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Abstract

Objectives: This study aimed to understand the current landscape of USA-based disaster medicine (DM) programs through the lens of alumni and program directors (PDs). The data obtained from this study will provide valuable information to future learners as they ponder careers in disaster medicine and allow PDs to refine curricular offerings.

Methods: Two separate surveys were sent to USA-based DM program directors and alumni. The surveys gathered information regarding current training characteristics, career trajectories, and the outlook of DM training.

Results: The study had a 57% response rate among PDs, and 42% response rate from alumni. Most programs are 1-year and accept 1–2 fellows per class. More than 60% of the programs offer additional advanced degrees. Half of the respondents accept international medical graduates (IMGs). Only 25% accept non-MD/DO/MBBs trained applicants. Most of the alumni hold academic and governmental positions post-training. Furthermore, many alumni report that fellowship training offered an advantage in the job market and allowed them to expand their clinical practice.

Conclusions: The field of disaster medicine is continuously evolving owing to the increased recognition of the important roles DM specialists play in healthcare. The fellowship training programs are experiencing a similar evolution with an increasing trend toward standardization. Furthermore, graduates from these programs see their training as a worthwhile investment in career opportunities.

Introduction

The growing need for disaster medicine (DM) specialists is becoming increasingly evident as the world faces an escalation in natural and human-made disasters. Disaster medicine, a specialized niche within emergency medicine, is crucial in responding to these events and the broader spectrum of disaster management, including preparedness, recovery, and mitigation.¹ The National Center for Environmental Information highlights the escalating frequency and severity of disasters in the US, with numerous costly events such as severe storms, wildfires, and floods occurring between 1980 and 2020, not to mention the staggering costs associated with the COVID-19 pandemic.² A similar trend is seen globally and is expected to worsen due to the escalating impacts of climate change. For example, there has been a 5-fold increase in weather-related disasters over the past 50 years, often disproportionately impacting low-income countries.³ Given this increase in disasters, it is imperative to have trained personnel in place to provide care to affected populations. There are currently 14 fellowship programs in the USA that offer specialized DM training (Table 1). As of the time of this study, disaster medicine was not accredited by the Accreditation Council for Graduate Medical Education (ACGME). A lack of a national governing body leads to variability among the various fellowship programs in terms of structure and curriculum offerings.

The purpose of this study was to learn about the current landscape of disaster medicine fellowship programs in the USA. Our objective was to collect data on curriculum content, training methodologies, and career trajectories. A survey was issued to program directors and program alumni. The data collected will enable stakeholders to improve disaster medicine fellowship educational offerings and establish a foundation for a common curriculum.

Table 1. List of DM programs obtained from the Emergency Medicine Residency Association (EMRA) fellowship guide, third edition¹

Disaster Medicine Programs	Length of Training (Years)
Beth Israel Deaconess Medical Center/Harvard	1
Brown University/Rhode Island Hospital	1
Carolinas/Atrium Health	1–2*
George Washington University	2
ICAHN School of Medicine at Mount Sinai - DM and Hospital Leadership	1
Indiana University	1
Johns Hopkins University	2
Mass General Hospital	1
State University of New York (SUNY) Downstate	1–2*
University of California Irvine	1
University of Connecticut	1–2*
University of Massachusetts	1–2*
University of Texas at San Antonio	1–2*
University of Texas Southwestern (Combined Global Health, EMS, and International DM)	2

*An extra year is added if pursuing an advanced degree/additional fellowship: EMS, MPH, etc.

Methods

Study Design and Setting

This study used a cross-sectional design. It comprised 2 separate surveys to capture responses from USA-based program directors (PDs) and alums. This study followed a similar design pattern employed by Neal *et al.*, which examined the training and career of regional anesthesia and acute pain fellows.⁴

Participants

The target population consisted of program directors and graduates of DM fellowship programs across the USA. Eligible programs were identified using the Emergency Medicine Residency Association (EMRA) fellowship guide, third edition,¹ for a current list of disaster medicine exclusive fellowships. The directory listed 14 programs, several of which were considered to have an approved curriculum by the Society of Academic Emergency Medicine (SAEM). The contact information for the program directors (PD) was obtained from program websites. An alumni listserv was requested from the PDs; 7 programs provided this information.

Survey Development and Distribution

The survey was developed by a multidisciplinary team at Beth Israel Deaconess Medical Center (BIDMC) disaster medicine fellowship program. The survey, which included an invitation letter detailing the study's purpose and confidentiality agreements, was emailed to the identified program directors and alumni. The PD version was open from February 2, 2024–February 23, 2024. The alumni version was open from February 9, 2024–February 23, 2024. At least 1 reminder email was issued to each group. Consent to participate was obtained.

Data Collection and Analysis

The REDCap survey platform was used to collect and store all survey responses anonymously. Data were exported from REDCap to Microsoft Excel for analysis upon the survey's closure.

The study used descriptive statistics to summarize various aspects of the program, such as its characteristics, curriculum elements, and participant demographics. Categorical variables were presented as frequencies and percentages. Open-ended responses were analyzed using thematic analysis to identify common themes.

Ethical Considerations

The institutional review board of the Beth-Israel Deaconess Medical Center (BIDMC) deemed this study exempt from approval as human subject research. All participants were assured of confidentiality and informed that participation was voluntary, with no negative consequences for non-participation. The study was approved by the Institutional Review Board (IRB) of BIDMC (IRB# 2023P001050).

Results

Program Directors

Eight of 14 program directors responded to the survey (57% response rate). Most of the programs are subdivisions of emergency medicine (63%). Many DM fellowships have been in operation for more than 6 years (Table 2).

