

DISASTER MEDICINE CURRICULUM: DETERMINING A NEED

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Disaster Medicine Curriculum: Determining a Need

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This survey was created, distributed, and analyzed following the checklist for reporting results of internet E-surveys (CHERRIES) guidelines

Abstract

Purpose: Recent terrorist attacks, natural disasters, and mass casualty incidents have made clear the need for properly trained healthcare personnel. Whether or not medical schools require their students to participate in any disaster medicine curriculum, and whether it is beneficial, is currently under review in the medical curriculum. The purpose of this study is to evaluate if fourth year medical students in the state of Arizona have experience in disaster medicine and to determine if they think it should be a part of the medical school curriculum.

Design: We created a digital questionnaire assessed the background of the medical student answering the questions and the comfort level of the medical student with disaster medicine, using a 5-point Likert response scale.

Results: We found that 51% of students who took the survey felt inadequate to some degree with their disaster medicine training so far and that 69% of respondents think there should be more training within the medical school curriculum. There was no significant difference in confidence to triage and treat disaster medicine patients between students who had received training as pre-medical students versus those who had not. There was a significant difference in confidence to triage and treat disaster medicine patients between students who had received training in medical school and those who had not.

Conclusion: The majority of students in this survey did not feel adequately prepared for disaster medicine and thought that it should be included within the medical school curriculum. Students who had already been exposed to disaster medicine in medical school felt more confident in their ability to triage and treat patients than those who had not.

Introduction:

Recent terrorist attacks, natural disasters, and mass casualty incidents have made clear the need for properly trained healthcare personnel. Post September 11, 2001, each state was instructed by the Center for Disease Control and the United States Public Health Service to revise their plans for any attack that may pose a threat to public health and safety¹. Divisions of the CDC were created to help coordinate and manage biological terrorism attacks, an arduous process that resulted in highly trained personnel.

For local disasters, national or even state level emergency preparedness resources may not be activated. This means that emergency departments, parent hospitals, and associated staff will need to be capable of managing a large number of patients in a short amount of time. In 2014, the CDC estimated that the average emergency department wait time for patients was 30 minutes while the average treatment time was 90 minutes². Long wait times combined with extended treatment times leads to emergency department overcrowding. This creates a vicious cycle, causing longer wait times and higher volumes of patients. In a study that surveyed 575 hospitals, 91% of them reported overcrowding in their emergency rooms³. Overcrowding most often occurred a few times per week in 53% of the hospitals, while it was reported as a daily occurrence in 39% of the hospitals. Full waiting rooms could last more than 6 hours per day. With emergency departments already so full on an almost daily basis, it is hard to imagine smooth and efficient operations during a mass casualty incident.

While entire states and national organizations may be better prepared for disasters with stores of clean water, food, vaccines, and emergency medical equipment, we must specifically

make sure that we are training physicians and other healthcare workers to handle the volume of patients that may influx secondary to a mass casualty event. As of 2016, there are over 380 courses offered to emergency physicians in disaster management and planning⁴. Though these courses are beneficial to emergency physicians and surgeons, many of them are not designed with other specialties in mind who may be called to help in the event of a disaster. A vast majority of the courses do not specify whether students or even residents are able to participate, or if the courses are designed for attending physicians with extensive clinical experience. This leads us to question whether there is a curriculum designed to be introduced early on in medical education that can be beneficial to physicians of all specialties.

When it comes to current disaster medicine curricula in medical school education, not much is required and many schools do not have objectives in the subject⁵. A few studies have proposed curricula that would give medical students the opportunity to train for disaster medicine and have a basic competency in the subject. One such study was designed in Canada and was based on evidence and outcome-based objectives. The objectives would include the following competencies: definitions of terms, philosophy of disaster medicine, description of disasters, historical perspective of disasters in Canada and worldwide, disaster management, risk analysis, EMS and disaster response, hospital disaster planning and response, medical management of disasters, psychosocial aspects of disaster medicine, international disaster response and ethics, and disaster medicine research⁶. A study conducted by the same researchers called upon the faculty and administration of fifteen Canadian medical schools to assess whether they felt the need for disaster medicine to be taught in medical school and, if so, what their schools were doing in order to fill this need. Despite obvious support for disaster medicine instruction and increases in terrorism and global disasters, 46% of the responding medical schools do not teach this topic⁵.

