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Disaster medicine curriculum for undergraduate medical schools in KSA



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Table of contents

ABSTRACT.....	1
INTRODUCTION	4
AIMS & SIGNIFICANCE OF THE STUDY.....	6
LITERATURE REVIEW.....	7
History of disaster medicine in a nut shell	7
Disaster medicine in current times	7
The need for disaster medicine curricula in medical schools.....	9
General characteristics of existing disaster medicine curricula.....	10
North America.....	10
Europe.....	13
Developing countries outside the Middle East.....	15
Middle Eastern Countries.....	16
Participation of medical students in the disaster response	17
The Saudi Arabian context.....	20
Disasters in Saudi Arabia.....	20
Medical schools in Saudi Arabia	21
Training health care students in disaster preparedness	22
Chapter 1: Disaster Medicine Curricula in Saudi Arabian Medical Schools	25
Chapter 2: Proposal for a community-based disaster management curriculum for medical school undergraduates in Saudi Arabia	41
Chapter 3: Evaluation of a new community-based curriculum in disaster medicine for undergraduates.....	49
OVERALL CONCLUSIONS	62
REFERENCES	63
Appendix 1: Case studies used in the curriculum	69
Community Education for Environmental Mitigation Measures.....	69
1. Hygiene promotion for school children in Turkey.....	69
2. Severe dehydration in children under 5 in refugee camps in Syria	70
3. Proper preparation and disposal of cholera patients bodies in Egypt	71
Principles of disaster management for different health sectors	73
1. Case study: Jeddah floods 2009.....	73
Appendix 2: Pre-test	83
Appendix 3: Post-test.....	87
Appendix 4: Form for evaluation of course by students	91

ABSTRACT



ABSTRACT

Background: Disaster medicine education in medical school is important for disaster preparedness. In response to the many major natural and technological disasters over the previous decades and the rising number and intensity of terrorist acts, many medical schools have incorporated disaster medicine curricula in their undergraduate studies. The aim of this study was to develop and evaluate a community-based curriculum in disaster medicine for medical students in Saudi Arabia.

Methods: An online survey was used to collect background information from all 30 medical schools in Saudi Arabia. The survey asked about the characteristics of disaster medicine education at the schools, the reasons for not including such training, and the willingness to incorporate it. Based on the results of the survey and the published literature, a curriculum was developed by using a structured five-step approach. The objectives and content of the curriculum were established in collaboration with Saudi Arabian and international experts in disaster medicine. The curriculum also aims to equip medical students with the teaching skills needed to promote disaster preparedness in their local communities. Learning strategies were selected in order to maximize participation and retention. The efficacy of the curriculum was evaluated on 14 female and 15 male students in their fourth, fifth or sixth year at Jazan University Medical School, Saudi Arabia. The course was held at the Research Center in Emergency and Disaster Medicine and Computer Sciences Applied to the Medical Practice (CREMIDEM) in Novara, Italy. It was evaluated by administering a test before the course and another after it. Moreover, the students gave feedback by filling out a questionnaire on the last day of the course.

Results: Twenty of the thirty medical schools responded (response rate 67%). Only three of the responding universities had disaster medicine programs, involving an average of three hours per year. Most medical schools indicated a willingness to implement disaster medicine training in undergraduate studies, but they cited lack of an adequate number of relevant professionals as a major impediment. Respondents without a disaster medicine curriculum indicated that they favored a mandatory, accredited, complementary course in the final three years of the six-year program, and most of them preferred a blended teaching approach. A

curriculum was designed by structuring it within five domains of disaster medicine. It was designed for two weeks of classroom activities followed by eight weeks of e-learning. The curriculum introduces core principles in three areas: emergency medicine, public health, and disaster management. Simulations, experiential activities, case-studies and role-playing are used to enhance learning. The curriculum also components about the adult learning process to enable students to design their own community-based training sessions in disaster preparedness. When the pilot course was held, the mean score on the pre-test was 41.0% and it increased significantly to 67.7% on the post-test (Wilcoxon test for paired samples: $z = 4.71$, $p < 0.0001$). There were no significant differences in the mean scores between males and females, or between students in their fourth, fifth or sixth year of medical school

Conclusions: The course was effective in teaching disaster medicine to undergraduate medical students. Graduates of this program would be able to improve disaster preparedness in Saudi Arabia by increasing surge capacity and by enabling participants to conduct their own community-based disaster preparedness training sessions.

INTRODUCTION

Disaster management is a multidisciplinary effort, and so is preparedness. At times of disaster all doctors are called on to participate, and familiarizing medical students with disaster medicine should enable them to work in a more coordinated and effective way during the extraordinary times of disaster.

Disaster management has been traditionally a postgraduate form of training. But gaps in undergraduate and postgraduate disaster medicine education have been noted worldwide.¹⁻⁶ Consequently, several governmental and educational authorities have acknowledged the importance of undergraduate disaster medicine education.⁷⁻⁹ The Association of American Medical Colleges has recommended the inclusion of disaster response training in the medical student curriculum, and the American Medical Association has affirmed its support for the involvement of medical students in the disaster response in ways that are appropriate for their skills.^{8,9} According to a report, Germany enacted a federal law in 2002 dictating that all medical students be familiarized with the basics of disaster medicine.¹⁰ Several medical schools and professional organizations have developed curricula specifying the competencies required in the education of all physicians.^{1,6,10-18} Nevertheless, medical students are to a large extent not adequately prepared for dealing with disasters, though they are generally willing to participate in disaster response.^{2,8,19-24}

There is not much information about disaster medicine education in the Middle East region. A paper published in 2013 reported a series of postgraduate educational programs initiated in Iran on the health care response to natural and technological disasters. However, the paper does not mention any undergraduate training in disaster medicine.²⁵ In recent years, a few Saudi Arabian universities initiated disaster medicine education, usually as short-term courses. But to the best of our knowledge, there are no published reports on disaster training in Saudi Arabian medical schools.

Search of the literature showed that no curriculum designed specifically for the needs of Middle Eastern medical students has been published.^{12,18,26-28} But many sets of core competencies and curricula in disaster medicine have been published,^{1,10,12-15,17,18,26,29} and two levels of disaster medicine training have been proposed: undergraduate and post-

graduate. During the undergraduate stage, students are taught the essential concepts of public health, emergency management, and risk assessment. At the post-graduate level, multi-disciplinary specialist training covers the totality of disaster medicine in-depth.³⁰

To design and implement a disaster medicine education program for undergraduates, one has to first understand the current state of disaster medicine education in the target community. Disaster medicine curricula should be contextualized to the local environmental and socioeconomic milieu.³⁰ On the other hand, because crises can span geographic and political regions, disaster medicine training should also be consistent with international standards.³¹

AIMS & SIGNIFICANCE OF THE STUDY

The aim of this study was to develop and evaluate a disaster medicine course for undergraduates in Saudi Arabian medical schools that meets international standards yet takes into consideration the local context. To achieve that aim, the following sequential, specific objectives were set:

- To understand the pattern of disaster medicine education in Saudi Arabian medical schools;
- To develop a disaster medicine training course for medical students in Saudi Arabia with content and text material supported and accepted by experts;
- To assess the learning effectiveness of the proposed disaster medicine course.

The findings of this research will be made available to the decision makers in the Ministry of Health, Ministry of Higher Education and medical schools as well as to other stakeholders in Saudi Arabia with the aim of prompting them to introduce disaster preparedness programs in medical schools in the country. The findings will also help these parties to implement a curriculum that provides future doctors with the basic skills and knowledge that can be used to develop community awareness and to train individuals who are actively working in institutions such as schools, universities and institutes for special needs. Well-trained and highly skilled medical students can provide valuable help during and after disasters. The curriculum proposed in this thesis would serve as a model for medical schools in Saudi Arabia and in other parts of the Middle East.

LITERATURE REVIEW

HISTORY OF DISASTER MEDICINE IN A NUT SHELL

The Black Plague of the Middle Ages was one of the biggest disasters in human history: it has been estimated that between 30% and 60% of Europe's population perished.³² Due to the severity and dynamics of the disease, and the very high mortality rate, people had to cooperate and to develop groups to deal with the isolation of infected individuals and disposal of corpses. Later, the Great Fire of London in 1666 set in motion a series of changes that eventually led to the establishment of the London Fire Engine Establishment in 1833.³³ However, the beginning of modern disaster medicine is associated with a Swiss man named Jean Henry Dunant.³⁴ After witnessing the suffering of the wounded in the aftermath of the huge battle of Solferino in Italy in 1859, he wrote a book named *A Memory of Solferino* in 1862. In the third part of the book he described his vision of the establishment of relief societies to provide care for those wounded in war. The modern organized response to disasters started one year later with the establishment of the International Red Cross. This was followed in 1864 by the signing of the Geneva Convention for the Amelioration of the Condition of the Wounded and Sick of Armies in the Field.³³ For his work, Dunant shared the first Nobel Peace Prize with Frédéric Passy in 1901.

In the last 50 years disaster medicine has become a separate scientific discipline through research and education efforts. In Europe, the first chair in disaster medicine was established in Linköpings, Sweden, and the first center in the world dedicated to research and education on the socio-behavioral aspects of disasters was established in the United States in 1963. Research has been focusing on "the chain of medical care" and the factors that enhance a synchronized response.³³

DISASTER MEDICINE IN CURRENT TIMES

Disaster is the result of a breakdown in the relations between man and his environment on such a large scale that the affected community needs extraordinary efforts to deal with it, and this often requires outside help or international aid.³⁵ Disasters are divided primarily into natural disasters and man-made disasters. Natural disasters include floods, tsunamis, earthquakes, landslides, and widespread infectious outbreaks. Man-made disasters include

armed conflict and terrorist attacks. “Technological disasters” is a term used to denote incidents such as nuclear plant accidents, chemical factory explosions, and train derailments.

The many recent catastrophic disasters, whether they are environmental catastrophes, infectious outbreaks, violent conflicts or terrorist attacks, have focused attention on disaster medicine. All health systems must be prepared to deal with such mass-casualty events. Fundamental to this preparation is the availability of trained health care professionals to manage the organizational, administrative and clinical aspects of the disaster response.^{12,29}

Disaster medicine is the science of analysis and development of methodology needed to handle situations in which the available resources are insufficient in relation to the immediate need of medical care.³⁶ This shortage is a hallmark of disaster situations. Disaster medicine seeks to mitigate the effects of disasters by dealing with the immediate response to them and the rehabilitation of those affected by them. This is done through collaboration with a wide variety of other health disciplines, including epidemiology, emergency surgery, communicable diseases, nutrition, public health, social medicine, community care, and international health.³⁵

The most obvious impact on the health of a population affected by a disaster is manifested in deaths, injuries and psychological stress attributed directly to the disaster.³⁷ Disasters are most critical events even for health workers, and responses to disasters have not always been successful. Poor communication, confused management and inadequate patient flow usually characterize health medical services, and with the limited resources medical care is inadequate.³⁸ Analysis of case studies of different disasters shows that the learning process plays a significant role in the context of crisis management. Many negative effects on health care systems are the result of an inadequate or ineffective learning process.³⁹

Health care professionals are faced by serious challenges in managing the health consequences of disasters. Medical and public health communities have been focusing even more on emergency preparedness, response and management due to heightened awareness and the reality that natural disasters, human systems failures, and conflict-based disasters are becoming more frequent worldwide.

An effective disaster medical response requires a well-planned and coordinated effort involving many trained and experienced professionals who can apply specialized knowledge and skills in critical situations.²⁹ Educational efforts are being invested in emergency medicine and family medicine to further develop capacities in disaster medicine.¹³ However, the current level of knowledge of disaster medicine among medical students and health professionals is not sufficient.²³

THE NEED FOR DISASTER MEDICINE CURRICULA IN MEDICAL SCHOOLS

In the early phase of the response to disasters, public services and health care systems become severely overwhelmed. This leads to disruption of services and difficulties in coordinating and managing the disaster response. At such a critical time, all available health workers are expected to participate in managing and controlling the situation. All physicians, regardless of their specialties, should be able to assist within their communities until regional, national or international aid arrives. Therefore, medical practitioners should have previous training and experience in the management of mass casualties in order to function effectively within their communities.^{18,40,41}

According to Chen,⁴² the major challenges facing the health care workforce during public health emergencies are health worker shortages, imbalance in the mix of relevant professional skills, misdistribution, negative work environment, and weak knowledge base.⁴³ In developing countries, the gaps and weaknesses that already exist in the health system are aggravated during public health emergencies.

The skills and knowledge required for an effective response to disasters depends on the type of disaster and the specifics of the situation. Most physicians and medical students do participate in the disaster response without prior training, and consequently they obtain real-life experience.⁴¹ But the basic knowledge and skills in disaster management can be provided for medical students during their academic years.⁴¹ The inclusion of components of disaster response training in medical curricula is recommended in order to prepare future physicians for potential disasters.⁴¹

Disaster medicine education differs in important ways from other topics taught in the medical curriculum because it focuses on taking preventive and preparatory measures and on the

use of innovative approaches to solving disaster challenges.⁴⁴ Medical schools also need to introduce students to medical, administrative and logistic aspects of disaster management, which will help them to understand the complexity of the system and how to function within it.^{18,40}

Many governmental agencies and other institutions, including medical schools, have established programs for fostering and strengthening disaster management training.²⁰ However, there are not enough published data clearly demonstrating the effectiveness of these programs in improving the knowledge, skills and attitudes of the target groups.²⁰ The training programs lack clarity, objectivity, competency-achieving goals, scientific accuracy, and validation.^{12,45}

GENERAL CHARACTERISTICS OF EXISTING DISASTER MEDICINE CURRICULA

North America

Inadequacy of disaster medicine training in medical schools can be found even at top universities. According to Cole et al.,⁴⁶ the Emergency Medicine Grand Rounds schedule for New York Presbyterian Hospital, which belongs to both Columbia University and Cornell University, had been showing only one presentation per year on blast injuries and one on toxicology since 2006. Also in New York, the website of the Department of Emergency Medicine at the Mount Sinai Hospital cites one talk about disaster surge capacity given back in 2009, but there is little else on terror or disaster medicine. Another example of such deficits is found in the 67 Grand Rounds that took place between September 2011 and June 2013 at the Department of Medicine of New York University's Langone School of Medicine: only one topic related to disaster medicine was included.⁴⁶ Even the long established disaster medicine programs were being taught at less than one-third of the medical schools.⁴⁶ But the 9/11 disaster was a wake-up call, and medical schools in the United States started developing programs of disaster medicine, mainly for practicing physicians, not for trainees.⁴⁶⁻⁴⁸ Nevertheless, it is noteworthy that in Canada, the number of programs of disaster medicine in medical schools has been reduced by 37% after 9/11.⁷

It is difficult to determine how individual medical schools educate and train their students for disaster in the United States because the medical schools have considerable flexibility in

designing their preclinical and clinical curricula. Examining the curricula of some medical schools can provide a view of practices at the local level.⁴⁶ Between 2003 and 2005, medical schools in the United States focused mainly on bioterrorism in their disaster medicine curricula, possibly because most of the events happening at that time were related to anthrax attacks and pandemic outbreaks. Such pathologies are probably also included in microbiology lectures during the preclinical phase or in internal medicine subjects during the clinical phase.⁴⁹ Some curricula also teach other subjects, such as threats from chemical agents or chemical terrorism.¹⁷ Most of the courses are mandatory and last four to five days. The education strategy adopts a combination of lectures, role playing and simulation.⁵⁰ Some of the schools developed curricula integrating the programs at four levels corresponding to the academic years. In that way, the students gain knowledge and develop skills progressively from the basic principles to the more complex skills required to achieve the final goals.⁵¹ One school that implemented such a disaster medicine curriculum is New York University College of Dentistry (NYUCD), and assessment of the curriculum indicated a very positive response among the students graduating in 2005.⁵² Another example is the curriculum related to bioterrorism taught at the College of Medicine of the Texas A&M University System Health Science Center. This course was reported to be effective in increasing disaster knowledge.^{17,50}

In 2003, the American Medical Association, in collaboration with four major medical centers and three national health organizations, established the National Disaster Life Support (NDLS) program. The NDLS courses stress a comprehensive all-hazards approach to helping physicians and other health professionals to deal with catastrophic emergencies ranging from terrorist acts to explosions, fires and natural disasters.⁵³ The NDLS program consists of three levels of education increasing in complexity in the successive academic years. NYUCD allowed its students in the top level of training in dealing with the effects of bioterrorism (d4) to participate in the first level of the NDLS program (core disaster life support). About 320 of NYUCD's senior students who graduated in 2005 had completed the core disaster life support course.⁵² This course is four hours long and is designed for all health workers, including mental health workers, planners and public health responders to incidents involving weapons of mass destruction.

