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## Disaster medicine curricula in Saudi Arabian medical schools

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### 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.<sup>1,2</sup>

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.<sup>3–8</sup> 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.<sup>9,10</sup> Several medical schools and professional organizations have developed curricula and sets of core competencies geared towards the education of all physicians.<sup>1,3,11–18</sup> According to a report,<sup>18</sup> 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.<sup>19</sup>

The Kingdom of Saudi Arabia is not exempt from natural and man-made disasters, the most common events being floods<sup>20</sup> 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.<sup>1–3,11–13,15,17,18,21,22</sup> 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.<sup>23</sup> 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.<sup>23</sup>

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.<sup>23</sup> 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.<sup>11,23</sup>

### **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**

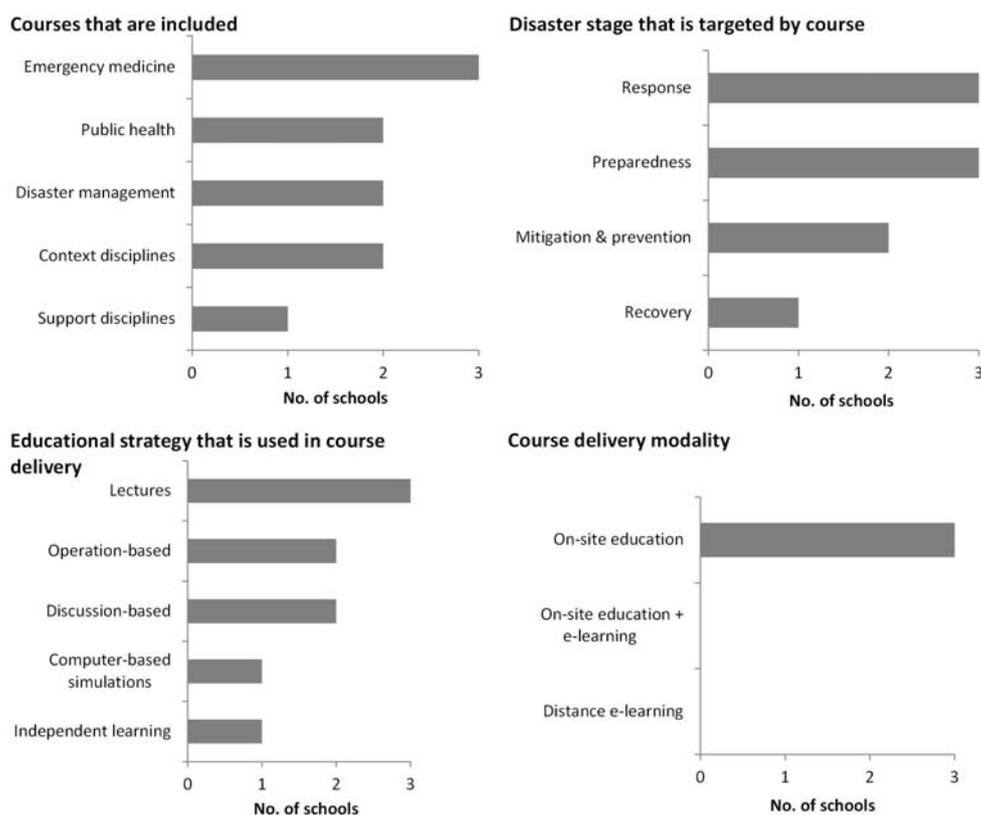
Only three of the 20 responding Saudi Arabian medical schools have undergraduate disaster medicine curricula, and these are all government-funded schools. In all three cases, disaster medicine is taught as an accredited complementary course integrated with related subjects such as emergency medicine, 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).