A study conducted with Dutch medical students in 2015 aimed to assess whether medical students felt that disaster medicine should be taught in their curriculum. A total of 999 students were surveyed, with 51% of participants stating that disaster medicine should absolutely be taught in regular medical curriculum⁷. Only 13% of participants stated that they had some knowledge of disaster medicine, though there was a high willingness to respond in disasters even without prior disaster medical knowledge. The study concluded that their students were not educated for disaster situations⁷. Another study published in 2017 aimed at assessing if disaster medicine curriculum designed for medical students would have a positive impact. Faculty members from four different healthcare schools (including nursing, medicine, pharmacy, and allied health) designed an online didactic course that would then be paired with interdisciplinary simulations based on real-life disaster situations. Pre-course and post-course assessments were given to the students to assess learning as well as overall satisfaction. The study found that 94% of students reported learning useful skills and that many felt that the interdisciplinary component of the education was vital in developing key communication skills⁸.

Methods

We created a digital questionnaire that first assessed the background of the medical student answering the questions. The second part of the survey aims to assess the comfort level of the medical student with disaster medicine, using a Likert scale rating system. The questionnaire was designed through Qualtrics and a link to the questionnaire was distributed to 4th year medical students using the schools' listservs. The survey was distributed to 4th year

medical students in March 2018 and March 2019. The University of Arizona IRB approved the survey in December 2017. The survey questions and potential answers are provided below.

1. What is your specialty of interest in medicine?
 - What residency specialty have you applied to/will you apply?
2. What prior medical exposure did you have before entering medical school?
 - Scribe
 - EMT
 - Paramedic
 - Firefighter
 - Law enforcement officer
 - Military medic/corpsman
 - Nurse
 - Certified Nurse Assistant
 - Pharmacy technician
 - Pharmacist
 - Veterinarian
 - Public health
 - Chiropractor
 - Foreign medical graduate
 - Admitted to medical school with advanced standing
 - DDS/MD/DO program
 - Shadowing physicians
 - If so, which specialties?
 - Other
 - Please specify
3. Have you had exposure to disaster medicine training during your pre-medical experiences?
 - If so, please describe
4. Have you had exposure to disaster medicine training during your medical school experience?
 - If so, please describe
5. Have you had exposure to disaster medicine training during medical school that was **NOT** sponsored by your medical school?
 - E.g. disaster medicine courses, wilderness medicine courses, mass casualty exercises
 - If so, please describe
6. Of the disaster medicine training you have received during medical school, was it
 - a curriculum requirement
 - training that was encouraged
 - something you chose to pursue on your own?
7. Do you feel prepared to **triage** patients during a mass casualty disaster?
 - 1 = Definitely yes
 - 2 = Probably yes
 - 3 = Unsure

- 4 = Probably not
 - 5 = Definitely not
8. Do you feel prepared to **treat** patients during a mass casualty disaster?
- 1 = Definitely yes
 - 2 = Probably yes
 - 3 = Unsure
 - 4 = Probably not
 - 5 = Definitely not
9. Do you feel that medical school has adequately prepared you in disaster medicine?
- 1 = Extremely adequate
 - 2 = Moderately adequate
 - 3 = Slightly adequate
 - 4 = Neither adequate nor inadequate
 - 5 = Slightly inadequate
 - 6 = Moderately inadequate
 - 7 = Extremely inadequate
10. The degree to which medical school has adequately prepared me for disaster medicine is
- 1 = Extremely adequate
 - 2 = Moderately adequate
 - 3 = Slightly adequate
 - 4 = Neither adequate nor inadequate
 - 5 = Slightly inadequate
 - 6 = Moderately inadequate
 - 7 = Extremely inadequate
11. Do you wish there was more mandatory training in disaster medicine in the medical school curriculum?
- 1 = Definitely yes
 - 2 = Probably yes
 - 3 = Unsure
 - 4 = Probably not
 - 5 = Definitely not
12. What additions, if any, to the medical curriculum would make you more comfortable as a physician in disasters?