However, from the point of view of providing training in disaster medicine to medical students in general, the NDLS program has three disadvantages. First, it targets those for whom disaster management is the primary responsibility. Second, the courses cannot meet the goals and objectives of disaster education for students in medical schools. Third, it is not possible to accommodate all enrolled medical students in the NDLS program.¹⁸

By the end of 2005, medical school educators began focusing more on other disaster related topics besides bioterrorism, such as mass casualties and triage, incident command system, bombing and blast injuries, radiological and chemical terrorism, the role of emergency agencies during disaster, and personal safety. While some of these courses concentrated on only one theme, such as triage, others presented introductory seminars for basic knowledge and skills needed in disaster medicine. These programs were 1–2 weeks long. Depending on the topics, competences and performance objectives, they were aimed at students either in their first year of medical schools or in their fourth year.^{40,45}

In 2005, students in their fourth year of medical school at the University of California Los Angeles received four hours of introductory seminars on disaster medicine, followed by participation as observers in hospital disaster drills for two days. Despite the short duration of the seminars, there was a positive impact on the students' attitudes and knowledge, and they were able to recognize and diagnose the problems occurring during drills.⁴⁰

In 2006, Kaji et al. developed an elective disaster medicine course of two weeks for medical students in their fourth year. Only six students participated in this course. All of them were able to answer the oral exam questions with grades > 90%, and all of them received high grades in their final presentation.¹⁸ However, six students is a rather small sample for such a study, and there seems to be nothing in the literature showing that this course was conducted for other students.

Most of the courses developed between 2007 and 2009 were of short duration (commonly four hours for one day). Some of the programs targeted first-year medical students with the aim of involving them as volunteers charged with special tasks such as patient transportation or primary triage.⁵⁴ On the other hand, other courses were aimed at medical students in their fourth year to enable them to participate with competency in disaster management during disasters. It was reported that most of these courses led to improvement, as shown by the

posttest,⁴⁵ but it seems that no provisions were made to conduct refreshment courses to enable participants to retain the competences and to periodically assess the gained knowledge and skills.¹⁰

In Canada, an inter-professional disaster/emergency management program was conducted from 2007 to 2008 for undergraduate students at institutions for nursing, medicine, paramedics, police, media, and health administration. The course lasted for eight weeks and was conducted online. It required three hours of work per week augmented with a live disaster simulation drill. The students participated in the simulation by playing the role of student practitioners assisting the professionals, victims or family members. The pre-test and post-test demonstrated that the students made statistically significant gains in all competencies.⁵⁵

Europe

In 2012, Djalali et al.⁵⁶ assessed the health system capacity for crisis management (including teaching and education) in 27 European Union countries. The study showed that education and training in crisis management was lacking in both undergraduate and postgraduate programs.

In 2010, Pfenninger et al. reported the development of a disaster medicine curriculum for students in their fourth year of medical school. The proposed approach was based on general and targeted needs assessment, definition of goals and objectives, choice of educational methods, and pilot implementation and evaluation.⁵⁷ The core contents were developed by experts from professional and governmental sectors, with input from the existing disaster medicine training programs, scientific evidence, and expertise-based proposals from international disaster medicine organizations. The course was designed to be obligatory and consists of 14 modules composed of units of two hours each. A blended learning teaching strategy was used, but no e-learning was included. The curriculum was implemented in nine medical schools in Germany, and evaluation of the success of this curriculum was planned to take place between 2007 and 2011.¹⁰ However, a search of the literature did not reveal that the evaluation was published.

In Italy, two institutes teach disaster medicine using different approaches and different core

contents. One is the Research Center in Emergency and Disaster Medicine (CRIMEDIM) in Italy⁵⁸ and the other is at the Medical School of the University of Florence in Italy. CRIMEDIM is associated with the Università degli Studi del Piemonte Orientale “Amadeo Avogadro,” in Novara and teaches disaster medicine in collaboration with Segetariato Italiano Studenti in Medicina (SISM). The latter is the largest academic association for medical students in Italy and is present in 37 of the 40 universities. The CRIMEDIM program encompasses seven modules intended for the last three years of medical school. It consists of elective didactic activities for one month using e-learning and a residency workshop of one and a half days, giving a total of 35 hours of didactic activities. The level of training was set at the second level described by the World Association for Disaster and Emergency Medicine (WADEM).⁵⁹ The program teaches the core knowledge and skills of disaster health management based on the three disciplines of the international standard for disaster medicine education defined by WADEM: clinical and psychosocial aspects, public health, and emergency and risk management. The teaching strategy uses a web-based platform and employs blended learning in classroom sessions and computerized simulation. From January 2011 through May 2013, the course was delivered at 21 different medical schools, with a total of 524 students attending the course. The students’ knowledge of disaster medicine and basic competencies in performing mass-casualty triage were significantly increased after attending the course.¹⁶

The disaster medicine curriculum at the Medical School of the University of Florence is focused mainly on in-hospital disaster response and rescue.⁶⁰ The training program is based on peer education, and its didactic activities cover four sessions of four hours each. Medical students in their third to sixth academic year are allowed to enroll in this elective course. The course, which was first implemented in 2008, is composed of three main parts: a medical part for triage and basic life support, a psychological part for developing the skills required for communication with victims, and the third part is technical and related to engineering aspects, such as evacuation and basic fire-fighting techniques.

Initially, the trainers constituted a multidisciplinary group composed of physicians, engineers and psychologists. After the first time the course was held, some of the participants chose to become trainers themselves, but they first had to serve as co-trainers. However, some parts

of the course, such as the psychological approach to casualties and the technical topics, are only held by or taught under the supervision of a professional in the area because of the strong expertise required for these themes. The peer technique used for teaching disaster medicine in this course demonstrated its effectiveness in improving the students' knowledge and in providing students with new behavioral and technical skills.⁶⁰

In Belgium, only two universities provide training in disaster medicine. Training is limited to introductory material given during two hours of the emergency medicine courses.⁶¹ In the Netherlands, until 2015 there has been no national or European disaster management curriculum ready for implementation in medical schools.⁴⁹

Developing countries outside the Middle East

Most of the research about different aspects of disaster medicine has been done in developed countries. There is little information about the disaster medicine discipline in countries of low or middle income.^{33,62-65}

In China, disaster medicine education is included in neither undergraduate nor postgraduate curricula of medical schools.²² Disaster medicine management research is in its infancy, and most studies are published in the national language, making it largely inaccessible to the scientific community at large. Moreover, there are deficiencies in the scientific rigor of the studies in terms of design and data.⁶⁶

Chinese medical schools have two approaches for teaching medicine. One of them concentrates on public health while the other concentrates on clinical practice. The outbreak of severe acute respiratory syndrome (SARS) in 2003 led to a realization of the importance of public health preparedness, including emergency and disaster preparedness. Consequently, the medical schools concentrating on public health restructured their curricula to include disaster preparedness. This explains why knowledge of disaster medicine was found to be greater among students in medical schools focusing on public health than in those that are more clinically oriented.²²

In India and Pakistan, most medical schools do not incorporate the principles of disaster medicine.^{5,67}

Nothing much could be retrieved from the literature about disaster medicine education in Malaysian medical schools. A post on the web site of Monash University highlighted an award winning presentation at an international conference of a study done by students. The study assessed student knowledge of disaster medicine and concluded that more emphasis should be placed on educating and training medical students to deal with disasters.⁶⁸ In a post on Research Gate in 2015,⁶⁹ Saiboon stated that he had done a study on 34 Malaysian medical schools and found that disaster medicine was included in only four schools. In 2007 Ahmad⁷⁰ called on Malaysian universities to play important roles during all phases of the disaster response by educating their faculties and conducting research on disaster medicine and community awareness programs. In a 2011 study performed by the above-mentioned Saiboon,⁷¹ 45 undergraduates in their fifth year at the medical school of National University of Malaysia (Universiti Kebangsaan Malaysia) received one day of simulation-based training in the basic principles of disaster medicine as part of their education in emergency medicine. The students were given a 90-minute concepts lecture on disaster risk management followed by a 3-hour practical session on radio communication, field triage, and transport of injured victims. The students were evaluated by a pre-test and a post-test, and the results showed significant improvements in their comprehension of the principles of major incidents management and in their confidence.

Middle Eastern Countries

There are no clear data about the inclusion of disaster medicine in medical school curricula in Middle Eastern countries. Most of the training and education programs in disaster medicine are directed to post-graduate health care students.⁷²

Israel is one of the leaders in disaster medicine education. There is a high degree of military and civilian coordination in both training and response,⁷³ but not a lot could be found on disaster medicine education for undergraduates in Israel. According to a 1977 conference paper,⁷⁴ a program for organization and medical aspects during mass casualties was introduced to senior medical students at Hebrew Medical School in Jerusalem; the course was very much appreciated by the students. The course was extended to all medical schools in Israel. In a response to a question about disaster medicine curricula in medical schools posted on Research Gate in 2015,⁷⁵ Arik Eisenkraft from the medical faculty of Hebrew

University in Jerusalem confirmed this information. He also stated that medical students receive a series of lectures on disaster medicine covering natural disasters, rescue and support delegations, and chemical, biological, radiological and nuclear events (CBRN). From time to time, medical students from other universities attend these lectures but they are not required to attend.

Ardalan et al.²⁵ reported that Iran had established a Master of Public Health with disaster concentration in 2006, a certificate course entitled Disaster Health Management and Risk Reduction in 2008, and a PhD in disaster and emergency health in 2011. These developments were prompted largely by the series of natural disasters Iran had experienced. But the paper does not mention any training during medical school years.

In 2011, the dean of the Saudi Arabian medical school at Al Qassim University called on health and education professionals to develop a strategy that the Middle Eastern countries can adopt in disaster management.⁷⁶ But only a few Saudi universities recently initiated disaster medicine education. For instance, King Abdulaziz University has been providing lectures in disaster medicine after the Jeddah floods in 2009, and Al Qassim and Jazan universities also offer limited curricula in disaster medicine.

PARTICIPATION OF MEDICAL STUDENTS IN THE DISASTER RESPONSE

The participation of medical students in patient care during disasters goes back a long time. Due to the shortage in health care personnel during the influenza pandemic of 1918, medical students in their third or fourth year were given one-hour lectures on influenza before being involved in patient care, in which they acted as nurses or interns.⁷⁷ In the 1950 breakout of poliomyelitis in Europe, 1500 medical and dental students assisted in mechanical ventilation of patients with respiratory failure.⁷⁸ The involvement of medical students in the disaster response has become more obvious in recent times. After the 9/11 attacks on the World Trade Center, medical students carried the information from triage stations to the surgical and resuscitation teams for assessment.⁷⁹ Some of them also participated in relief efforts such as assisting psychiatrists by providing psychiatric first aid to victims and affected families.⁸⁰ In the same year there was an outbreak of H5N1 avian influenza virus in Europe, and the Belgian Royal Medical Academy suggested that senior medical students cover the shortage in general practitioners in frontline pandemic care.^{49,81} In the Chilean earthquake of

2010, medical students participated in the administration of vaccines, provision of medication to patients, treatment of infections, and provision of mental health support to victims.⁸²

The literature indicates that most medical students are willing to assist in the disaster response. A survey done in 2006 assessed the readiness of senior Belgian medical students to support frontline care in an H5N1 pandemic.⁸³ The survey showed that despite their limited knowledge about H5N1, these students had a high level of willingness to participate in medical care of patients with avian influenza during a pandemic. In another survey, senior Dutch medical students were invited to complete an online survey on training and knowledge of disaster medicine. Though their knowledge and estimated capability were limited, they showed a relatively high willingness to respond to various types of disasters ranging from Ebola pandemics to nuclear plant incidents and pandemic influenza.⁸³

However, medical students should have at least basic knowledge and skills and appropriate attitudes that enable them to participate effectively in the response to disasters. Medical students participating in the disaster response following the 2005 Kashmir earthquake and the 9/11 terrorist attack could not provide effective emergency care to the victims because they were totally unprepared to cope with these extreme emotional situations.^{79,80} In the wake of the 2005 Kashmir earthquake, Pakistani medical students participated in the search and rescue operations to provide emergency care, but they faced severe emotional challenges. They also faced medical challenges such as difficulties in prioritizing the medical care to patients because they were working without supervision and had no previous training in disaster management.⁸⁴ While working in hospitals with daily emergencies, students follow the orders of the senior doctors and have all the medications and equipment they need, but the situation is totally different during a disaster. Medical students involved in disaster management and response need to have a clear understanding of their planned tasks and responsibilities in advance.⁸³ Indeed, if the students are not well prepared for important disaster management roles, they can become obstacles in the post-disaster environment. During the 2003 outbreak of severe acute respiratory syndrome in Toronto, medical students were sent home from the University of Toronto medical school because their presence was felt to be unnecessary and stressful for the medical staff dealing with the outbreak.⁸⁵

Medical students are generally aware of the need for disaster medicine training in the medical curriculum. Studies done in Italy and the Netherlands^{81,83} in 2010 and 2013, respectively, showed that most students in the last three years of medical school believe that at least a basic knowledge of disaster medicine is important for their careers, and that disaster medicine education should be a mandatory part of their regular curriculum. In another study, done in the USA in 2005, 43 self-selected fourth-year medical students received a four-hour seminar about disaster medicine followed by a drill on the following day. Analysis showed that the sessions made the students appreciate the importance of incorporating disaster training into the general medical school curriculum.¹⁸

Medical students are not expected to be in the front line of clinical care during disaster situations. Rather, they are needed to provide surge resources within competencies corresponding to their capability. Knowledge and skills alone are sufficient for dealing with some issues arising during disasters, but other issues involve decision making, which is often more difficult, even for health professionals. How medical students can be enabled to contribute effectively to the disaster response can be deduced from the needs of health professionals during disasters. In the Haiti earthquake, physicians faced three important challenges for every patient: sorting of the patient according to urgency, the resources needed for medical care, and the practicality of saving that patient.⁸⁶ Sorting patients according to urgency (triage) can be learned without difficulty. In one study, first-year medical students achieved the same scores as emergency physicians in the triage of patients into not injured, delayed injured, life-threatening or dying categories.⁵⁴ Medical students can triage the patients during disaster, but certified physicians and incident commanders should decide on the type of care needed and on priorities. However, senior medical students who completed surgery and medicine ward clerkships would be able to assist in surgical operations and resuscitation, as well as perform other less specialized work at relief centers, such as providing help in the preparation of food and the delivery of supplies.⁸⁷

Involving medical students in the disaster response has to take into consideration some legal and ethical issues. During the disaster response, medical students practice medicine without being licensed. Medical schools could take the responsibility for medical mistakes made by

their students. This would be similar to the operation of relief organizations, which require certain standards of their relief workers and provide them with legal protection. To avoid legal complications, both victims and students have to be protected, and this can be achieved by allowing the students to work only under supervision during the response to disaster, which will prevent them from exceeding their roles. Providing medical students with exercise and training will help them not only to gain basic knowledge and skills for dealing with patients in stressful environments but will also enable them to understand the demands and limits of their roles in such situations (unpublished⁸⁸).

Students who are not properly prepared and protected can cause dangers to themselves as well. Medical schools cannot take the responsibility for forcing students into situations that expose them to undue risk, such as treating highly contagious patients or working in a scene with chemical hazards, without proper education and training in the use of personal protective equipment and standard operation procedures for specific situations. During the outbreak of SARS in Asia, medical schools were forced to stop or restrict the contact of students with SARS patients because of pressure from the students' families.⁸⁹

Emergency first responders, whether military or civilian personnel, are given priority when it comes to providing protective equipment or vaccines, and medical students who serve as volunteers should also be given such priority.⁸⁹ Because they are still in training and are newly involved in the disaster response, their occupational risk has to be reduced by giving them priority in receiving all types of protection ahead of the qualified individuals in the medical groups.⁹⁰

THE SAUDI ARABIAN CONTEXT

Disasters in Saudi Arabia

The Kingdom of Saudi Arabia covers an area of 2,149,690 km², making it the largest Arab state in Western Asia. It is divided into thirteen provinces and has a population of 28 million, including expatriates.⁹¹ It is a high-income country, with a gross domestic product of US\$ 746.2 billion in 2014.⁹²

Floods have been by far the most important natural disasters in Saudi Arabia. The 2003 Makkah flood and the 2009 Jeddah flood were the most severe, fatal and costly.⁹³ While floods have taken the most notable tolls, the Kingdom of Saudi Arabia must also prepare for human-related disasters. The mass gatherings for Ramadan and Hajj are particularly vulnerable events. This massive influx creates particular strains on public emergency and transportation services, infectious disease control, and food security. During the 2015 Hajj season, at least 717 people were crushed to death and hundreds of others were wounded in a stampede of pilgrims at Mina. This was one of the worst incidents in years to hit the Muslim Hajj season in Saudi Arabia.⁹⁴

In addition, Saudi Arabia faces other threats, such as those caused by unique pathogens, for example the Middle East respiratory syndrome (MERS).⁹⁵ MERS is a viral respiratory disease caused by a novel coronavirus (MERS-CoV) that was first identified in Saudi Arabia in 2012. Most of the cases reported worldwide (714 out of 842 cases) were from the Arab Peninsula region, and the mortality rate was 40%.⁹⁶ Moreover, political unrest in the Middle East heightens the possibility of catastrophe due to violent conflict and/or terrorist attacks.

Previous case-studies of disaster responses in Saudi Arabia have noted a reactive approach and a greater need for the involvement of health professionals, including nurses and medical doctors, in disaster management.^{76,93}

Medical schools in Saudi Arabia

The Saudi Arabian medical schools were founded in two phases. The first phase was started in 1967 when King Saud University in the capital city of Riyadh established the first medical school. In 1975, two medical schools were established in Jeddah (at King Abdul-Aziz University) and in Dammam (at King Faisal University). In 1980, a medical school was started at King Khalid University in the southern region, and in 1996, Umm Al-Qura University Medical College was established.⁹⁷

The second phase in the establishment of medical schools in Saudi Arabia was prompted by statistics published by the Ministry of Health in 2006. Those statistics showed that Saudi nationals constituted less than 20% of the physicians working in the country.⁹⁸ Consequently, more medical schools were established, and by the end of 2008 they became 21. There are currently 30 medical schools (both government and private) in Saudi Arabia.