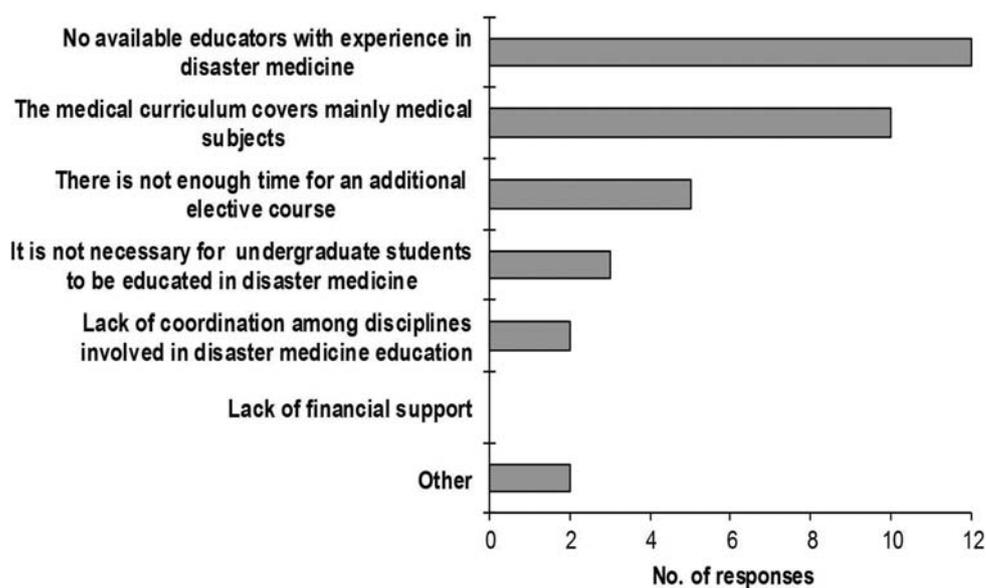
Respondents indicated that an average of 9.0 hours (SD = 6.97 h) should be dedicated to disaster medicine education. Sixteen of the seventeen schools lacking a disaster medicine curriculum stated that they prefer to implement such a curriculum as a complementary course. Thirteen schools preferred disaster 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.

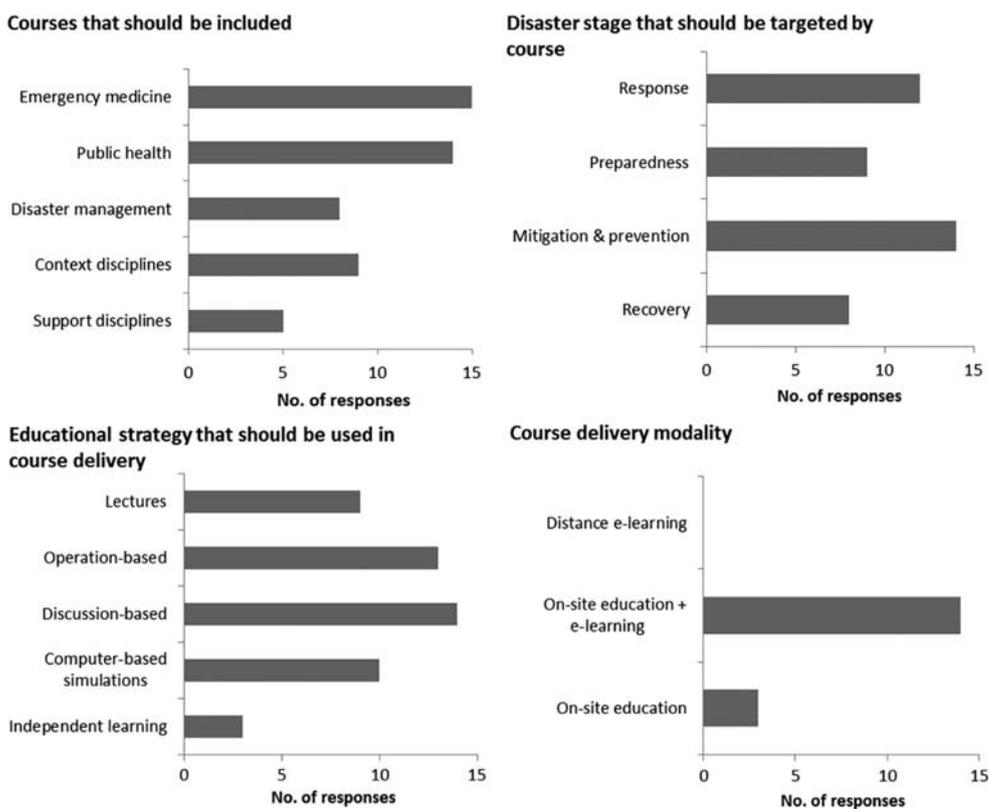
### DISCUSSION

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.<sup>6,8,24-28</sup> 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.<sup>26</sup> In 2005, 46% of Canadian medical schools did not teach disaster medicine, though 92% of them believed that this material should be core content.<sup>25</sup> A Chinese survey of medical students, teachers, clinicians and laypeople concluded that knowledge of disaster medicine was inadequate.<sup>29</sup>