Results

A total of 51 students responded to the questionnaire. With regards to chosen specialty, 49% (25) answered primary care, 43% answered non-primary care/non-surgical (22), and 8% chose surgery (4). Prior exposure to medicine was mostly shadowing at 67% (34), followed by public health and scribing. Prior to medical school starting, only 17% (9) of respondents had exposure to disaster medicine. During medical school, 78% (40) of respondents answered that they had training in disaster medicine, with 51% (26) of respondents answering that this was part of a required curriculum.

Question	Definitely not	Probably not	Unsure	Probably yes	Definitely yes	Total
Do you feel prepared to triage patients during a mass casualty disaster?	3	10	9	23	6	51
Do you feel prepared to treat patients during a mass casualty disaster?	4	9	11	25	2	51
Do you wish there was more mandatory training in disaster medicine in the medical school curriculum?	0	6	10	21	14	51

Table 1

Question	Extremely inadequate	Moderately inadequate	Neither adequate nor inadequate	Moderately adequate	Extremely adequate	Total
Do you feel that medical school has adequately prepared you in disaster medicine?	4	20	3	23	1	51
The degree to which medical school has adequately prepared me for disaster medicine is:	4	22	2	23	0	51

Table 2

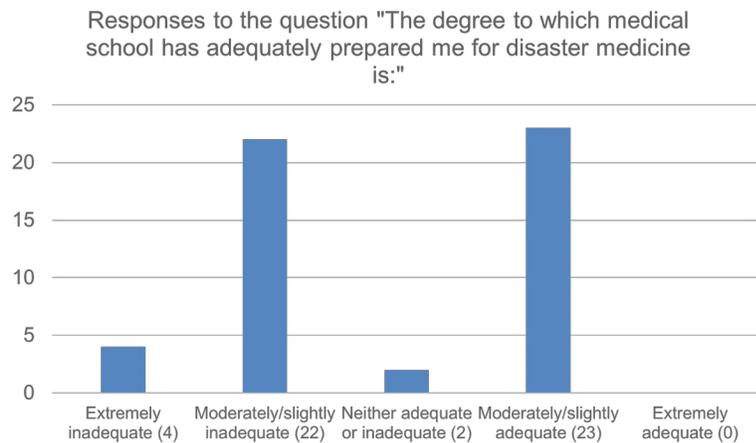


Figure 1

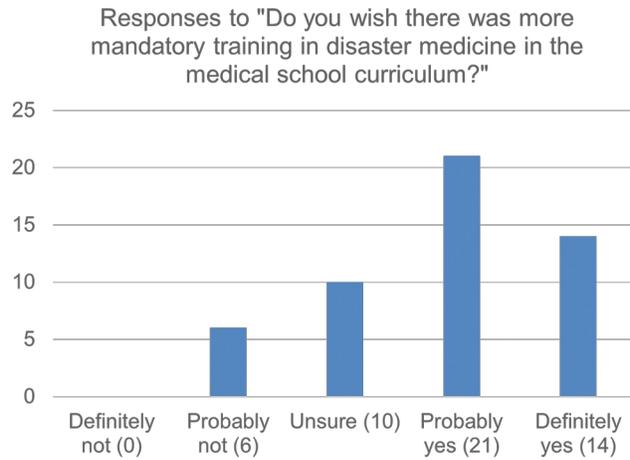


Figure 2

We analyzed the answers to the questionnaire based on two categories of respondents: those that had disaster medicine training during their pre-medical experiences and those that had not. There was no statistically significant difference between the two groups when it came to feeling prepared to triage and treat disaster medicine patients (table 3).