Eight of the medical schools have community-oriented curricula. Notably, medical schools established during the first phase employed traditional curricula, but in the second phase many changes and innovations were introduced in the medical education programs.⁹⁷

TRAINING HEALTH CARE STUDENTS IN DISASTER PREPAREDNESS

The literature on disaster management has increased quickly in recent years, but the medical specialty societies have made few assessments of their roles in disaster medicine.¹⁴ The available data suggest that health professionals do not feel competent or knowledgeable in this area, although they would like to be.⁹⁹ Current education and training of health workers does not adequately address the unique and complex situations that occur in disasters. Most of these health care professionals are not familiar with topics such as disaster triage, the incident command system, and the special needs of patients exposed to catastrophic events.¹²

According to the literature, efforts to train local physicians began in 2002.³ But a 2007 study on the preparedness for bioterrorism among practicing and retired physicians in Tarrant County (Texas) found that the majority of the physicians had no such training.³ But since September 11, 2001, disaster medicine response education and training has been growing. However, much of it has been developed and taught without recognized standards for validation of the content and performance objectives. In some cases, course designers created the training instructions before determining the competences required in the target audience, which made implantation of the course ineffective.¹²

Although initial work has been done to identify broad-based competencies for all health professionals involved in disaster response,¹² there are currently no consensus on comprehensive, widely recognized requirements for all-hazards disaster medical education and training. To ensure that these health professionals are adequately prepared for disasters and public health emergencies, we need to define the knowledge and skills (psychomotor and mental operations) and attitudes (values) that health professionals need in order to be effective and adequately prepared.^{12,29}

In 2004, the WADEM Education Committee created an international standards framework system for disaster health training and education that can improve the management of

responses during disasters.³⁰ This framework can be thought of as seven educational levels starting from the community level and ending by a higher level of specialty at the doctoral level. The framework is based mainly on the Bradt modules¹⁴ and on three disciplines relevant to disaster health: clinical and psychosocial care, public health, and emergency and risk management, in addition to support and context disciplines. Two levels of disaster medicine training have been proposed: core training and specialist training. Core training is devoted to the essential concepts of public health, emergency management and risk assessment. On the other hand, specialist training is a multi-disciplinary in-depth study of the totality of disaster medicine, and it is conducted at the postgraduate level.³⁰

In 2010 the National Collaborative for Disaster Health Education and Research in Australia developed an educational framework proposing the use of the seven educational levels of the WADEM framework, along with educational outcome and core content according to Bloom's taxonomy. This taxonomy defines the cognitive objectives for each level in sequence from the lowest to the highest: knowledge, comprehension, application, analysis, synthesis and evaluation.^{7,15}

No data could be found that compare the competences and knowledge gained by students from disaster medicine training within each health care discipline. At the same time, no studies could be found comparing the perceived competences with the actual knowledge and whether these competences are suitable for and consistent with disaster preparedness across the various professional health care disciplines.²⁰

Competences have been defined as a set of behaviors that include the knowledge, skills and attitudes that are essential for successful work achievement.¹² Competency statements outline the level of knowledge, skills and attitudes that must be realized to meet the training goal. Competency-based education emphasizes what learners are supposed to do, not just what they should learn. That means it focuses on the knowledge, skills and attitudes that are directly related to the ability to perform a specific task.¹² All previous studies have shown that competence-based education with performance objectives/outcomes is paramount for successful training and effective disaster response.^{12,20,30} At the same time, competency-based education provides a blueprint for the development of all-hazards disaster curricula and training courses to meet the needs of the target audience.¹²

Much of the literature reviewed mentioned several important elements in establishing a curriculum for disaster medicine training for undergraduate and postgraduate students. The most important elements are as follows:

1. Disaster medicine curricula should be designed for a local system. The course contents should be related to the local culture, including culture anthropology, culture geography, and lessons learned from past disasters. At the same time, the courses should be consistent with international standards. However, curricula can be taught in the students' native language or in a language that is commonly used in the country.³⁰
2. Emergency care is often delivered by a team of doctors, nurses and EMS personnel playing unique but interlocking roles. The care delivered by each group is sometimes interdependent on what treatment the other has provided, is providing, or will provide. It is believed that this kind of collaboration builds a stronger basis for training when competencies are cross-referenced. For example, the specific knowledge and skills required to care for crush injury victims are different for EMTs, nurses, and physicians. However, they all must have competency within their specialty to manage crush injury victims.¹²
3. Another important element of curriculum design is to ensure that the instructional strategies used to teach content match the performance objectives and meet the identified training needs.¹²
4. Disaster medicine should be included as a separate subject in its own right in medical school curricula rather than being scattered as parts inserted in other subjects. For example, the topic of smallpox can be taught in microbiology, pharmacy and infectious diseases, but it should also be studied under bioterrorism.²⁰
5. Systematic and formal evaluation of the students and the program is one of the important elements for measuring the curriculum objectives and evaluating whether the program has achieved its goals.^{20,30} Developing refresher courses after each program at defined time intervals for each course is important for continuing professional development.³⁰

Chapter 1: Disaster Medicine Curricula in Saudi Arabian Medical Schools

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Research article

Disaster medicine curricula in Saudi Arabian medical schools

Nidaa Bajow^{1*}, Ahmadreza Djalali², Pier Luigi Ingrassia², Hussein Ageely³, Ibrahim Bani³, Francesco Della Corte²

ABSTRACT

Background: Disaster medicine training in medical school is a key element of disaster preparedness, and several international educational authorities have called for an increase in this specific type of training. The objective of this study was to assess the current state of disaster medicine education in the Kingdom of Saudi Arabia.

Methods: All 30 medical schools in Saudi Arabia were invited to participate in the study, and a 25-item online survey was sent to those that consented.

Results: The response rate was 67%. Only three of the responding 20 universities currently have disaster medicine programs, and they spend an average of three hours per year on the subject. Respondents without disaster medicine curricula indicated that a mandatory, accredited course in the final three years of the six-year program was their preferred method for implementation, and most favored a blended approach.

Conclusions: The study found that there is a paucity of disaster medicine programs in Saudi Arabia. Most schools indicated a willingness to implement such training in their undergraduate programs but cited lack of an adequate number of relevant professionals as a major impediment.

Keywords: disaster medicine, disaster health, medical education

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INTRODUCTION

All modern health systems must be prepared to deal with mass-casualty events, be they environmental catastrophes, infectious outbreaks, or violent conflicts. Fundamental to this preparation is the availability of trained healthcare providers to manage the organizational, administrative and clinical aspects of disaster response.^{1,2}

The many recent catastrophic natural disasters and increased terrorist attacks have focused attention on disaster medicine. Nevertheless, gaps in undergraduate and postgraduate disaster medicine education have been noted worldwide.^{3–8} Consequently, multiple educational authorities have called for improved disaster medicine education. The Association of American Medical Colleges has recommended that disaster response training be an integral part of the medical student curriculum, and the American Medical Association has affirmed that they support skill-appropriate medical student involvement in disaster planning and response.^{9,10} Several medical schools and professional organizations have developed curricula and sets of core competencies geared towards the education of all physicians.^{1,3,11–18} According to a report,¹⁸ in 2002 Germany enacted a federal law that requires all medical students to be familiar with the basics of disaster medicine.

In our region, there is inadequate information on disaster medicine education. A paper published in 2013 reported that Iran, prompted by a long series of natural disasters and technological disasters such as plane crashes and the train blast of 2004, established a Master of Public Health with a focus on disasters in 2006. Additionally, an eleven-day course on Disaster Health Management and Risk Reduction was offered in 2008, and a PhD in disaster and emergency health in 2011, but there was no mention of training during medical school years.¹⁹

The Kingdom of Saudi Arabia is not exempt from natural and man-made disasters, the most common events being floods²⁰ and incidents that affect public health and safety during mass gatherings. Moreover, the Middle East and North Africa continue to be the scene of many devastating man-made disasters. Healthcare delivery personnel, including disaster medicine specialists become overloaded, and doctors of various specialties have to fill in the gaps. Managing disasters is a multidisciplinary effort, and so is preparedness. At times of disaster, all doctors are called on to participate, and familiarizing medical students with disaster medicine should enable them later on to work in a more coordinated and effective way during extraordinary times of disaster.

The published sets of core competencies and curricula in disaster medicine could be adapted to the Saudi Arabian context.^{1–3,11–13,15,17,18,21,22} Two levels of disaster medicine training have been proposed. Core disaster health training captures the most essential concepts germane to public health, emergency management, and risk assessment. Specialist training would be conducted at the postgraduate level as multidisciplinary training examining the totality of disaster medicine in-depth.²³ But implementation of any such training program first requires an understanding of the present state of disaster medicine curricula in the target community. Disaster medicine curricula should be designed for a local system, yet should be consistent with international standards.²³

Despite the substantial risks of disasters in Saudi Arabia, only a few Saudi universities have recently initiated disaster medicine education, usually as short-term courses, and, to the best of our knowledge, there are no published reports on disaster training programs in medical schools. The objective of this study was to assess the state of undergraduate disaster medicine education in the medical schools of Saudi Arabia. The analysis could be a suitable basis for further developing an educational framework for medical students that is compatible with both national and international disaster medicine standards.

METHODS

Survey development

A web-based survey system (Survey Monkey LLC, Palo Alto, California USA) was used to develop and distribute a standardized survey questionnaire. The survey was carried out in the medical schools of Saudi Arabia from January to April 2014.

The questionnaire was developed around a questionnaire piloted and published by the Education Committee of the World Association for Disaster and Emergency Medicine.²³ The questionnaire consisted of 25 multiple-choice and open-ended questions, classified into two main sections. The first section collected demographic information and the second section inquired about the inclusion and extent of disaster medicine education in medical colleges in Saudi Arabia (Appendix 1). The key

topics included were integration of the disaster medicine curriculum, methods of teaching, core competencies of disaster medicine education, and time dedicated to disaster medicine education.

The questionnaire was consensus approved by four experts in the field of medical education and disaster medicine and by three members of academic medical affairs from three different Saudi medical schools. No questions or concerns were raised by the participants and no problems were detected in the design or structure of the questionnaire.

Content design

Core disciplines were extracted from a review of standards and literature on public health, emergency medicine, and disaster/risk management. Support disciplines were defined as those professions playing a role complementary to the core disciplines, such as geography, anthropology, and engineering. Context disciplines were defined as including basic life support, community healthcare, economics, media management, political science, social sciences, and socioeconomic sciences.^{11,23}

Data collection

All 30 medical schools in Saudi Arabia were targeted in this study. Deans of the medical schools were sent invitations to participate in the web-based survey. Those who consented provided the contact information for their academic medical affairs directors, whom we asked to complete the questionnaire. Nonrespondent deans were sent three email reminders. If there was still no response from the dean or the director of medical academic deans, the study lead made a single telephone reminder call. If there was still no response, the participant was considered non-participatory. For nonrespondents, we obtained from other sources three items of information: date on which the medical school was established, whether it is a governmental school, and whether it has a disaster medicine curriculum.

The data were analyzed using Statistical Package for the Social Sciences (SPSS) Version 20 and are presented as descriptive statistics (percentage, mean, frequency, standard deviation). Student's t-test was used to compare mean values and chi-square test to compare frequencies.

The study was approved by the Ethics Committee of Jazan Medical School in Saudi Arabia. Participation was voluntary and all participants were allowed to withdraw from the study at any time. Confidentiality of the data was guaranteed and the results of the survey were kept without any identifying information.

RESULTS

Medical school profiles

Out of the 30 medical schools, 20 responded to the survey (67% response rate). Most respondents (17/20) are government-funded, and the other three are privately funded.

Disaster medicine curricula

Only three of the 20 responding Saudi Arabian medical schools have undergraduate disaster medicine curricula, and these are all government-funded schools. In all three cases, disaster medicine is taught as an accredited complementary course integrated with related subjects such as emergency medicine, surgery or general internal medicine. All three curricula include the preparedness and response phases of the disaster management cycle, use exclusively on-site education to deliver the material, and use lectures as an educational strategy (Fig. 1). The disaster training course is part of the final three years in these schools. An average of 3.3 hours (range 2–6 hours) are dedicated to disaster medicine teaching.

Reasons for not implementing disaster medicine in the curricula

The 17 respondents that do not include disaster medicine in their curricula offered various reasons for not including it. The most frequently cited reason was paucity of available expert educators (70.6% of responses), followed by the curriculum covering mainly medical subjects (58.8%) (Fig. 2). None of the respondents mentioned a lack of financial support as a reason.

Preferred content and delivery

Respondents from the medical schools currently lacking a disaster medicine curriculum believed that emergency medicine (15/17) and public health (14/17) topics should be included in their studies.

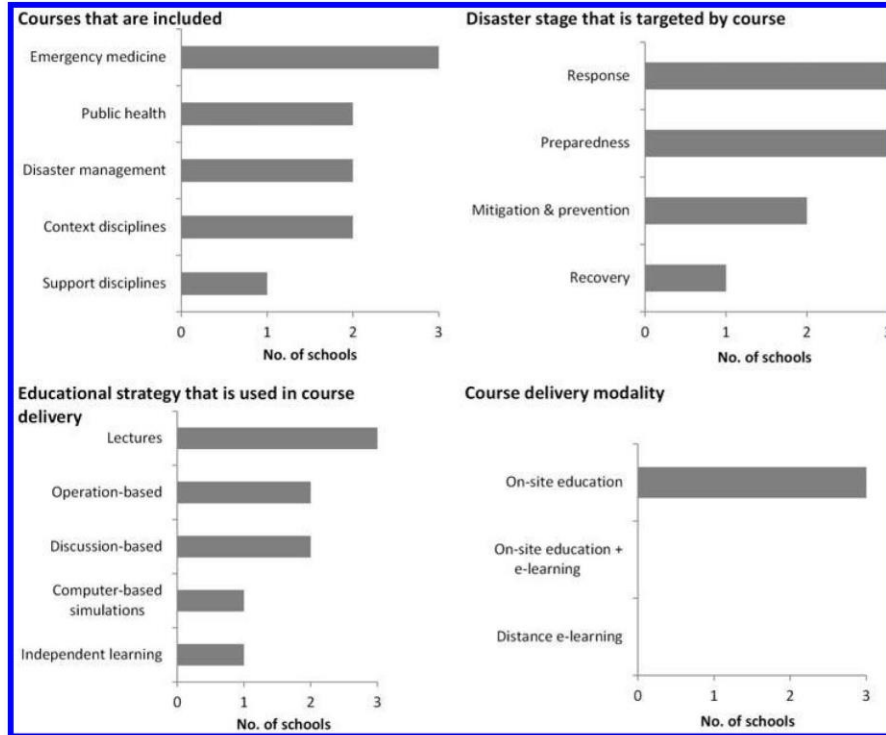


Figure 1. Characteristics of disaster medicine curricula in the three Saudi Arabian medical schools teaching this subject.

The mitigation and prevention cycle was their main interest. Fourteen of seventeen respondents preferred a combination of on-site education and distance e-learning (Fig. 3).

Respondents indicated that an average of 9.0 hours (SD = 6.97 h) should be dedicated to disaster medicine education. Sixteen of the seventeen schools lacking a disaster medicine curriculum stated that they prefer to implement such a curriculum as a complementary course. Thirteen schools preferred disaster medicine to be an accredited, required course. All 17 schools stated that the course should be implemented in the last three years of the six-year course curriculum.

Responders versus non-responders

The limited information we obtained about the non-responders allowed us to compare them with the responders (Table 1). The responding institutions have been in existence for an average of 14.1 years (SD 12.8; range 7(40), whereas the non-responders have existed for an average of 11.6 years (SD 13.7; range 2(40)). The difference between the two groups is not significant by the Student's t-test ($p = 0.3$). We also divided responders and non-responders into categories of <10 years and >10 years old and compared them using Chi-square test. There was no significant difference between responders and non-responders ($p = 0.2$). While 85% (17/20) of the responders had no disaster medicine curriculum, 80% (8/10) of the non-responders also had no such curriculum. Again, this difference is significant. Table 1 also shows that only 5 of the 30 medical schools in Saudi Arabia (17%) have a disaster medicine curriculum.

