi Arabia lack disaster plan to enhance EMS preparedness. ^{2,6,7} Comprehensive disaster plans are an essential element in enhancing a nation's disaster preparedness i.e., the ability of a nation to mitigate, respond, and recover from disaster. ^{1-3,7} The results from this study will enable the development of informed plans and policies for enhancing disaster preparedness of Saudi hospitals. ^{1,4,5} This study will describe disaster plans and identify areas for improvement in Saudi hospitals to facilitate preparedness of EMS in Saudi Arabia. ²

RESEARCH QUESTION

This study will address this question:

What is the level of disaster preparedness of the Riyadh Armed Force Hospital EMS services?

AIM AND OBJECTIVES

The main aim of the study is to determine the level of disaster preparedness of the Riyadh Armed Force Hospital EMS services.

- i. The specific objectives are:
- ii. To describe the level of EMS disaster preparedness
- iii. To identify and describe the communication strategies of the EMS disaster preparedness plan
- iv. To assess the infrastructure and equipment, training and education of the EMS staff
- v. To assess the plan for disaster preparedness command and control, monitoring and evaluation, and response strategies of the EMS
- vi. To assess the adequacy of the disaster and emergency response and post-disaster recovery plan for the EMS

STUDY METHODOLOGY

Study Design

The study design will be a cross-sectional, descriptive study. This will involve the description of the characteristics and state of preparedness of the ambulance vehicles and EMS staff at Riyadh Armed Force Hospital, in Saudi Arabia. 9

Thereafter, the researcher will use a modified checklist to enable a systematic description of the preparedness of the EMS ambulance vehicles and staff at the military hospital.

Study Setting and Population

Riyadh Armed Force Hospital (RAFH) in Saudi Arabia will be the primary study site. RAFH is one of many military hospitals in Riyadh, the capital city of Saudi Arabia. RAFH was selected due to its heavily populated urban setting and vulnerability to numerous disasters that can result in mass casualties. The hospital has an emergency centre that functions 24/7 and regularly provides emergency and ambulance services during disasters. Given its setting and involvement in disaster response, RAFH is an ideal site for the assessment of EMS disaster preparedness and response.

Sample Size

The sample will include 12 ambulance vehicles and 20 EMS staff at the military hospital. This is an adequate sample size for a single-centre cross-sectional descriptive study due to the restricted number of ambulance vehicles and EMS staff. ¹⁰

Sampling methods

The ambulance vehicles and EMS staff will be selected through a convenience sampling strategy. Convenience sampling was chosen for its ease and enough data generation given limited time constraints. ^{9,10} Given that the sample is from a single hospital, the selected sample (ambulance vehicles and EMS staff) will have invariable qualities throughout the military hospital. ^{9,10} Thus, the convenience sampling approach will enable the detection of relationships among different phenomena that impact EMS preparedness in the military hospital. Additionally, convenience sampling enables the generalization of the information concerning the EMS preparedness of the military hospital. ^{9,10}

Recruitment and enrolment

The researcher will recruit participants within the military hospital. The researcher will approach potential EMS staff present on duty who are not engaged in any activity during the study. The researcher will provide the potential participant with an introductory letter (Appendix II) describing the intent and purpose of the study followed by a consent form (Appendix III). The researcher will review all aspects of the study and informed consent before asking the participant to sign to indicate a voluntary agreement to participate in the study. ^{9,10} Thereafter, the researcher will arrange for a convenient time and place to meet the participant.

Data Collection and Management

A modified hospital emergency checklist customized for EMS (see appendix I) will be used as the data collection tool. ¹¹ The checklist consists of 11 key components:

General consideration; command and control; communications; safety and security; key area selections; key staff selections and staff tasking; infrastructure and equipment; training and education; monitoring and evaluation; response; and post-disaster recovery.

The response or observation of the items in the checklist will have a restricted response of 'Yes' or 'No'. The researcher will also have the opportunity to document 'comments' against each checklist item whenever necessary. The use of the checklist will enable the researcher to identify major components of the EMS disaster plan and compare them with existing EMS emergency

and disaster preparedness checklists. This will provide the researcher with adequate insight into the extent of preparedness of the military hospital's EMS.

Data Analysis

All data will be cleaned, sorted, and stored in Microsoft Excel. The 'Yes' response for the checklist items will be score 1, while the 'No' response will be scored 0 for quantitative review. The derived quantitative data will be coded and analysed using descriptive statistics with Microsoft Excel and Statistical Package for Social Sciences (SPSS).

Ethical Considerations

This study will adhere to all applicable ethical considerations. First, the researcher will seek ethical approval from the University of Cape Town Human Research Ethics Committee to proceed with the study. Secondly, the researcher will seek permission to research military hospital management. Thirdly, the researcher will only interview those who voluntarily agree to sign a consent form. The researcher will provide all participants with adequate information to achieve well-informed and entirely voluntary consent. Participants will not be coerced or compelled to participate in the study. The researcher will not use the data collected for personal gain or benefit.

The hospital management will receive a copy of the final project publication to identify various recommended strategies for the improvement of EMS disaster preparedness at the military hospital. The study will not expose participants to any significant risks, including psychological, emotional, or physical. All information provided by the participants will be handled with privacy and confidentiality. The participants will not be required to provide their names, identifiable information, or contact details during the study to ensure anonymity, privacy, and confidentiality of the information they will provide.

Limitations

The key limitations of the study will be methodological. As a cross-sectional descriptive study lacking a case-control approach, avoidance of confounding variables will be limited. The small sample size will limit the validity and statistical robustness of the findings and the generalisability of the findings. The generalisability of the findings will also be restricted given its single site setting. The use of convenience sampling will limit the randomization of the sample, which will risk the underrepresentation of subgroups, and will not provide enough power for subgroup analysis.^{9,10}

APPENDIX 3: TIME FRAME

This study will be conducted for ten months (*see figure 1*).

Activity	Jan	Feb-Mar	Apr-May	Jun-Jul	Aug-Sep	Oct
Compilation of the proposal						
Gain permission and approval						
Data collection						
Data analysis						
Compilation of the final project						

Figure 1: time frame

APPENDIX 4: BUDGET

This study will cost approximately R 24500 and will be self-funded (*see table 1*).

Table 1: Budget

Items/Activities	Quantities	Total cost (ZAR)
Stationery and printing		1000
Travel and logistics	1 return air ticket and 2 visits to the military hospital	20000
Communication	Airtime purchase for telephone calls	500
Printing and Photocopying	Proposal (6 copies) Data collection tool (30 checklist) Final drafts 10 copies of final drafts	1000
Miscellaneous		2000
Total		24500

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APPENDIX 3: LOCAL HREC REF: 1401



UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee



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Observatory 7925
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Website: www.health.uct.ac.za/fhs/research/humanethics/forms

18 March 2020

HREC REF:073/2020

Prof L Wallis

Division of Emergency Medicine
c/o Ms Vathiswa Mzamo
F-51 OMB

Dear Prof Wallis

PROJECT TITLE: EMERGENCY UNIT AND DISASTER PREPAREDNESS: A STUDY OF MILITARY HOSPITALS IN SAUDI ARABIA (MPHIL DEGREE - MR YASIR ALOTAIBI)

Thank you for your response addressing the issues raised by the Faculty of Health Sciences Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 March 2021.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.

(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

The HREC acknowledge that the student: Mr Yasir Alotaibi will also be involved in this study.

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

Yours sincerely

PROFESSOR M BLOCKMAN

CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938
NHREC-registration number: REC-210208-007

HREC 073/2020sa

This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use: Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines. The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.