Table 3: Pre-medical exposure vs. no pre-medical exposure (Wilcoxon rank-sum to compare Likert scales)

There was also no statistically significant difference between the two groups of students as to whether they felt mandatory disaster medicine curriculum in medical school was needed.

The next groups of students we compared were those that had received some sort of training while in medical school versus those that did not. There was statistically significant difference between the two groups in whether students felt prepared to triage and treat patients in mass casualty situations and whether they felt that medical school had adequately prepared them for disaster situations. Students who had no exposure to disaster medicine prior to medical school answered with lower ratings on the survey, indicating that they did not feel adequately prepared with disaster medicine. There was no statistically significant difference between the groups when it came to wanting more disaster medicine curriculum in medical school – both groups felt that there could be more within the curriculum (Table 4).

	Have you had exposure to disaster medicine training during your medical school experience?		P-value
	No	Yes	
	Mean (SD)	Mean (SD)	
Do you feel prepared to triage patients during a mass casualty disaster? (n, %)	2.54 (1.03)	3.60 (1.03)	0.006
Do you feel prepared to treat patients during a mass casualty disaster? (n, %)	2.45 (1.13)	3.45 (0.93)	0.009
Do you feel that medical school has adequately prepared you in disaster medicine? (n, %)	2.72 (1.34)	4.17 (1.56)	0.01
The degree to which medical school has adequately prepared me for disaster medicine is:	2.72 (1.34)	4.03 (1.68)	0.04
Do you wish there was more mandatory training in disaster medicine in the medical school curriculum?	2.36 (1.03)	2.97 (0.92)	0.06

Table 4: Medical school exposure vs medical school non-exposure (Wilcoxon rank-sum to compare Likert scales)

Next, we compared students by their chosen specialties. There was a statistically significant difference between those going into surgery and those going into primary care when it came to students feeling that medical school adequately prepared them for medical school. (table 5). Primary care students were more neutral, whereas surgery students felt that medical school did not adequately prepare them.

Outcomes	Primary Care	Non-PC / Non-Surgical	Surgery	P-value
Do you feel prepared to triage patients during a mass casualty disaster? (n, %)	3.12 (1.24)	3.54 (0.96)	4.00 (0.82)	0.29
Do you feel prepared to treat patients during a mass casualty disaster? (n, %)	3.12 (1.05)	3.27 (1.12)	3.75 (0.50)	0.45
Do you feel that medical school has adequately prepared you in disaster medicine? (n, %)	3.44 (1.53)	4.00 (1.60)	5.75 (0.96) *	0.03
The degree to which medical school has adequately prepared me for disaster medicine is:	3.36 (1.66)	3.86 (1.69)	5.50 (0.58)	0.07
Do you wish there was more mandatory training in disaster medicine in the medical school curriculum?	3.08 (0.86)	2.54 (1.06)	3.00 (0.82)	0.17

Kruskal Wallis Test to compare Likert Scales between specialties

Table 5: Outcome by chosen specialty (Kruskal Wallis Test to compare Likert scales)

*Statistical significance between surgery and primary care following pairwise comparison with Bonferroni adjustment (p=0.016)

Outcome	None	Curriculum Requirement	Pursued on my own	Training that was encouraged	P-value
Do you feel prepared to triage patients during a mass casualty disaster? (n, %)	2.54 (1.04)	3.38 (1.13)	4.00 (0.76)*	4.00 (0.63)	0.02
Do you feel prepared to treat patients during a mass casualty disaster? (n, %)	2.45 (1.13)	3.15 (0.67)	4.13 (0.64)*	3.83 (0.41)	0.003
Do you feel that medical school has adequately prepared you in disaster medicine? (n, %)	2.72 (1.34)	4.03 (1.68)	3.87 (1.35)	5.16 (0.98)**	0.04
The degree to which medical school has adequately prepared me for disaster medicine is:	2.72 (1.34)	3.84 (1.71)	3.62 (1.77)	5.33 (0.82)**	0.04
Do you wish there was more mandatory training in disaster medicine in the medical school curriculum?	2.36 (1.03)	2.92 (0.89)	2.63 (1.06)	3.66 (0.52)	0.04