DISCUSSION

This study demonstrates that most Saudi Arabian medical schools do not engage in disaster medicine education: 83% of the schools in Saudi Arabia do not have a disaster medicine curriculum. However, Saudi Arabia is not unique in its lack of disaster medicine education. Despite the increasing incidence and severity of disasters worldwide, multiple studies confirm either the absence of disaster medicine training programs or a lack of appropriate content within them.^{6,8,24-28} One survey in the United States assessed disaster medicine knowledge and perceived motivation for disaster response among

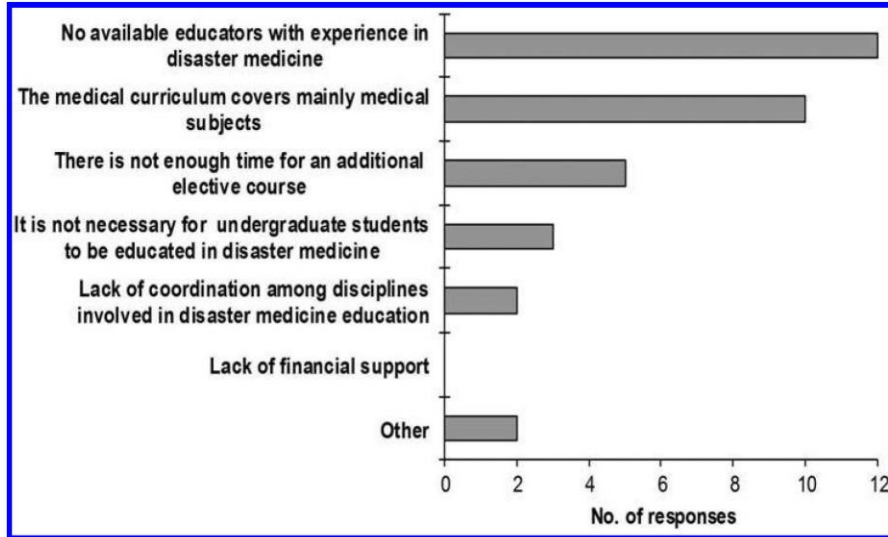


Figure 2. Reasons given for why a disaster medicine curriculum is not implemented.

medical, nursing and dental students. Most of the students (88%) believed that disaster preparedness is an important part of the curriculum, but the majority (85%) had never been present at a disaster. Respondents generally believed that their training does not enable them to perform professionally in a disaster.²⁶ In 2005, 46% of Canadian medical schools did not teach disaster medicine, though 92% of them believed that this material should be core content.²⁵ A Chinese survey of medical students, teachers, clinicians and laypeople concluded that knowledge of disaster medicine was inadequate.²⁹

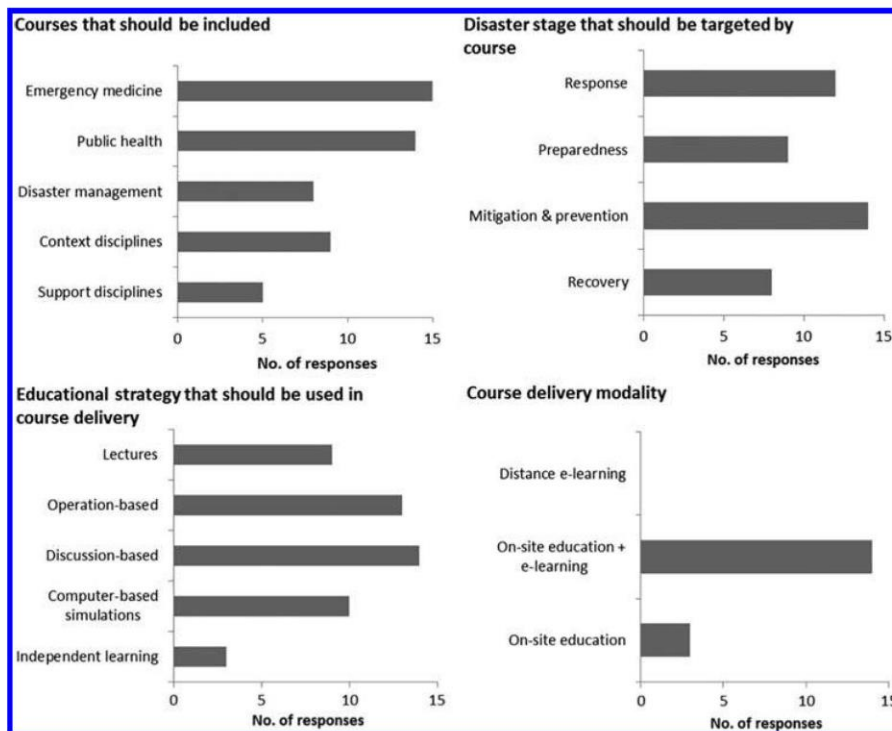


Figure 3. Respondents' views regarding potential disaster medicine curricula.

Table 1. Comparison of responding and non-responding medical schools.

	Responders	Non-responders	Total
Funding*			
Government	17 (85%)	9 (90%)	26 (87%)
Private	3 (15%)	1 (10%)	4 (13%)
Disaster medicine curriculum (DMC)[#]			
Incorporate DMC	3 (15%)	2 (20%)	5 (17%)
Do not incorporate DMC	17 (85%)	8 (80%)	25 (83%)

*[#] No statistically significant difference between responders and non-responders by Chi square test ($p = 0.3$ and 0.7 , respectively).

[#]Based on the five schools for which information could be obtained.

An analysis of the response to the 2006 Kashmir earthquake called for enhanced disaster medicine training of medical students in that region.³⁰

One poll of US medical schools reported that disaster medicine courses utilized lectures (27.5%), group discussions (20.6%), live simulations (20.6%), distance learning (6.8%), computer simulations (3.4%) and web-based self-learning (3.4%). A European survey noted the following breakdown of training tools in their disaster medicine programs: lectures (100%), skill training (88%), drills (79%), full-scale exercises (73%), table-top exercises (61%), functional exercises (61%), and computer-based exercises (13%).³¹

The three current Saudi disaster medicine curricula use a blended approach, and prospective implementers indicated that they would prefer this approach as well. Our results also indicate an interest in using distance education and e-learning methods, which have been effective in other programs.^{23,31} Because the respondents in our study cited the lack of trained educators as an impediment in disaster medicine education, distance/electronic learning could be used to maximize exposure to trained teachers.

The respondents in this survey expressed a willingness to incorporate simulation exercises into teaching disaster medicine in Saudi Arabia. Simulation learning has been used successfully in other areas of emergency medicine, and could play an important role in disaster medicine education as well.¹⁶ Students also prefer simulation-based learning to a lecture-based curriculum.^{13,14}

Regarding specific course content, an international study examining existing disaster medicine programs in 2004 highlighted the prominence of clinical care, public health, and emergency/risk management content.²³ Other studies have generally shown that students are eager for training in most subdomains of disaster medicine.^{10,24–26,29,31} This is concordant with the results of our survey, and supports the inclusion of broad-based and comprehensive content in any disaster medicine curriculum to be developed for Saudi Arabia.

Should disaster medicine be taught in one concentrated effort, or more gradually at multiple points during undergraduate and postgraduate training? Our survey indicates a unanimous preference for teaching disaster medicine in the last three years of a six-year medical program, and a very strong preference for introducing disaster medicine as a complementary course integrated with other related subjects, as opposed to an independent subject.

Implementing an appropriate disaster medicine curriculum can face different challenges. In this survey, unavailability of qualified educators and the perception that disaster medicine lies outside the current educational mandate were the two most frequently cited reasons for lack of disaster medicine education in Saudi Arabia. These concerns have been voiced by other disaster medicine educators around the world. A working group of the World Association for Disaster & Emergency Medicine noted barriers to developing international standards in disaster medicine education that are consistent with our results.²³

LIMITATIONS

One limitation of this study was that one-third of the Saudi medical schools did not respond, creating the potential for non-response bias. The non-responders are most likely future non-implementers, so understanding their unique circumstances would have heightened the clarity of this assessment. Nevertheless, the comparison that we were able to make between responders and non-responders does not point to a clear bias.

A second limitation is that the questionnaire was based on a piloted questionnaire that was proposed but not validated by the Education Committee of the World Association of Disaster and Emergency

Medicine (WADEM).²³ The questionnaire was not validated in the current study, but a consensus was approved by four experts in the field of medical education and disaster medicine and by three members of academic medical affairs from three different Saudi medical schools. No questions or concerns were raised by the participants and no problem was detected.

CONCLUSIONS

Only 15% of the Saudi medical schools covered in this survey teach disaster medicine, spending an average of only three hours on the subject. Implementation of a mandatory, longitudinal, curriculum in disaster medicine could help to move the country towards a more consolidated and organized approach for dealing with catastrophic events. The results of the current study can serve as a platform for developing disaster medicine education within all Saudi medical schools.

Conflicts of interest

The authors declare that they have no conflict of interest to disclose in any way related to this work.

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Assessment for the incorporation of a disaster medicine course within the

University information

***1. Name of your university**

***2. Type of medical school**

Governmental

Non governmental (private)

***3. Number of medical students in your school**

***4. Year of establishment**

Demographic profile for respondents

***5. Age**

***6. Gender**

Male

Female

***7. Qualification level (More than one answer is possible)**

Bachelor degree

Master

Doctorate (board)

Other (specify below)

Other (please specify)

Disaster medicine education

Assessment for the incorporation of a disaster medicine course within the

***8. Is there a disaster medicine education within your medical school curriculum?**

Yes

No

A disaster medicine curriculum is NOT implemented at my university

***9. Please select what are the reasons for the lack of implementation? (It can be more than one answer)**

The medical curriculum covers mainly medical subjects.

There is not enough time for students to be educated in disaster medicine by additional elective course.

It is not necessary for the undergraduate students to be educated in disaster medicine.

Lack of financial support.

Lack of coordination among disciplines involved in disaster health education.

No educators with experience in disaster medicine are available.

***10. If such a course was available, I would like it to be:**

An independent course (taught as a separated subject).

A complementary course (themed approach with main subjects such as emergency medicine, surgery and general medicine).

***11. I would like such a course to be implemented as:**

An accredited required course

A non accredited elective course

***12. I believe that the course should be implemented within:**

The first 3 years of the medical school

The last 3 years of the medical school

Assessment for the incorporation of a disaster medicine course within the

Look at the pictures below:

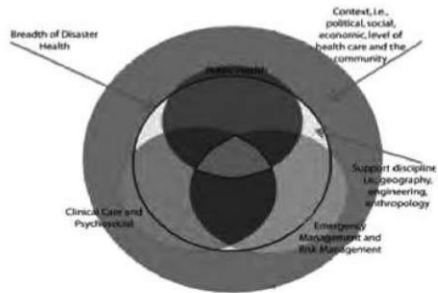


Figure 1—A framework for "Disaster Health" (Beadt et al, 2003)

Markey © 2005 Perioperative and Disaster Medicine

Emergency medicine	pre-hospital triage, tagging, treatment and transport Emergency department triage, stabilization, care and referral Facility-based specialty coordination
Public health:	Environmental health monitoring Hazardous material handling and safety, Relief worker disease surveillance Disease outbreak investigation
Disaster management:	Site security urban search and rescue Incident command and emergency operations centre management, Hazardous materials management, Geographic information systems, Resource mobilization, Public information, Media relations.
Context disciplines includes	Basic life support, community health care economics, media management, political science, social sciences, and socio- economic sciences.
Support disciplines includes	:anthropology, architecture, engineering, ethnology, geography, geology, seismology, and spatial planning

*** 13. About the disaster curriculum, which among the disciplines listed above should in your opinion be included? (More than one response is possible).**

- Emergency medicine
- Public Health
- Disaster management
- Context disciplines includes
- Support disciplines includes

Assessment for the incorporation of a disaster medicine course within the

Look at the following picture:



*** 14. Which stage of the disaster management cycle should be the training course directed to? (More than one response is possible)**

- Mitigation and prevention: to undertake an action aiming at decreasing the likelihood that the event or crisis occurs and, at the same time, to minimize the impact of a disaster on human life losses).
- Preparedness: to design strategies, processes and protocols for response.
- Response: efforts to minimize hazards created by a disaster.
- Recovery: to establish procedures, resources and policies to make people/institutions involved get over.

*** 15. In your opinion, what's the modality the course should be delivered with?**

- On-site education
- Distance e-learning
- Combination of on-site education and distance e-learning.

Assessment for the incorporation of a disaster medicine course within the

Look at the following education and training methods

1. Discussion -based exercise :	Provide a forum for discussing or developing plans, agreements, training and procedures
1.1.Seminar ;	provide concept of idea and presentation
1.2.Workshop :	achieve a specific goal or build product
1.3. Games:	explore decision making process and examine the consequence of this decision
2.Operation – based exercise:	validate plan policies, agreements and procedures clarify the role and responsibilities
2.1 Drill :	validate single operation or function of an agency
2.2 A functional exercise (FE) :	is a single or multi-agency activity designed to evaluate capabilities and multiple functions using simulated response
2.3 A full-scale exercise (FSE)	is a high-stress multi-agency, multi-jurisdictional activity involving actual deployment of resources in a coordinated response, as if a real incident had occurred

***16. Eventually, the course should be delivered through (more than one response is possible)**

- Lectures
- Computer-based simulations
- Discussion-based exercise: seminars,workshop,games
- Operation- based exercise: drill, function exercise, full scale live simulation exercise
- Papers & Books

***17. How many hours do you think should be dedicated to the course in disaster medicine during the academic year?**

A disaster medicine curriculum is implemented at my university

***18. The course provided by your university is:**

- An independent course (taught as a separated subject)
- A complementary course (themed approach with main subjects such as emergency medicine, surgery and general medicine)

***19. This course has been implemented as:**

- An accredited required course
- A non accredited elective course

Assessment for the incorporation of a disaster medicine course within the

***20. The disaster medicine curriculum has been implemented for the time period of:**

- First 3 years medical school
- Last 3 years medical school

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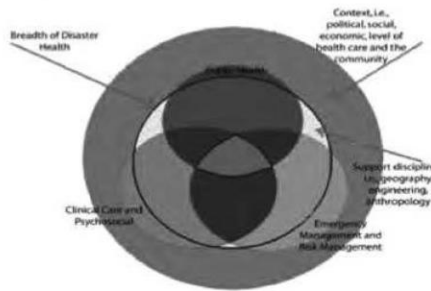


Figure 1—A framework for "Disaster Health" (Bradt et al, 2003)

Marley © 2005, Prehospital and Disaster Medicine

Emergency medicine	pre-hospital triage, tagging, treatment and transport Emergency department triage, stabilization, care and referral Facility-based specialty coordination
Public health:	Environmental health monitoring Hazardous material handling and safety, Relief worker disease surveillance Disease outbreak investigation
Disaster management:	Site security urban search and rescue Incident command and emergency operations centre management, Hazardous materials management, Geographic information systems, Resource mobilization, Public information, Media relations,
Context disciplines includes	Basic life support, community health care economics, media management, political science, social sciences, and socio- economic sciences.
Support disciplines includes	:anthropology, architecture, engineering, ethnology, geography, geology, seismology, and spatial planning

***21. About the disaster curriculum, which among the disciplines listed above are included in the course? (More than one response is possible)**

- Emergency medicine
- Public Health
- Disaster management
- Context disciplines includes
- Support disciplines includes

Assessment for the incorporation of a disaster medicine course within the

Look at the following picture:



***22. Which stage of the disaster management cycle is the training course directed to? (more than one response is possible)**

- Mitigation and prevention: to undertake an action aiming at decreasing the likelihood that the event or crisis occurs and, at the same time, to minimize the impact of a disaster on human life losses).
- Preparedness: to design strategies, processes and protocols for response.
- Response: efforts to minimize hazards created by a disaster.
- Recovery: to establish procedures, resources and policies to make people/institutions involved get over.

***23. What's the modality the course is delivered by?**

- On-site education
- Distance e-learning
- Combination of on-site education and distance e-learning.

Assessment for the incorporation of a disaster medicine course within the

Look at the following education and training methods

1. Discussion -based exercise :	Provide a forum for discussing or developing plans, agreements, training and procedures
1.1.Seminar ;	provide concept of idea and presentation
1.2.Workshop :	active a specific goal or build product
1.3. Games:	explore decision making process and examine the consequence of this decision
2.Operation – based exercise:	validate plan policies, agreements and procedures clarify the role and responsibilities
2.1 Drill :	validate single operation or function of an agency
2.2 A functional exercise (FE) :	is a single or multi-agency activity designed to evaluate capabilities and multiple functions using simulated response
2.3 A full-scale exercise (FSE)	is a high-stress multi-agency, multi-jurisdictional activity involving actual deployment of resources in a coordinated response, as if a real incident had occurred

***24. The course is delivered through (more than one response is possible):**

- Lectures
- Computer-based simulations
- Discussion-based exercise: seminars,workshop,games
- Operation- based exercise: drill, function exercise, full scale live simulation exercise
- Papers & Books

***25. How many hours are dedicated to the course in disaster medicine during the academic year?**

Chapter 2: Proposal for a community-based disaster management curriculum for medical school undergraduates in Saudi Arabia



ORIGINAL ARTICLE

Proposal for a community-based disaster management curriculum for medical school undergraduates in Saudi Arabia

Nidaa Bajow, MD, MSc DM; Ahmadreza Djalali, MD, MSc DM, PhD; Pier Luigi Ingrassia, MD, MSc DM, PhD; Hussein Ageely, MD; Ibrahim Bani, MD, PhD; Francesco Della Corte, MD

Abstract

Objectives: Health professional preparedness is a key element of disaster response; overall there is a need for increased disaster medicine training worldwide. The objective of this study was to design and develop a curriculum in community-based disaster medicine for Saudi Arabian medical undergraduates.

Methods: A structured five-step approach was used to develop a curriculum. Expert stakeholders from the Saudi Arabian and international disaster medicine communities were surveyed to determine objectives and content. Learning strategies were carefully considered to maximize participation and retention. Particular attention was paid to equipping learners with the teaching skills required to promote disaster preparedness in their local communities.

Curriculum design: The course consists of 2 weeks of classroom activities followed by 8 weeks of e-learning structured within five domains of disaster medicine. The curriculum introduces core principles in emergency medicine, public health, and disaster management. Simulations, experiential activities, case studies, and role-playing activities are all used to promote higher levels of cognitive engagement. Special content addresses the adult-learning process, and students design their own community-based seminars in disaster preparedness.