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

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

	Responders	Non-responders	Total
<b>Funding*</b>			
Government	17 (85%)	9 (90%)	26 (87%)
Private	3 (15%)	1 (10%)	4 (13%)
<b>Disaster medicine curriculum (DMC)#</b>			
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.<sup>30</sup>

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%).<sup>31</sup>

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.<sup>23,31</sup> 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.<sup>16</sup> Students also prefer simulation-based learning to a lecture-based curriculum.<sup>13,14</sup>

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.<sup>23</sup> Other studies have generally shown that students are eager for training in most subdomains of disaster medicine.<sup>10,24–26,29,31</sup> 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.<sup>23</sup>

## 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).<sup>23</sup> 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.

## Funding sources

No funds were received for this project.

## Acknowledgements

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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:**

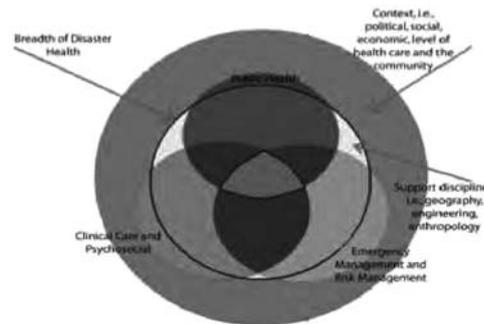


Figure 1—A framework for "Disaster Health" (Bradt *et al.*, 2003)

Murray © 2008. Prehospital and Disaster Medicine

<b>Emergency medicine</b>	pre-hospital triage, tagging, treatment and transport Emergency department triage, stabilization, care and referral Facility-based specialty coordination
<b>Public health:</b>	Environmental health monitoring Hazardous material handling and safety, Relief worker disease surveillance Disease outbreak investigation
<b>Disaster management:</b>	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.
<b>Context disciplines includes</b>	Basic life support, community health care economics, media management, political science, social sciences, and socio- economic sciences.
<b>Support disciplines includes</b>	: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 :	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 polices, 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

**Look at the pictures below:**

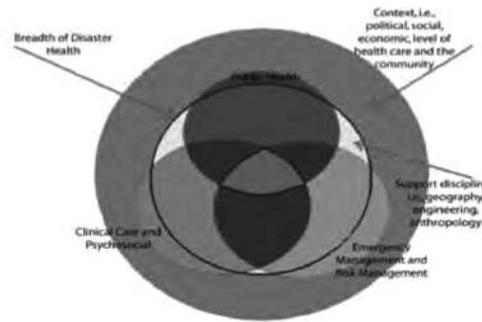


Figure 1—A framework for "Disaster Health" (Bradt et al, 2003)

Murray © 2004 Prehospital and Disaster Medicine

<b>Emergency medicine</b>	pre-hospital triage, tagging, treatment and transport Emergency department triage, stabilization, care and referral Facility-based specialty coordination
<b>Public health:</b>	Environmental health monitoring Hazardous material handling and safety, Relief worker disease surveillance Disease outbreak investigation
<b>Disaster management:</b>	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.
<b>Context disciplines includes</b>	Basic life support, community health care economics, media management, political science, social sciences, and socio- economic sciences.
<b>Support disciplines includes</b>	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**

<b>1. Discussion -based exercise :</b>	Provide a forum for discussing or developing plans, agreements, training and procedures
<b>1.1.Seminar :</b>	provide concept of idea and presentation
<b>1.2.Workshop :</b>	active a specific goal or build product
<b>1.3. Games:</b>	explore decision making process and examine the consequence of this decision
<b>2.Operation – based exercise:</b>	validate plan polices, agreements and procedures clarify the role and responsibilities
<b>2.1 Drill :</b>	validate single operation or function of an agency
<b>2.2 A functional exercise (FE) :</b>	is a single or multi-agency activity designed to evaluate capabilities and multiple functions using simulated response
<b>2.3 A full-scale exercise (FSE)</b>	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?**