Table 6: Outcome by type of medical school experience (Kruskal Wallis test to compare Likert scales between specialties)

*Statistical significance between None and Pursued on Own groups following pairwise comparison with Bonferroni adjustment ($p < 0.008$).

**Statistical significance between None and Encouraged groups following pairwise comparison with Bonferroni adjustment ($p < 0.008$).

Discussion

The goal of this study was to examine the exposure and confidence level of 4th year medical students with disaster medicine. The survey was distributed to 160 fourth year medical students and 51 students responded, giving the study a response rate of 32%. We found that 51% of students who took the survey felt inadequate to some degree with their disaster medicine training so far (figure 1) and that 69% of respondents think there should be more training within the medical school curriculum (figure 2).

We did not find any statistically significant difference in responses between students who had pre-medical disaster medicine training and those that did not (table 3). There was a statistically significant difference between students who had exposure to disaster medicine while in medical school and those who did not. Those with no prior experience with disaster medicine before starting medical school did not answer as highly as the students with exposure to disaster medicine prior to starting medical school. These findings may be for several reasons. The training that students receive prior to medical school may be geared towards other health professionals, or they may have received the training long before medical school started and have forgotten the details. The important takeaway is that the data demonstrates that those who are receiving disaster medicine training in medical school are finding it valuable.

At the end of the survey, students were asked if they had any suggestions on how disaster medicine might best be incorporated into the curriculum. Many of the responses involved adding

simulations, especially for triage. In 2016, the German Medical Students' Association created a gameboard simulation called AFTERSHOCK, a game designed to simulate early disaster response after an earthquake. Eighty-nine medical students played the game and found the simulation to be a useful way to learn about the challenges of humanitarian assistance and disaster relief⁹. Another student in 2018 aimed to assess if medical students would gain knowledge of disaster medicine through a course that consisted of both didactics and hands-on simulations. The authors developed a curriculum that lasted over the course of two years and consisted of 24 hours of combined training. Before the course and at the end of the course, students were evaluated via a multiple choice questionnaire. The mean test score for all students participating in the training increased from 5.30 ± 1.05 (with a maximum score of 10), to 7.98 ± 0.96 post course¹⁰. Studies like these demonstrate that education on disaster medicine while in medical school would have great benefit for the students.

A major limiting factor in this study is the sample size. There were 51 4th year medical students who responded to the survey. Although this study concluded that 4th year medical students think there should be more disaster medicine in medical school curriculum, a larger study is needed in order to confirm this conclusion. This study was also limited to 4th year medical students and did not survey attendings or residents at any level of training. It would be interesting to see how the completion of residency would affect these results. Many hospitals have mass casualty simulations to train their personnel, which may affect the confidence that attendings and residents have with disaster medicine knowledge. Presuming that they participate in such trainings and have more medical training in general, it would be interesting to see if they feel more comfortable with the subject than the 4th year medical students do and exactly what factors have contributed to that possible elevated confidence.

The importance of disaster medicine preparedness is unfortunately demonstrated on a regular basis throughout the world. This survey demonstrated that 4th year medical students do not feel comfortable treating and triaging patients of mass casualty events and that they think disaster medicine should be a part of the medical school curriculum. As other studies have demonstrated, we have various ways to implement this education into the curriculum. Whether through simulations, didactics, or in-person lectures, disaster medicine can successfully be taught to medical students and have a lasting impact on their educations.

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