Conclusions: The curriculum is designed to promote learning in disaster medicine. Given the paucity of disaster medicine educators in the region, student graduates of this program would be able to improve disaster preparedness in Saudi Arabia by launching their own community-based disaster preparedness initiatives. The program could also be adapted for use throughout the Middle East.

Key words: disaster medicine, medical education, community-based disaster medicine

Introduction

Preparedness is a prerequisite to appropriate disaster response and relies largely on the training of qualified health professionals. Given the potential for crises that span geographic and political regions, it is important that disaster medicine training be both consistent with international standards and contextualized to the local environmental and socioeconomic milieu.^{1,2}

Saudi Arabia has witnessed several large-scale disasters and faces threats from unique pathogens such as MERS-CoV.³ Political unrest in the Middle East heightens the possibility of catastrophe due to violent conflict and/or terrorist attacks. Moreover, large seasonal gatherings at Makkah and Madina during the Hajj strain the local health and transportation infrastructure and are particularly vulnerable to infectious, environmental, and human-related risks.⁴

Previous case studies of disaster responses in Saudi Arabia have noted a reactive approach to disaster management and a great need for the involvement of health professionals, including nurses and medical doctors.^{3,5} In addition, several governmental and educational authorities worldwide have underscored the importance of undergraduate disaster medicine education.⁶⁻⁸ Nevertheless, medical students are to a large extent inadequately prepared for disaster scenarios, even though they are generally willing to participate in disaster response.^{7,9-15}

A survey of all medical schools in Saudi Arabia demonstrated a scarcity of disaster medicine education

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145

(N.B. et al., unpublished data, 2015). Two of the main reported impediments to the implementation of a disaster medicine curriculum are the inadequate number of qualified educators in this field and a perceived lack of relevance to the existing medical school curriculum. The respondents indicated a preference for using both didactic and interactive learning activities and a combination of on-site education and distance e-learning.

Despite the recent international proliferation of proposed disaster medicine competencies and curricula, to our knowledge, there is no published curriculum tailored to the specific needs of Middle Eastern medical students.¹⁶⁻²⁰ The objective of the present study was to design a competency-based curriculum for undergraduate medical students in Saudi Arabia that is consistent with both international guidelines and the needs of the local community.

Methods

This qualitative study was conducted from January to May 2014. Five experts in disaster management and medical education from Saudi Arabia, Italy, and Iran participated in this study. A five-stage approach was used to design the community-based disaster medicine curriculum.

Target group identification

The results of a background survey indicated that most medical schools in Saudi Arabia are willing to implement disaster medicine teaching and favored an accredited course integrated with other complementary subjects in the final 3 years of the 6-year program and that they favor using a blended approach to teaching (N.B. et al., unpublished data, 2015). Medical students in their final 3 years of undergraduate training were therefore selected as target learners.

Literature review

A comprehensive literature review was conducted to identify evidence-based disaster medicine curricula and core competencies in disaster management for medical students. While both undergraduate and postgraduate programs were included in this search, focus was placed on undergraduate medical education.

Assessment of stakeholder needs

The next phase of this study was identification of the educational priorities in disaster medicine for the target group. Specific emphasis was placed on identifying needs unique to medical students, core topic areas, and educational methods.

The five experts brainstormed to identify 13 possible content themes and then reviewed their relevance to disaster medicine training programs in Saudi Arabia. Through this review, the options were narrowed down to eight themes. These were presented during structured telephone interviews with eight Saudi Arabian stakeholders from Civil Defense, Academic Emergency Medicine, the Department of Emergency and Disaster at the Ministry of Health, and the Red Crescent. These stakeholders were all emergency responders. The interviewees were asked to rate the importance of the following eight themes for a course in disaster medicine, and to suggest teaching tools that would likely promote effective learning:

1. introductory disaster medicine principles;
2. mass casualty management;
3. critical event safety;
4. psychosocial care;
5. community awareness;
6. complex humanitarian emergencies;
7. public health emergencies and interventions; and
8. other miscellaneous topics such as media relations, humanitarian assistance, and research.

Identification of core competencies

After needs were assessed with the stakeholders, the shortlist of eight themes was cross-referenced with other published competencies and curricula, as well as with published standards for medical education. After

considering these themes in the light of logistics and resources, a consensus was reached on five themes that were considered most important and practical. These themes were used as the basis for determining associated competency-based topics.

These competency-based topics were developed with the stratified levels of Bloom's taxonomy²¹ in mind (knowledge, comprehension, application, analysis, synthesis, and evaluation). Efforts were made to design competencies at every level of these strata to engage the learners and promote maximum retention.^{17,22}

Content development

Content and learning activities specific to the refined list of competencies were developed by the course organizers in consultation with international experts and the published literature. A list of didactic lectures was generated, and their topics were delegated to the available experts who were best suited to teach them. Attention was given to matching the specified competencies to appropriate teaching and learning activities. In keeping with the results of the needs analyses, effort was made to develop interactive, student-centered content (Figure 1).

Design of the Curriculum

Discussions with the eight expert stakeholders identified a set of teaching strategies that would likely

be effective in this setting. The main tools selected were small group discussions and didactic lectures, followed by case studies, simulation, videoconferencing, and problem-based learning exercises. There was also consensus that a combination of e-learning and on-site teaching was the best delivery approach.

The final program developed in this study is intended as an elective course to be held during summer. The first part consists of 2 weeks (10 work days) of learning activities structured around competencies in five key domains of disaster medicine (Table 1 and described below). These activities include lectures, case studies, workshops, simulation-based training, and site visits. During the second week, the students begin to design a workshop for community education, specifying the goals, target groups, and material. The students are then divided into two or three groups, and each group adopts a topic and works on it. On the last day of the second week, they present their programs in front of the tutors.

In the second part, the teaching material is placed on a Web site that is accessible to students and tutors. During the following 8 weeks, the students work to further develop their programs for community teaching, and to that end they interact with the tutors online until their programs are approved by the end of the eighth week. The students then conduct their workshops for educating the community.

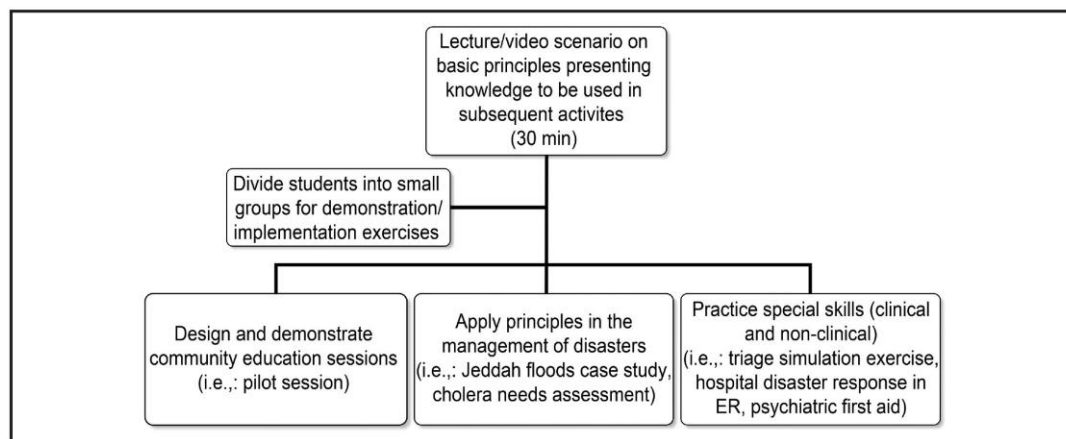


Figure 1. Teaching process for community-based disaster medicine lectures.

Domains	Competency	Teaching and learning activities
Disaster risk reduction	<p><i>Risk identification:</i></p> <ul style="list-style-type: none"> • Explain the concept and methods of hazard and risk assessment • Determine the hazards and risks in your community • Apply the principle of safety for self and others by identifying safety threats and appropriate actions to be taken in response <p><i>Risk mitigation:</i></p> <ul style="list-style-type: none"> • Demonstrate the use of standard personal protective equipment • Distinguish between different levels of personal protective equipment • Prepare a personal/family disaster preparedness plan 	<p><i>Didactic lectures:</i></p> <ul style="list-style-type: none"> • Hazard identification and risk assessment • Strategies for preventing and mitigating risks to self and others <p><i>Workshop:</i></p> <ul style="list-style-type: none"> • Using available tools to assess risks in Jazan <p><i>Experiential activities:</i></p> <ul style="list-style-type: none"> • Donning and doffing PPE • Preparing family disaster plan
General concepts of disaster medicine and humanitarian health	<ul style="list-style-type: none"> • Define key terms of disaster medicine (eg, mass casualties, disaster medicine, triage, Incident Command System [ICS], and complex humanitarian emergency) • Differentiate between the disaster response phases • Distinguish between disaster medicine and emergency medicine • Identify the characteristics of the disaster management cycle • Determine and compare the medical aspects of specific types of disasters (eg, earthquakes, floods) • Describe the epidemiology of disaster • Explain command and control structures • Distinguish between the members of the local emergency management system and describe their roles during a disaster (Red Crescent, public health, civil defense, hospitals) • Outline the phases of complex humanitarian emergencies • Explain and demonstrate the minimum standards in humanitarian response • Explain and implement public health assessments and interventions during disaster case studies • Identify general concepts in communicable disease management during complex humanitarian emergencies • Explain and demonstrate how to handle psychological reactions caused by exposure to a disaster (psychiatric first aid) • Explain the moral and ethical issues relevant to the management of individuals (of all ages) and communities affected by disaster 	<p><i>Didactic lectures:</i></p> <ul style="list-style-type: none"> • Introduction to disaster medicine • Differences between emergency and disaster medicine and humanitarian health • Jazan emergency medical systems • Top 10 priorities of public health assessment during humanitarian emergencies • Psychiatric first aid techniques • Infectious disease in emergencies • Humanitarian standards in context: the SPHERE project • The role of MOU and the Red Crescent during population displacement • International humanitarian law • Ethics in disasters • Medical aspects of different disasters <p><i>Case studies:</i></p> <ul style="list-style-type: none"> • The 2009 Jeddah Flood <p><i>Role play:</i></p> <ul style="list-style-type: none"> • Psychiatric first aid
Disaster and mass casualty incident management	<ul style="list-style-type: none"> • Explain the different approaches to managing mass casualties • Explain the concept and functions of an advance command post/team (ACP) • Describe the concept of hospital disaster preparedness • Explain and demonstrate the common types of mass casualty triage 	<p><i>Didactic lectures:</i></p> <ul style="list-style-type: none"> • Mass casualty triage • Command and control, the ICS • Hospital disaster preparedness <p><i>Site tours:</i></p> <ul style="list-style-type: none"> • Visit to Novara university hospital • Visit to Novara EMS dispatch center • Visit to Advanced Medical Post (AMP) <p><i>Simulation:</i></p> <ul style="list-style-type: none"> • Mass casualty triage • Disaster scene management • Prehospital and hospital disaster response

Domains	Competency	Teaching and learning activities
Principles of community disaster awareness	<ul style="list-style-type: none"> • Determine the role of community members in public health surveillance during emergencies • Design public health education tools that help engage community members during the early phases of disaster management • Demonstrate physical and environmental mitigation strategies for community members (eg, hygiene and sanitation promotion, awareness of airborne and waterborne disease prevention, cholera prevention, prophylaxis, and treatment) • Explain issues in the management of volunteers during a disaster • Explain the principles of public health education 	<i>Didactic lectures:</i> <ul style="list-style-type: none"> • Community education for environmental mitigation measures • Role of volunteers • Community education for public health surveillance
Training sessions for community education	<ul style="list-style-type: none"> • Prepare and develop tools that will help the students provide education/awareness to community members in disaster preparedness/management • Identify and address the key elements of the learning process • Identify the specific features of adult learning (andragogy) • Explain the differences between adult-learning styles • Explain and demonstrate the characteristics of different types of simulations 	<i>Didactic lectures:</i> <ul style="list-style-type: none"> • General concepts of adult teaching <i>Project work:</i> <ul style="list-style-type: none"> • Preparation of a pilot session for community disaster education • Trial run of a pilot session for community disaster education • Group discussion and debriefing on the pilot session

The above-mentioned five key domains covered in the first part are as follows:

1. disaster risk reduction (including risk assessment, risk prevention, and mitigation strategies);
2. general concepts of disaster medicine and humanitarian health;
3. disaster and mass casualty incident management;
4. community disaster awareness; and
5. training for community education leadership.

For the first domain, disaster risk reduction, key concepts are introduced in a lecture. These key concepts are transformed into experiential learning through a workshop on risk assessment as well as practice in putting on and taking off personal protective equipment.

The general concepts of disaster medicine and humanitarian health domain is allotted the most curricular time because the course organizers considered it fundamental learning. Fourteen core competencies pertinent to this domain were identified, and core content was incorporated in 13 didactic lectures. To solidify the learning and to highlight the importance of a proactive disaster response approach for all the sectors involved in the many phases of disaster management, the 2009 Jeddah floods were analyzed in a case-study format and included in the curriculum.

The disaster and mass casualty incident management domain lends itself to site tours and simulation exercises. Field visits are scheduled to the regional Emergency Medical Services dispatch center, Emergency Department, and Intensive Care Unit. An additional visit is scheduled to the Advance Medical Post of the Red Cross, where the goal is to introduce mass casualty protocols and search and rescue procedures. Several simulation exercises are included: a disaster scenario is introduced and then small groups of students are required to handle elements of the disaster management process (ie, triage, provision of first

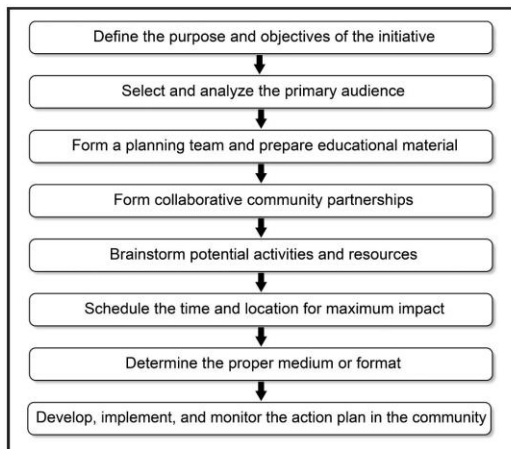


Figure 2. Template for development of community education pilot session.

aid, coordinated patient transport, communication with dispatch and hospitals, ER, and hospital disaster protocols). A virtual reality simulation environment is used to teach prehospital and triage procedures for conventional mass casualties, such as in a building collapse.

During training in community disaster awareness, two didactic lectures provide core content. Students complete an exercise in designing public health education interventions according the World Health Organization strategies, using the South Sudan Cholera outbreak as an example. Three mock community education sessions are held to demonstrate the principles of community awareness: hand washing (for educators of primary school children), preparation of oral rehydration solution (for mothers with young children visiting pediatric clinics), and corpse disposal during cholera outbreaks (for healthcare workers dealing with evacuated populations in Aswan).

The final domain, training for community education, is incorporated to increase disaster preparedness in the Kingdom of Saudi Arabia as a whole. Students are first oriented to key principles of teaching and adult education and then asked to determine their own learning style through a self-diagnostic exercise and group activities. The Red Cross and Red Crescent module on increasing community disaster awareness is extensively consulted to determine the best methods for planning

public education initiatives and is used to develop a teaching template for the students (Figure 2).²³

Discussion

Most published curricula in disaster medicine have originated in North America or Europe.¹ The current program was developed using structured methods, is competency/outcome based, and uses a variety of student-centered teaching strategies tailored for Saudi Arabia. Also novel is the emphasis on community education; graduates of this program are equipped to train other medical students and community members. This community-based emphasis will help students to understand the socioeconomic environment in which they will eventually work and could be applicable in the predisaster phase for mitigation and prevention.²⁴ This skill set could be of particular use to the Saudi community, which needs more trained teachers in disaster medicine.^{4,5}

It has been suggested that disaster medicine curricula should be competency/outcome based regardless of the level of training.⁶ Competency-based common educational goals are one way to ensure consistency across disaster medicine programs and to facilitate coordination between international administrative bodies in the event of an actual disaster.^{17,25} Competency-based education may also increase the acceptance of disaster medicine education because it provides educational results that are measurable and can be used as quality improvement indicators; these qualities make it appealing to policy makers.¹⁸ In keeping with similar efforts, development of this course used an iterative approach to solicit key domains and competencies from relevant stakeholders.^{1,17,19,25,26} The course includes competencies common to several other disaster medicine curricula but still contextualizes disaster medicine to the region of the target learners.

Also included are competencies related to adult education, which equip students to disseminate knowledge of disaster medicine throughout their lay communities. A health needs assessment of the Jazan area highlighted several community health problems that could be ameliorated by this curriculum, including the prevalence of communicable diseases, shortages of safe drinking water, and the overall poor community health

awareness.²⁷ This course emphasizes the engagement of community members in a manner that is appropriate to their age and context; students participate in mock teaching sessions for children, mothers, and new refugees. This course also trains the community in public health surveillance, which is important for the early monitoring and detection of disease.

Like other curricula, this program uses a blend of didactic teaching and interactive exercises to maximize student learning.^{15,16,28,29} Simulation, which has been shown to be a powerful teaching tool elsewhere,³⁰ can be used to good effect. Although web-based learning poses some technical difficulties for course organizers, it is nevertheless useful in facilitating communication between students and teachers once the 2-week on-site course is completed. Similar benefits have been noted by other educators.^{7,31,32}

An analysis by the World Association for Disaster and Emergency Medicine cited barriers to disaster medicine education that overlap with those in this study, namely fragmentation of the educational infrastructure, communication challenges related to language differences, and a lack of coordination among the disciplines involved in disaster health education.³¹ Another study by the American College of Emergency Physicians cited time and space constraints.¹⁸ Those factors were taken into consideration when developing the curriculum proposed here. In particular, the course is foreseen as an elective course to be held during the summer, when various educational and training activities are provided for medical students in Saudi Arabia.

Conclusions

This study describes a student-centered, competency-based disaster medicine curriculum that places special emphasis on contextualized community education. To enhance the feasibility and efficacy of the training program, focus was placed on blended learning techniques and adult learning. After participating in this program, students would be able to initiate disaster management training in their communities. This curriculum could also be used as a template for educators throughout the Middle East, in the hopes of strengthening disaster preparedness in the region.

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Chapter 3: Evaluation of a new community-based curriculum in disaster medicine for undergraduates

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Abstract

Background: Nowadays, many medical schools include training in disaster medicine in undergraduate studies. This study evaluated the efficacy of a disaster medicine curriculum recently designed for Saudi Arabian medical students. Methods: Participants were 15 male and 14 female students in their fourth, fifth or sixth year at Jazan University Medical School, Saudi Arabia. The course was held at the Research Center in Emergency and Disaster Medicine and Computer Sciences Applied to the Medical Practice in Novara, Italy. Results: The overall mean score on a test given before the course was 41.0% and it increased to 67.7% on the post-test (Wilcoxon test for paired samples: $z = 4.71$, $p < 0.0001$). There were no significant differences between the mean scores of males and females, or between students in their fourth, fifth or sixth year of medical school. Conclusions: These results show that this curriculum is effective for teaching disaster medicine to undergraduate medical students. Adoption of this course would help to increase the human resources available for dealing with disaster situations.

Background

The last two decades have seen a growing interest in disaster medicine. This is understandable given the number and magnitude of natural disasters (such as the 2004 Indian Ocean earthquake and consequent tsunami, and hurricane Katrina) as well as man-made and technological disasters (such as the 9/11 bombing, the Fukushima Daiichi nuclear disaster and the ongoing series of worldwide terrorist attacks).

Disaster medicine, which is pivotal in such circumstances, has been traditionally a postgraduate form of training. However, in the face of large-scale disasters, personnel trained in disaster medicine are frequently inadequate and other medical personnel have to pitch in. In view of the gaps in undergraduate and postgraduate disaster medicine education,[1-5] some educational authorities have called for improved disaster medicine education[6, 7] and several medical schools and professional organizations have developed curricula in disaster medicine for education of all physicians.[8-16]

A survey of all Saudi Arabian medical schools by Bajow et al. showed that teaching of disaster medicine was scarce, but there was willingness to institute such training at the undergraduate level, with a preference for both didactic and interactive learning activities coupled with a combination of on-site education and distance e-learning.[17] Consequently, Bajow et al. developed a training curriculum consistent with international educational and disaster medicine standards but also catering to the needs of the local community.[18] The aim of the current study was to evaluate the efficacy of this curriculum in improving the knowledge of Saudi Arabian medical students.

Materials & Methods

Setting and participants

Saudi medical students are routinely sent abroad during the summer for further education or training, and the community-based disaster medicine course was piloted at the Research Center in Emergency and Disaster Medicine and Computer Sciences Applied to the Medical Practice (CRIMEDIM) in Novara, Italy. The two-week course started on 16 June 2014.

The participants were 15 male and 14 female students in their fourth, fifth or sixth year at Jazan University Medical School, Saudi Arabia, which agreed to participate in this study. The students were selected on the basis of having a minimum overall grade of 3.5/5.0 and possession of good knowledge of English.

Nineteen instructors participated in implementing the program; most have an MD designation, one is a paramedic, and one is a nurse working in civil defense and with the Red Cross. The physicians were mainly specialists in anesthesia, emergency and disaster medicine, or tropical medicine, and most were full-time faculty at CRIMEDIM. All of them had experience in medical education related to emergency and disaster medicine, and some had experience with emergency humanitarian relief.

All the students consented to full participation before the program and had not received any instruction in disaster medicine. The study was approved by the Ethics Committee of Jazan Medical School in Saudi Arabia.

Curriculum

The curriculum introduces core principles in emergency medicine, public health, and disaster management (Fig. 1). It uses several approaches: simulations, group discussions, case-studies, and role-playing to promote higher cognitive engagement. A module on adult-learning enables students to design sessions for educating communities in Saudi Arabia in disaster preparedness.

Evaluation of the efficacy of the course

A pre-test was conducted on the first day of the course and a post-test on the last day. The questions were obtained mainly from the question test banks of CRIMEDIM. The instructors were asked to prepare questions relevant to their subjects if they could not find appropriate questions in the CRIMEDIM database. Each 30-minute test consisted of 25 multiple choice questions with only one correct answer. No points were deducted for incorrect answers.

Week 1	Day 1	Day 2	Day 3	Day 4	Day 5
9:00—10:30	Course presentation Student and faculty presentation Pre-test	Hazard identification and risk assessment	CASE STUDY DISCUSSION The Jeddah flood 2009	Medical aspects of different disasters Prehospital disaster management	Hospital disaster preparation ISEE simulation: familiarization
11:00—12:30	Introduction to disaster management	WORKSHOP Using available tools to assess risks to Jazan	International humanitarian law Ethics in disasters	Mass casualty triage XVR simulation mass casualty triage	ISEE SIMULATION Prehospital and hospital disaster response
13:30—15:00	Differences between emergency and disaster medicine, and humanitarian health	Strategies for preventing and mitigating risks to self and to others	VISIT Novara University Hospital	Command and control and the incident command system	ISEE SIMULATION After action review Debriefing of the first week
15:30—17:00	The emergency medical systems used in Jazan	General concepts of adult teaching	VISIT Novara EMS dispatch centre	XVR SIMULATION Disaster scene management	
Week 2	Day 1	Day 2	Day 3	Day 4	Day 5
9:00—10:30	Impact and principle of community participation Tools for community awareness & public education	Top ten priorities & public health assessment during humanitarian emergencies	Techniques to handle psychological reactions caused by disasters	Infectious diseases in emergencies	International coordination for disaster response
11:00—12:30	Community education for environmental mitigation measures	Humanitarian standards in context: The Sphere Project Community education for public health surveillance	Preparation of the pilot session for community education	GROUP 1 Simulation of a pilot session for community education	Discussion on the group pilot session
13:30—15:00	Community awareness: Role of volunteers Preparation of the pilot session for community education	The role of MOU & Red Crescent during population displacement in Jazan	TRIP lake Lago Maggiore	GROUP 2 Simulation of a pilot session for community education	Post-test Debriefing & farewell
15:30—17:00	VISIT Advanced medical post	R-LAND SIMULATION Response to a complex humanitarian emergency		GROUP 3 Simulation of a pilot session for community education	

Figure 1. The contents and schedule of the disaster medicine course.

The questions in the two tests were different but both sets covered the four major course domains: (1) general concepts of disaster medicine, (2) disaster risk reduction, (3) mass casualty incident management, and (4) community disaster awareness. The number of questions for each domain paralleled the relative weight of the domain in the curriculum. Four experts from CRIMEDIM reviewed the pre-test and post-test

Besides attending the lectures and various activities, the students were divided into groups of 3-5 students, who were asked to prepare community training sessions. On the last day of the program, each group of students presented their pilot community education session and received feedback from the instructors and the other students. The post-test was administered after this session. Passing the course required a grade of $\geq 60\%$ in the post-test and participation in the presentation of the community training session.

To obtain feedback from the students about the course, they were asked to fill an evaluation form at the end of the course. In addition to the nine questions (mostly Likert scale), they were asked for suggestions on how the course might be improved.

Statistical analysis

Statistical analysis was done using SPSS, version 11.0. The reliability of test items was tested by calculating Cronbach's alpha coefficients for the knowledge and practice items.

The data are presented as mean percent score and standard deviation. The non-parametric Mann-Whitney test was used to compare the means of two groups, and the Kruskal Wallis test was used to compare the means for three groups. Wilcoxon Signed Rank test was used to compare pre-test with post-test mean scores. Level of significance was set at $p\text{-value} \leq 0.05$.

Results

Cronbach's alpha coefficients for the knowledge and practice items, calculated on the pretest and the post-test, were 0.723 and 0.897, respectively, demonstrating the reliability of the test items.

Of the 29 students, 34.4% were in their fourth year, 24.1% in their fifth year, and 41.4% in their sixth year. To assess the gain in knowledge from the course, the pre-test and post-test results were compared (Fig. 2). The overall mean score was $41.0\% \pm 6.29$ SD on the pre-test and $67.7\% \pm 7.70$ SD on the post-test ($p < 0.0001$). There was no significant difference between the mean scores of males and females on the pre-test or on the post-test (Fig. 2).

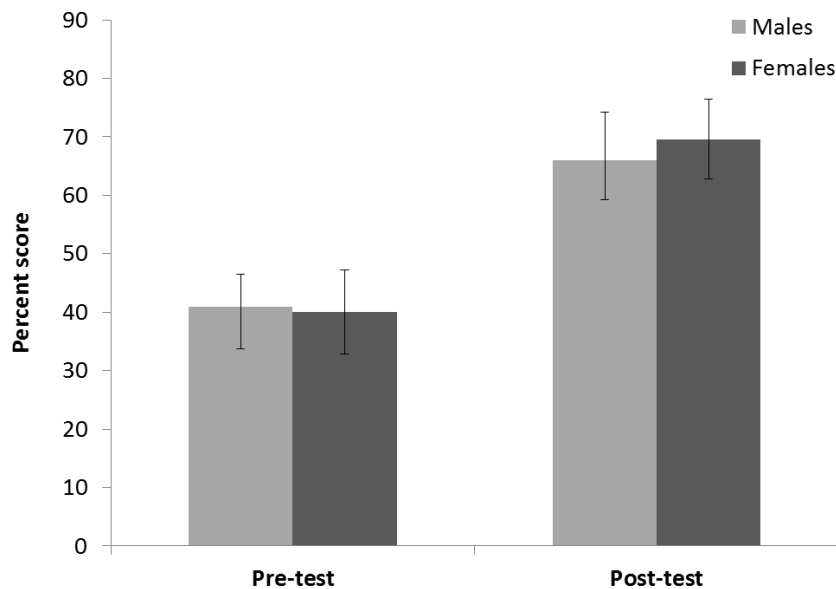


Figure 2. Mean percent scores of males and females in the pre-test and post-test.

*Difference from relative pre-test score is significant at $p < 0.001$ by Wilcoxon test. No significant difference was found between males and females on the pre-test ($p = 0.594$) or post-test ($p = 0.124$). Error bars: standard deviation.

Given that the students were from three different years of medical school, we wondered whether the one or two years' difference in medical school education might affect the scores. But comparison of the pre-test mean scores of students in the fourth, fifth and sixth years showed that there was no significant difference between them ($39.2\% \pm 6.20$ SD, $43.4\% \pm 7.80$ SD and $41.0\% \pm 5.44$ SD, respectively; $p = 0.317$). Likewise, there was no significant difference between them on the post-test (data not shown).

Finally, we looked at how the students evaluated the course. Most of them (76%) found it interesting and stated that their personal goals were met by the program (72.4%). When asked whether the workshop was informative and valuable, 34.4% strongly agreed and 48.2% agreed, giving an overall rate of 82.6% positive answers, while 14% were "neutral." Many students commented that the course was appropriate and relevant to their medical education. Some students complained about some technical difficulties during

videoconferencing or suggested that more time should be given for the community education session.

Discussion

This study shows that the curriculum developed for Saudi Arabian medical schools is significantly effective in increasing the students' average knowledge of disaster medicine. The statistically significant increase in overall mean score from 41.0% on the pre-test to 67.7% on the post-test is somewhat better than that described in a similar study, which reported that the scores increased from 39% on the pre-test to 58% on the post-test.[19] However, our students were selected for having above average grades and good knowledge of English. Nevertheless, this selection represents the real situation of students who would be sent for overseas training if the course is adopted by Saudi Arabian medical schools.

Though male medical students are separated from female students in Saudi Arabia, they follow the same curricula and the same standards are applied. So it was not surprising that the scores of males and females were not different, either on the pre-test or the post-test. Moreover, given that disaster medicine is not taught in the undergraduate years, the results confirmed our expectation that students in their fourth, fifth or sixth year would perform similarly in the pre-test.

According to the National Educational Framework for disaster health, students can be trained and educated in the basic skills needed for the response to mass casualties.[9] These include preparedness, planning, response and recovery, and understanding the roles of different organizations. The course has a community-based disaster medicine curriculum that encourages learners to apply concepts, skills and attitudes to their unique local context. This course considered the specific needs of the medical students and the community at large and consisted of an appropriate number of learning activities in a balanced variety of educational settings.

In their final three years, medical students can work as volunteers. One study demonstrated that up to 96% of medical students are willing to volunteer during disasters by helping triage and by providing first aid and community education.[5] In the 2005 earthquake in Kashmir,

medical students participated in search and rescue operations and provided emergency care under supervision.[20]

Healthcare workers are faced by three main issues during disasters: triage of the patients, resource allocation, and clinical care. One study showed that triage can be learned by first year medical students with a degree of accuracy that is comparable to that of more experienced peers.[21] We expect that medical students in their fourth to sixth year of medical school can perform equally well if not better. Providing additional human resources for triage can free the specialized professionals for other duties.

This course was designed to teach knowledge and skills sequentially, in that basic principles are first presented in didactic sessions, and then competencies are strengthened by practicing skills in hands-on exercises and simulation sessions. Then, the acquired knowledge and skills are implemented by designing sessions geared towards community education. All the learning activities are inter-related, and this creates a framework for effective disaster medicine training.[22] It has been demonstrated that participants in courses using different teaching methods are more confident in their knowledge for at least six months following the training.[23]

The gold standard for demonstrating the effectiveness of a curriculum in medical education is the demonstration of a change in behavior or performance in the real-world clinical setting. However, it is often more feasible to measure changes in knowledge and educational satisfaction,[14, 24, 25] which was done in this study. The students' experience encompasses important factors such as satisfaction with teaching and perception of quality of the learning material, physical environment, and learning culture.[26] The course evaluation process helps guide future modifications of the curriculum in order to better meet the program's objectives.[27] In addition to evaluating the course by comparing the pre-test and post-test scores, we sought feedback from students. This feedback was quite positive.

One major challenge in this study was the budgetary constraint, which limited the number of participants. However, this is the first interventional study that focuses on the education of medical students in Saudi Arabia by using an internationally developed, approved and delivered curriculum. Further studies should enroll larger numbers of students.

Conclusion

This study demonstrates the efficacy of the proposed course in disaster medicine for Saudi Arabian medical students. This course would help to increase the size of the human resources available for dealing with disaster situations. This course could be adapted to other countries in the region by replacing the components that have been designed on the basis of the Saudi Arabian context with others that are relevant to the target society.

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Authors' contributions

NB, AD, FDC, PLI, LR, HA and IB participated in conception and design of the research. NB acquired and analyzed the data. NB, AD and FDC interpreted the results. NB wrote the manuscript. All authors read the manuscript and approved its submission to BMC Medical Education.

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Competing interests

The authors declare that they have no competing interests concerning this paper.

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OVERALL CONCLUSIONS

1. Disaster medicine is taught only at a minority of Saudi Arabian medical schools, where the time allotted to the subject is too short to gain sufficient knowledge and skills. Implementation of a mandatory, longitudinal curriculum in disaster medicine could help to move the country towards a more consolidated and organized approach for dealing with catastrophic events.
2. The curriculum designed in this study is student-centered, competency-based, and places special emphasis on contextualized community education. It also focuses on blended learning techniques and adult learning to enable students to initiate disaster management training in their communities.
3. The curriculum is effective for teaching disaster medicine to Saudi medical students, would increase disaster preparedness, and help to increase the surge capacity in disaster situations.
4. The course could be adapted throughout the Middle East by replacing the components that have been designed on the basis of the Saudi Arabian context with others that are relevant to the target society.

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Appendix 1: Case studies used in the curriculum

COMMUNITY EDUCATION FOR ENVIRONMENTAL MITIGATION MEASURES

1. Hygiene promotion for school children in Turkey

Goal: Develop a hygiene promotion program to increase proper hand washing before eating and after using the toilet to interrupt the transmission of disease agents leading to a significant decrease in cholera infections.

Scenario: On January 12, 2015 an earthquake with a catastrophic magnitude 7.0 hit Afyon, Turkey. At that time you were a new medical school graduate and doing your internship with the family medicine department at a local University hospital in Afyon. Six weeks later, the first case of death caused by cholera was reported. The patient was from a rural area located on the outskirts of Afyon. The second patient transported to the University hospital is a 7-year-old child who is diagnosed with cholera and is now under close monitoring and undergoing treatment.

The head of the family medicine department approaches you and explains to you that there are concerns that the cholera might spread rapidly and cause thousands of deaths or hospitalizations. He tasked you along with 4 of your colleagues to go to the rural area outside of Afyon to the school where the 7-year-old child goes and conduct hygiene lessons for 200 school children and their teachers.

Time Frame: 15 minutes for preparation and 10 minutes to present.

Target Audience: Primary school children between the ages of six and twelve years old.

Secondary Target Audience: School Teachers.

Materials: Clear Water, Soap, and Hand-Washing Community Education Cards.

You will be asked to do a full demonstration of your hand-washing lesson.

Here are some questions to think about:

What is the objective of conducting these lessons in school? Why is this target population significant?

Describe the importance of proper hand washing techniques?

If soap is not available what are some alternative methods to properly and hygienically cleanse their hands?

What are the steps to proper hand washing? (ex: What water to use, How to wash hands, how to dry hands...etc)

How will you make sure that these children between the ages of 6-12 not forget your lesson? What teaching tools will you use?

2. Severe dehydration in children under 5 in refugee camps in Syria

ORS solution preparation demonstration

Goal: Develop an educational workshop to counsel mothers of children under the age of 5 to raise their awareness on signs of cholera and severe dehydration and how to manage it.

Objective: To teach mothers of children under the age of 5 the methods of managing the dehydration in children under 5; how to prepare an ORS solution.

Scenario: In the year 2016 Raqqa province in Eastern Syria, suffered from a severe drought. A severe heat wave struck them where the temperatures exceeded 40 degrees Celsius for 58 days in a row. Residents of Raqqa, started migrating and re-settling on the outskirts of Damascus. Over time the drought caused hundreds of thousands of people to get displaced. Camps were set-up outside of Damascus by the United Nations to contain the displaced population from congesting the capital.

At that time you were a new medical school graduate and you were volunteering with the Red Crescent as part of their mobile medical team. You were part of a team that is monitoring this emergency situation. Six month following the set up of the camps, the Ministry of Health reported that there was a massive cholera outbreak in these overcrowded camps the fatality rates were approaching 28% due to the poor living conditions. The medical director of the Red Crescent reported that the mobile medical team would need to draft a plan and immediately depart to the camps. Your team was tasked with conducting ORS educational workshops for mothers of children under the age of 5. You and a team of 4 other doctors prepare for your upcoming journey to the camps.

Time Frame: 15 minutes for preparation and 10 minutes to present.

Target Audience: Mothers of children under the age of 5.

Secondary Target Audience: Camp healthcare workers.

Materials: Clear Water, ORS packets, sterile utensil for stirring the solution, clean cup or spoon, ORS community education card.

You will be asked to do a full demonstration of how to prepare an ORS solution.

Here are some questions to think about:

What is the objective of conducting these refugee camp workshops?

What is ORS? Why is it so important in preventing infant mortality?

What materials are needed to prepare ORS packets? How to prepare an ORS solution?

What are the symptoms of patients that will need intravenous electrolyte rehydration?

Is it important to continue breastfeeding and feeding while undergoing a rehydration treatment? What are your instructions for feeding/breastfeeding alongside ORS treatments?

How to identify symptoms of Cholera in children under 5?

What are things that make ORS solutions not effective? (ex: wrong amount, using fruit juice...etc)

3. Proper preparation and disposal of cholera patients bodies in Egypt

Dead body preparation of a cholera patient demonstration

Goal: Develop an educational workshop to train designated healthcare workers, who will be present at funeral gathering and supervising the use of hygienic practices.

Objective: To train designated healthcare workers on proper cleansing of the dead body, and guidelines for conducting funeral gatherings using hygienic practices to decrease the risk the transmission of cholera; to conduct a workshop for families living in the temporary re-settlement shelters on hygienic practices to prevent the spread of the infection from the deceased person to other members in the family.

Scenario: On November 28, 2007 heavy winds and rain swept across Aswan. The rains caused a flash flood. It flooded away cars, homes, damaged infrastructures, and interrupted communication services. The government's civil defense department established disaster response teams to rescue and evacuate the population. The rescued and evacuated population was re-settled in temporary shelters until the situation is under control. Seven weeks later, the first death caused by cholera was reported. You were a General Practitioner in Aswan's community health clinic. The next day two more members of the same family were transported to your center and they were both diagnosed with cholera.

The one family member who was not yet diagnosed with cholera, the 30-year-old daughter of the deceased, wanted to do a funeral ceremony for her father who passed away. Funerals for people who die from cholera can contribute to the spread of an epidemic. Funerals may bring people from other uninfected cities into the infected shelters in Aswan from which they can carry the cholera organism back home with them.

You immediately call a meeting with the other three doctors in the center to notify them of the situation. You start drafting a plan immediately, and start creating a workshop for each shelter building to raise awareness about cholera, prevention, and proper preparation and disposal of cholera patient bodies. You also train designated healthcare workers on these techniques. These healthcare workers will be assisting you in the workshops.

Time Frame: 15 minutes for preparation and 10 minutes to present.

Target Audience: Rescued and evacuated populations re-settled into temporary shelters in Aswan.

Secondary Target Audience: Designated healthcare workers who will assist in monitoring the body preparation and disposal process.

Materials: Clear Water, Soap, Bleach, and Cotton.

You will be asked to do a full demonstration of how to properly prepare a dead body.

Here are some questions to think about:

What is the objective of conducting these shelter workshops?

How can people who prepare a body of a cholera patient be exposed to high concentrations of vibrios?

If funerals cannot be cancelled in the community, how can you reduce the spread of infection to other family members or visitors attending the funeral feast?

If families choose to prepare the dead body at home, what instructions will you give them on how to properly sanitize and clean the dead body?

The shelters have unhygienic living conditions and contamination of cholera is inevitable. How can a family deal with the deceased person's bed sheets, clothing, and mattress?

PRINCIPLES OF DISASTER MANAGEMENT FOR DIFFERENT HEALTH SECTORS

1. Case study: Jeddah floods 2009

Name: _____

Date: _____



SECTION 1: INTRODUCTION

1.1 FLOODS

Floods are defined as “the overflow of areas that are not normally submerged with water or stream that has broken its normal confines or has accumulated due to lack of drainage.”

Flooding is the most common type of disaster in both developed and developing countries, accounting for 42% of all disasters during the decade (from 1996 to 2005). It affected 1.3 billion people, with resulted in 90,000 fatalities.

1.2 CAUSE OF FLOODS

Floods can arise from:

- Overflowing rivers (river flooding)
- Heavy rainfall over a short duration (flash floods)

- An unusual inflow of sea water onto land (ocean flooding). Ocean flooding can be caused by storms such as hurricanes (storm surge), high tides (tidal flooding), seismic events (tsunami) or large landslides (sometime also called tsunami)
- Flood can also be caused by blocked sewage pipes and waterways, such as the Jakarta flood (February 2007)
- Heat waves may trigger flash floods from quickly melting mountain snow (spring floods)
- Heavy rainfall during the a tropical rainy season can lead to monsoon floods, for example, flooding in some equatorial countries, such as Bangladesh

1.3 FLOOD DAMAGES

Flood can cause primary, secondary, tertiary damages.

Primary damage are like:

- Physical damage;
- Casualties.

Examples: drowning, epidemics.

Secondary damage are like:

- Water supplies contamination;
- Diseases-- Spread of water borne diseases. Examples: Leptospirosis
- Shortage of food crops due to loss of entire harvest.

Tertiary damage are like:

- Economic loss;
- Physiological.

1.4 PERIODIC vs. FLASH FLOOD

Periodic floods	Flash floods
Occur naturally on many rivers --forming floodplain	Flood that rises and falls rapidly with little or no advance warning
River floods usually result from heavy rain -- sometimes combined with melting snow causing the rivers to overflow their banks.	Usually result from intense rainfall over a small area
Last relatively longer —days to week(s)	Coastal areas are occasionally flooded by high tides caused by severe winds on ocean surfaces, or by tsunami waves caused by undersea earthquakes.

1.5 FLOODS IN SAUDI ARABIA

A statistical analysis of natural hazards in Saudi Arabia between 1982 and 2005 showed that the most frequent type of hazard was floods. It has a frequency of occurring 7 times per year with average economic losses amounting to approximately 19 million USD per year (AI-Saud, 2010).

The cause of flood hazards:

1. Effects of Climate Change caused an arid region like Saudi Arabia which historically gets infrequent rainfalls to now have significantly more rainfall (IPCC Report, 2007).

2. Improper urban planning where settlements are allowed to be constructed without taking into consideration the natural risks that might occur, increasing the severity of the hazard.
3. When cities, such as Jeddah and Makkah, which are located in low ground and are surrounded by mountains, experience rainfall water runs downward in valleys towards these cities. Due to the poor drainage systems, the continuous flow of water could easily lead to flash floods.

SECTION 2: CASE STUDY

Case Study: Jeddah Floods - 25th November 2009 (Black Wednesday)

Location: Jeddah, Saudi Arabia

Background:

Jeddah is a port city and is one of the most important cities in Saudi Arabia in term of trade, which has great importance for international trade with foreign markets. Jeddah is also the main gate of the two Holy Mosques and the first stop for pilgrims coming to perform hajj with an annual number of visitors ranging between 3 to 5 million people annually. Population-wise it is the most cosmopolitan city and second largest city in Saudi Arabia. It represents almost 14% of the total population of the kingdom estimated at 25.37 million. The population of the municipality of Jeddah is approximately 5.1 million, with a growth rate of 3.5% annually (municipality, 2009). This rapid increase in population density is causing locals to resort to settling in areas that are reclaimed from the sea, forming two thirds of the current city. These settlements have no solid infrastructure to contain this population growth.

Geography:

The city of Jeddah is located on the west coast of the Kingdom of Saudi Arabia. It is geographically lies in the Hijazi Tihama located in the lower Hijaz Mountains. The terrain of Jeddah is low and flat near the Red Sea, slowly rising towards the East. Then the land slopes up into the small hills in the East. There are many old "Wadis", or Dry Riverbeds, that lead from the hills into the Eastern areas of Jeddah. Unfortunately many of these areas in the East have been built up with "uncontrolled" and "illegal" neighborhoods, often by poorer people who did their own building. A rain of high intensity sends huge amounts of water into Jeddah, through these Wadis in the East, and through the streets of the city. Supposedly there have been many "flood control" projects funded over the past years, but it is unclear how many were actually done.

Climate:

Most of Saudi Arabia is a desert with an arid climate. The western region, where Jeddah is located, is mountainous except for the Tihama coastal plain bordering the Red Sea. Jeddah is extremely hot and humid during the summer months. Humidity reaches its highest level in the summer because of the high temperature of sea water and it is lower in the winter due to the impact of moderate air mass associated with high pressures.

Event: “Black Wednesday”

Wednesday, 25th November 2009

8:00 AM Heavy rainfall reported in Jeddah and lasted for six continuous hours without interruption. More than 90 millimeters (3.5 inches) of rain fell in Jeddah just in the first 4 hours. This was nearly twice the average for an entire year. This happened just two days prior to Eid al-Adha festival and during the annual hajj pilgrimage to the nearby holy city of Mecca.

Thursday, 26th November 2009

Roads were under a meter (three feet) of water, many victims were believed to have drowned in their cars, or were died due to injuries related to collapsed bridges. The Saudi civil defense announced that the death toll has risen to 48 people and that 900 were rescued. The civil defense used rubber boats to rescue trapped people. According to the Saudi Interior Ministry, none of the flood victims were taking part in the Hajj pilgrimage. However, the main Haramain expressway between King Abdulaziz International Airport in Jeddah and Mecca was closed stranding thousands of pilgrims. Parts of the 80-kilometre (50 mi) highway were reported to have caved in, and the Jamia bridge in eastern Jeddah partially collapsed. The highway remained closed amid fears that the bridge would collapse completely.

Friday, 27th November 2009

Director of Health Affairs in Jeddah issued a public announcement to keep people away from places with water reserves and torrential rains for the fear of the spread of infectious diseases. During the announcement he announced that the death toll has risen to 83 people and that the civil defense aircrafts continue to rescue trapped people.

Saturday, 28th November 2009

Saudi civil defense announced that the death toll has risen to 106. Saudi lawyer Waleed Abu Al Khair said that he would sue the Jeddah Municipality, stressing that families suffered from the failure of the sewerage system in the city. There was increasing media attention and thousands of people turned to the social networking site Facebook to vent complaints about inadequate infrastructure on a specifically created webpage.

Sunday, 29th November 2009

Prince Khalid al-Faisal, the governor of Mecca region, in which Jeddah lies, blamed "arbitrarily built" neighborhoods, and not the absence of a sewage system. Saudi media, which is mostly owned and fully controlled by the ruling family, followed suit and pointed a finger at citizens who bought land and built houses in unplanned areas.

Monday, 30th November 2009

The flood cast a shadow on the travel of pilgrims returning to their home countries due to delays in flight departures. This was a result of a breakdown in the airports automation system inquires. Each travel process was done manually. Civil defense was still involved in search efforts to find the missing flood victims. King Abdullah has ordered the formation of an investigative committee, headed by the governor of Mecca himself. King Abdullah bin Abdul Aziz to form a commission to investigate the disaster, Jeddah and give the power to call any of the official inquiry, headed by the Prince Khalid bin Faisal, governor of Mecca and instructs the competent authorities for the payment of compensation of one million riyals for each victim's family and provide assistance and shelter all those affected by the floods

Thursday, 3rd December 2009

The search for the missing continues and the civil defense announced the names of the 108 deaths caused by the floods. A center was developed by the civil defense to monitor the developments of the flood and those trapped in “Lake Musk”. Following this incident, the death toll continued rising and the number of the missing decreased slightly.

Post-Flood Damages:

This was the heaviest rainfall in Saudi Arabia in more than three decades and described by civil defense officials as the worst case in 27 years. This city of more than 4 million people lacked proper sewage system and treatment facilities and the flood exponentiated the problem. The rain that fell on Black Wednesday had nowhere to go but to flood the streets and neighborhoods of Jeddah, creating havoc and death in its way.

Here is the summary of damages caused by this flood:

- Monetary losses were 3 Billion Riyals
- Long installations of government facilities
- Compensation for those affected is estimated at 5.1 Billion Riyals.
- Death toll has reached 122 cases with 350 people missing.
- Displacement of thousands of families. The number of people sheltered in furnished apartments included 26,711
- Paid subsistence for families 7,821
- Sales fell to about 60% in shops and the fear of the spread of infectious diseases such as the dengue fever. Business losses alone were over 1 Billion riyals
- Farms were destroyed to lengths of about 100 KM.
- Buildings cracked such as residential buildings, shops, which lead to collapse.
- Some main and branch road had washed away between 7,000 10,000 cars
- Mental disorders especially among children who lived through the suffering and
- Civil disorder and frequent thefts of equipment and cars.

Health:

Hospitals: Three were essential hospitals. Flood victims were mainly distributed between three hospitals in Jeddah. The three hospitals were identified by the Ministry of Health as disaster hospitals. The victims were distributed in the following proportions:

1. King Fahad General Hospital: 50%
2. King Abdulaziz Hospital: 35%
3. Al Thaqer Hospital: 15%

Note: *Other private and governments hospitals were also available to assist during the disaster, and were on standby to assist the three designated hospitals.*

Each one of the three disaster hospitals had mobile teams. King Fahad and King Abdulaziz both had 3 mobile teams and Al Thaqer Hospital had 2. Unfortunately, when the disaster struck the mobile teams at Abdulaziz and Al Thaqer were not prepared. There was a lag in time before the mobile teams were cleared to be out with the search teams to save victims. Some teams took as long as 12 hours before being able to go on their first trip.

King Fahad General Hospital: It is the largest hospital under the Ministry of Health in the region. Its capacity was much larger than the other two hospitals. Therefore, King Fahad General Hospital was the most hospital that assisted during the early weeks of the flood onward.

King Abdulaziz Hospital: It is a medium sized hospital and could have been really helpful during the first phase of the rescue, unfortunately, this hospital was located on a disaster area. On Black Wednesday staff members were trapped in the hospital for more than 17 hours. No one was able to leave the facilities and no one was able to come into it either. The roads leading up to the hospital were closed, the first group of patients arrived approximately more than 20 hours later on helicopters.

Al Thaqer Hospital: It is the smallest hospital out of the three assigned to disasters. It is estimated to have a total of 100 beds. The hospital also did not have morgue capacities to take on many bodies. In addition to their capacity limitation, the hospital was physically affected by flood water. There were reports that the building itself was damaged by flood water. The flood also managed to damage patients' records and the pharmacy.

The University Hospital, on the other hand, ordered its administrators and patients to evacuate. The hospital was not prepared to handle the disaster. Their morgue was over the capacity and they had an overflow where 32 corpses were placed in the Emergency Room. For two days, they had no strategy and/or a mapped out plan to deal with the corpses. In addition, communication was down in most hospitals. Without working phones, computers and overhead pagers, the information from and to hospitals were scarce. Critical messages were delivered in person. The laboratories and CT rooms were also down and shut down.

Psychology: The Saudi Society of Psychiatry organized a workshop for psychological support to those affected by floods (adults and children). It was decided that the workshop be first in English, targeting doctors, psychologists and social workers in the sectors of government and private health.

The Community:

A significant portion of humanitarian aid came directly from the local community. The community collaborated to create small relief-based groups. They volunteered their time tirelessly without them having previous emergency preparedness training. They assisted in providing food for the victims and providing shelters. In addition, they organized groups to assist in cleaning up the damaged areas. The community also assisted in arranging for and providing Psychological support to families affected by the flood.

SMALL GROUP DISCUSSION WORKSHEET

Disaster Cycle [Jeddah Floods 2009]

Instructions

The class will be divided up into 3 groups, they will each have 20 minutes to fill out the tables below:

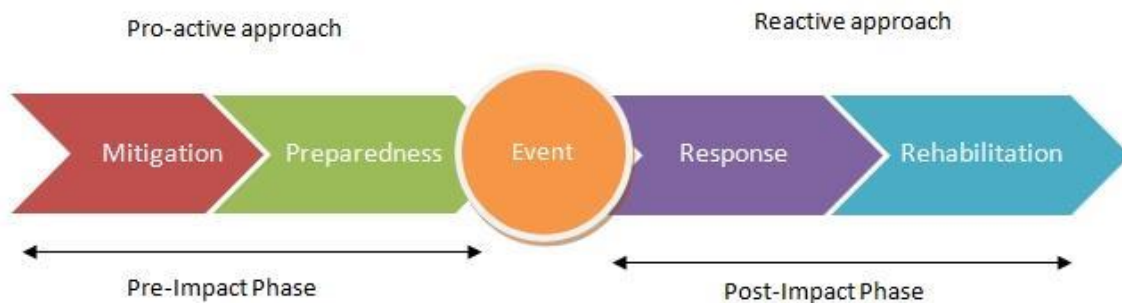
1. Pre-Flood Phase
2. During Flood
3. Post-Flood Phase

Each group will present two things for each phase: (a) What actually happened, and (b) What would they recommend should have happened (think about best practices).

You will present these two points from the perspective of the following four industries –

- Hospitals (Healthcare)
- Civil Defense (Government)
- EMS (Emergency)
- Ministry of Health (Public Health)

Disaster Management Cycle:



Disaster management cycles are really important because its main aim is to reduce, or avoid, the potential losses from hazards, assure prompt and appropriate assistance to victims of disaster, and achieve rapid and effective recovery phase.

GROUP I: Pre-Flood Phase

Identify activities that are designed to reduce or eliminate risks to persons or property, or lessen the actual potential effects or consequences of flood in Jeddah.

	Actual	Recommendation
Hospital		
Civil Defense		
EMS		
Ministry of Health		

GROUP II: During Event

Identify immediate response activities during the flood to save lives, protect the environment, and meet basic human needs.

	Actual	Recommendation
Hospital		
Civil Defense		
EMS		
Ministry of Health		

GROUP III: Post-Impact Phase

Identify activities and programs that were done to return conditions in Jeddah back to a level that is acceptable. These actions might be ongoing and extended long after the flood

	Actual	Recommendation
Hospital		
Civil Defense		
EMS		
Ministry of Health		

Appendix 2: Pre-test

COMMUNITY-BASED DISASTER MEDICINE COURSE FOR JAZAN UNIVERSITY MEDICAL STUDENTS

PRE-TEST

This pre-test consists of 25 multiple-choice questions, only one answer among those proposed is correct. You will have 30 minutes of time to complete the pre-test. All questions are based on the content that will be presented during the course.

The pre-test is not intended for summative assessment. Therefore, we ask you to complete it without the fear of making mistakes or being judged. We are aware of the difficulty of the questions due to your limited previous knowledge of the subject. It will be helpful to us to understand your starting level and track your improvement over time making sure our contribution to your education.

1) Between the following type of disaster, which one has an effect on the community over a longer period?

- a. drought*
- b. landslides
- c. road accident
- d. avalanche

2) Vulnerability is (tick the wrong sentence):

- a. the integration of potential exposures and societal resilience with a specific focus on particular places and times
- b. a possibility of occurrence
- c. a social condition*
- d. a damage potential

3) A different medical approach is necessary to achieve the objectives of disaster medicine due to (tick the wrong sentence):

- a. the number and variety of casualties
- b. the multiplicity of tasks*
- c. the immediate effects of the disaster on the community and especially on the health care system
- d. the large amount of medical resources available directly after the disaster

4) Which of the following items is not part of the 'Disaster Cycle'?

- a. Prevention
- b. Preparedness*
- c. Mitigation
- d. Response

5) Which is the continent most hit by natural disaster?

- a. Asia
- b. Europe*
- c. Americas
- d. Africa

6) Mitigation is (tick the right sentence):

- a. long-term activity designed to return infrastructure systems to pre-disaster conditions
- b. short-term activity intended to return vital life-support systems to operation*
- c. activity intended to develop operational capabilities and to improve effective response to disasters
- d. activity designed to eliminate or to reduce the impact of future disasters

7) With regard of disaster, which of the following sentence is false:

- a. the available resources are not sufficient enough for the need of immediate aid
- b. the severity of the health damage is too high to be faced without an unavoidable decreasing in quality standards of health care
- c. the objective of all disaster efforts is to reduce the occurrence and/or the impact of catastrophic situations on life, environment, and property*
- d. in case of disaster, the emergency response with best outcome are those carried out by international equipments and field hospitals

8) With regard of disaster response phase, indicate the correct sentence

- a. Response is the short-term activity intended to return vital life-support systems to operation
- b. The Emergency Operation Centres (EOC) may be activated*
- c. The incidents' resource requirements continually change to meet the needs of the incident
- d. This is the period that immediately follows the occurrence of the disaster

9) What is a disaster plan?

- a. Systematic procedures that clearly detail what needs to be done, how, when, and by whom before and after the time an anticipated disastrous event occurs
- b. Written document or map for disaster management generated by any given political jurisdiction or private organization
- c. The document which addresses all aspects of the response, including personnel, equipment, contingency issues, policy issues, and inter organizational and inter-governmental relations
- d. All of them*

10) Which of the following is NOT a key component of hospital disaster planning?

- a. Comprehensive emergency management
- b. Hazard specific planning*
- c. Hazard vulnerability analysis
- d. Hospital incident command system

11) Which of the following is TRUE regarding casualty arrival to the hospital?

- a. All casualties will be transported via the emergency medical services system*
- b. The most seriously injured patients will arrive to the hospital first
- c. Patients exposed to hazardous materials will be decontaminated prior to arrival
- d. The hospital closest to the scene may receive many patients while more distant hospitals with excess capacity may not receive any casualties

12) Each of the following is a top-level, major functional area of the Incident Command System EXCEPT:

- a. Safety*
- b. Plans
- c. Operations
- d. Logistics

13) Mass Casualty Incidents (MCI's) are characterized by several parameters. Which of the following characteristics is not linked to MCI's :

- a. In MCI's the number of casualties exceeds the ability of medical teams to provide quality medical care
- b. MCI's are always limited in time*
- c. MCI's can be divided in single and multi-focus MCI
- d. In MCI's the casualties are distributed between the hospitals to avoid the situation in which one hospital is overwhelmed while the other hospitals in this area still have sufficient resources

14) Personal protective equipment includes:

- a. Oxygen masks
- b. Weapons
- c. Surgical gloves
- d. Masks appropriate to filter particulate matter/dusts*

15) International Humanitarian Law

- a. Is part of public international law*
- b. Is a law created by states
- c. Is composed of treaty regulations and customary rules
- d. All of the above

16) In a shopping mall Hazmat attack, the command post should be:

- a. In the middle of the mall to control the entire scene
- b. In the parking lot
- c. A minimum of 5 miles distant from hospital*
- d. There is no need for a command post

17) Which of the following choices best represents the overall philosophy of primary mass casualty triage?

- a. Treat the paying patients first*
- b. Do the best for each individual patient
- c. Make the less sick patients wait the longest
- d. Do the best for the greatest number of patients

18) Which of the following statements about mass casualty triage is correct?

- a. There are currently no objective triage tools that have been proven effective through research.
- b. Special groups of patients, such as children or the elderly, should be triaged first.
- c. Each patient in an MCI should be triaged only once.
- d. Once a patient has been assigned a triage priority (color), that priority should never be changed.*

19) Which of the following adult MCI patients would not be tagged Red using the START tool?

- a. Initially apneic, starts to breathe on upper airway opening
- b. RR 8, cap refill 4 sec*
- c. Can't walk, RR 22, cap refill 2 sec, obeys commands
- d. RR 14, cap refill 2 sec, fails to obey simple commands

20) Which of the followings is not one of the top 10 public health priorities during emergencies?

- a. Initial assessment *
- b. Measles vaccination
- c. Elective surgery
- d. Set up of surveillance systems

21) The Integrated Food Security Phase Classification (IPC):

- a. Classifies food insecurity according to a 5-steps scale
- b. Does not consider malnutrition rates
- c. Is an internal UN classification scale*
- d. Is only used as an assessment tool

22) Types of environment degradation (all true except one)

- a. Deforestation
- b. Soil erosion*
- c. Floods
- d. Landslides

23) Regarding use of a real person as a patient in Drill, all these requirement are true EXCEPT.

- a. Recruitment of volunteer.
- b. Education of volunteer.*
- c. Patient from hospital as volunteer.
- d. Consents .

24) The type of events that can cause PTSD include:

- a. Family trip*
- b. Football matching
- c. Being held hostage
- d. Natural disasters, such as (floods, earthquakes, tsunamis)

25) PTSD can cause many symptoms such as:

- a. Insomnia
- b. Anxiety
- c. Frightening thoughts*
- d. All of the above

Appendix 3: Post-test

COMMUNITY-BASED DISASTER MEDICINE COURSE FOR JAZAN UNIVERSITY MEDICAL STUDENTS

Post-TEST

This post -test consists of 25 multiple-choice questions, only one answer among those proposed is correct. You will have 30 minutes of time to complete the post-test. All questions are based on the content that was presented during the course.

Name_____

Surname_____

1) Which of the following is the correct definition of disaster?

- a. The occurrence of widespread, severe damage, injury, or loss of life or property, with which the community cannot cope, and during which the affected society undergoes severe disruption
- b. The result of a vast ecological breakdown in the relations between man and his environment, a serious and sudden (or slow, as in drought) disruption on such a scale that the stricken community needs extraordinary efforts to cope with it, often with outside help or international aid
- c. An event that produces many casualties, but is managed completely with the resources available within the area in which the event occurred
- d. All the above

2) Which of the following is TRUE regarding casualty arrival to the hospital?

- a. All casualties will be transported via the emergency medical services system
- b. The most seriously injured patients will arrive to the hospital first
- c. Patients exposed to hazardous materials will be decontaminated prior to arrival
- d. The hospital closest to the scene may receive many patients while more distant hospitals with excess capacity may not receive any casualties.

3) The six critical elements necessary for hospital operations include all of the following EXCEPT:

- a. Transportation
- b. Supplies and equipment
- c. Supervision
- d. Patient satisfaction.

4) The incident commander present at the scene of a MCI will give a preliminary report to the EMS dispatch centre including this information EXCEPT:

- a. number of death
- b. number and severity of casualties
- c. type of incident
- d. number of (medical) resources needed.

5) Lifesaving procedures performed in the shortest time prior to evacuation to hospitals consist of?

- a. airway management
- b. c-spine control
- c. external hemorrhage control
- d. cardiopulmonary resuscitation

6) Those who create IHL rules are:

- a. The ICRC
- b. The United Nations
- c. The States
- d. Public Opinion

7) The only ICS position that must always be filled is:

- a. Operations chief
- b. Planning chief
- c. Finance chief
- d. Incident Commander

8) With regard to Environment degradation, which of the following sentence is false:

- a. Processes induced by human behavior and activities that damage the natural resource base or adversely alter natural processes or ecosystems.
- b. Environmental degradation is largely caused by man's activities but can also be a consequence of natural hazards.
- c. The community can't slow down environment degradation and protect their environment and in return reduce the frequency and impact of disasters.
- d. Environment Degradation leads to increase in frequency and intensity of natural disasters, and increases the impact of such disasters.

9) With regard to the most common causes of death during emergencies, which of the following sentence is false:

- a. diarrhea & malnutrition
- b. acute respiratory infections
- c. malaria
- d. leukemia

10) With regard to Mitigation measures, which of the following sentence is false:

- a. The measures taken prior to the impact of a hazard event to minimize its effects (which may be structural and non-structural)
- b. We can avoid the fatalities, loss of property and infrastructure with mitigation measure.
- c. Training, education and public awareness help for mitigate the disaster impact on a community.
- d. It is a key component of the recovery process.

11) With regard to disaster preparedness objectives, which of the following statement is false:

- a. Reduce morbidity and mortality.
- b. Provide care for casualties.
- c. Have the ability to protect staff only.
- d. Have the ability to protect public health and medicinal assets.

12) With regard to preventive measures to decrease morbidity & mortality during emergency, which of the following statement is false:

- a. Appropriate shelter and site planning.

- b. Clean water.
- c. Good sanitation system.
- d. Renewable energy sources.

13) With regard to actions in emergency response, which of the following statement is false:

- a. conduct community-based surveillance and early warning of diseases of epidemic potential;
- b. provide first aid and basic life support, and support mass casualty management including essential trauma and surgical care.
- c. provide psychosocial services, community support and psychological first aid
- d. reducing underlying risk factors by making hospitals and health facilities safe, and targeting essential health care to vulnerable populations in hazard-prone communities

14) With regard to community participation, which of the following statement is false:

- a. is the active involvement of people from communities preparing for, or reacting to, disasters.
- b. the prime component is to involve the vulnerable community in the disaster mitigation process.
- c. the community in disaster mitigation require all possible resources to make it more sustainable.
- d. during disaster mitigation, we requires only participation of individual within the vulnerable community.

15) Which of the following is not an advantage of using objective tools for MCI triage?

- a. They can help to bring order and organization to a chaotic scene.
- b. They save money.
- c. They can help to assure that resources are used in the most effective manner.
- d. They may take some of the emotional burden away from those doing triage.

16) Which of the following statements about Public Health Surveillance in complex emergencies is not true?

- a. It may involve the community itself
- b. It is performed only at specific times
- c. It could be focused only on specific problems according to the context
- d. It has a preventive purpose

17) The START Triage method is based on the detection of the following parameters except:

- a. radial pulse
- b. respiratory rate
- c. level of consciousness
- d. heart rate

18) Which of the following treatments are allowed by START Triage method:

- a. airway management and external hemorrhage control
- b. c-spine control
- c. cardiopulmonary resuscitation
- d. None

19) The Mass Casualty Triage consists of the following elements:

- a. assessment of the nature and severity of injuries
- b. categorization of the victims
- c. rapid assessment of all the victims of a disaster
- d. all the precedent

20) Triage this victim using the START triage algorithm:

Gender: F Age: 19

Remarks: Sitting inside the bus. Shortness of breath; abrasions right hemothorax and abdomen

Symptoms: Pain in the chest and abdomen

Vital signs:

BP 70/40 mmHg

FC 144/min

FR 35/min

Radial pulse: None

State of consciousness: Shaken, difficulty in performing simple commands

Pupils: Left / right normal photomotor reflex present and symmetrical

Choose one:

- a. MINOR/GREEN
- b. DELAYED/YELLOW
- c. IMMEDIATE/RED
- d. DECEASED/BLACK

21) All of the following are part of the 3S concept of Surge Capacity EXCEPT:

- a. Stuff
- b. Staff
- c. Selection
- d. Structure

22) The best way to save lives in a MCI is :

- a. Applying the "scoop and run" approach
- b. Applying the "stay and play" approach
- c. Applying the "scoop and play" approach
- d. Not to stick to fixed protocols but applying principles adapted to each situation

23) The following statements are related to personal and scene safety EXCEPT:

- a. It is recommended that disaster response groups include security personnel to help protect responders and equipment
- b. Response personnel should, if at all possible, have two-way communications equipment available to report concerns and call for assistance if needed
- c. Although formal self-defense training is likely of minimal benefit, response personnel may benefit from training in situational awareness and risk prevention
- d. Rescue-workers are allowed to use weapons in their defense during rescue

24) In some disaster situations rescue-workers should take into account some specific issues. Indicate which of the following concepts might need your attention.

- a. Floods may represent additional hazards related to redistribution of chemicals and other materials inundated by flood waters
- b. Stagnant water may create mold and insect hazards
- c. Animals as "victims" in a disaster may become a potential source of life-threatening infectious diseases
- d. All the above

25) Common safety measures in disaster situations include:

- a. Setting up safety margins/Safety factors
- b. Implementation of standard protocols and procedures
- c. Training of caregivers
- d. All the above

Appendix 4: Form for evaluation of course by students

Review Guidelines						
Please take a moment to complete this evaluation form. Your comments will assist us in improving our future community-based disaster medicine workshops and seminars. Please fill out the form below and submit it prior to leaving the class.						
Participant Information						
Name <i>(Optional):</i>			Were you personally interested in this course? (Yes/ No)			
Date:			Were your personal goals for this course met? (Yes / No)			
Evaluation						
Scale: 1. strongly agree; 2. agree; 3. neutral; 4. disagree; 5. strongly disagree						
	1	2	3	4	5	Comments
1. Overall, the pre-workshop course was appropriate and informative.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
2. The workshop was scheduled at a suitable time of year.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
3. Overall, the workshop facilities and location were appropriate and satisfactory.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
4. Overall, the workshop material was presented in a clear and organized manner.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
5. Overall, the instructors were effective and responded to questions in an informative, appropriate and satisfactory manner.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
6. Overall, the handouts for discussion groups and case studies were clear and useful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
7. Overall, the workshop was informative and valuable.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
8. Was the workshop above or below your current knowledge level?	<input type="checkbox"/> Above <input type="checkbox"/> Below <input type="checkbox"/> Just Right					
9. Would you recommend this session to another colleague?	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>		
10. In what ways could this workshop have been improved to better suit your needs?						
11. Other comments.						
Thank you for participating in this Evaluation. Your feedback is valuable to us.						