Most programs (75%) have a 1-year training duration; the remainder are 2 years, and none are longer than 2 years.

There is a near-even split among the respondents regarding the teaching modalities employed. About a third of the respondents reported equal parts of didactic and field experience, and a similar proportion also reported didactics primarily with a small portion of field experience. Two programs noted mostly field experience with a small component of didactics. Interestingly, more than half of the programs offer an option for field deployment as part of their curriculum.

More than 60% of the programs offer an additional advanced degree, in most cases a Master of Public Health (MPH). All the respondents confirmed that they accept at least 1–2 fellows per class, while 1 program indicated they accept more than 2 fellows per class.

Fifty percent of the programs accept international medical graduates. Twenty-five percent accept non-MD/DO candidates, and a similar percentage also accept non-emergency medicine-trained candidates.

Around half of the respondents mention some form of accreditation or approval, mainly from SAEM. One respondent noted accreditation from another non-SAEM group not mentioned in the response.

In reference to the curriculum, at least 75% of the respondents agreed (somewhat or strongly agreed) that their program exposed fellows to essential curricular items specified in the SAEM 1-year format. The SAEM developed a standard curriculum that must be followed by DM fellowships in order to gain SAEM approval. The organization created a 1-year and a 2-year curriculum format. Seventy-five percent of the respondents report that research is a graduation requirement. Interestingly, while half of the programs report producing fewer than 5 publications in the past decade, the other half report over 11 publications, with 3 programs reporting over 20 publications in the past decade.

Table 2. Program director response data

Survey Data Program Directors			
Response Rate	8 (42%)		
How long has a disaster medicine fellowship been in operation at your institution?			
3–5 years	2 (25%)		
6–10 years	3 (37.5%)		
Greater than 10 years	2 (25%)		
How many publications have your program produced in the past decade?			
0–5	4 (50%)		
6–10	0		
11–20	1 (12.5%)		
> 20	3 (37.5%)		
With regard to fellowship training, which modality best describes your teaching modality?			
Equal Part Didactic, field experience	3 (37.5%)		
Mostly field experience (> 80%) with a small component of didactic experience	2 (25%)		
Mostly didactic (>80%) with a small component of field experience	3 (37.5%)		
What is the length of training?			
1 year	6 (75%)		
2 years	2 (25%)		
How many fellows do you accept per class?			
1–2	8 (100%)		
Yes/ No Responses	Yes	No	
Does your program offer other professional degrees as part of the fellowship?	5 (62.5%)	3 (37.5%)	<i>Professional degree offered: MPH (100%)</i>
Does your program accept International Medical Graduates (IMGs)?	4 (50%)	4 (50%)	
Does your program accept non-MDs/DOs?	2 (25%)	6 (75%)	
Does your program accept non-emergency medicine-trained individuals?	2 (25%)	6 (75%)	
Does your fellowship have an accreditation from any organization (i.e. SAEM)?	5 (62.5%)	3 (37.5%)	
Does your fellowship offer deployment during training?	5 (62.5%)	3 (37.5%)	
Is research a required component for graduation?	6 (75%)	2 (25%)	
Is Disaster Medicine a combined fellowship at your institution?	2 (25%)	6 (75%)	
Is disaster medicine a sub-division (housed under another department or division) at your institution?	5 (62.5%)	3 (37.5%)	<i>Emergency Medicine (80%); EMS (20%)</i>

Fellowship Alumni

Ninety-seven alumni were contacted across seven programs. Five recipient emails were invalid, and 39 completed the survey (an adjusted response rate of 42%).

The survey found that 58% of the participants had completed fellowship training within the past 2 years. At the time of fellowship, 33% were considered international medical graduates (IMGs). Nearly 90% of the respondents were MDs, DOs, or MBBS. The remainder identified as having a Master's or Doctor of Nursing Practice.

Fifty-eight percent of respondents worked in academic settings post-fellowship. Over 31% worked in government positions. 26% worked in community practice, and another 21% were in emergency management. A small portion, 2.6%, worked in NGOs. A significant portion of respondents held roles that overlapped multiple practice domains or in combination (Table 3).

The majority (74%) of the participants agreed or strongly agreed that their fellowship training gave them an advantage in the job market. Most respondents mentioned that their fellowship training allowed them to expand their niche of clinical practice (74%) and assume leadership roles (69%). In terms of salary impact, the responses were neutral.

Curriculum

Regarding curriculum, at least 74% of the respondents agreed (somewhat or strongly) that their fellowship adequately trained them on key curricular domains specified in the SAEM 1-year format (Table 4).

Free Responses (Table 5)

When asked about the best aspect of fellowship, most respondents highlighted the networking and collaboration opportunities they

Table 3. Alumni response data

Alumni Data					
Response rate	39 (42%)				
How long ago did you complete your fellowship?					
0–2 years	22 (56.4%)				
3–5 years	6 (15.4%)				
6–10 years	8 (20.5%)				
Greater than 10 years	2 (5.1%)				
Were you considered an IMG during the fellowship?					
Yes	12 (30.8%)				
No	24 (61.5%)				
Which of the following best describes you?					
MD/DO	35 (89.7%)				
MBBS	1 (2.5%)				
BSN/DNP	2 (5.1%)				
Which of the following best describes your current practice?					
* Omitting percentages as several respondents checked multiple practice domains					
Academic Medicine	22				
Humanitarian activities	6				
Government	12				
NGO	1				
Community Practice	10				
Consulting	2				
Emergency Management	8				
	Strongly Agree	Somewhat agree	Neutral	Somewhat Disagree	Strongly Disagree
My fellowship training provided me with an advantage in the job market	18 (46.2%)	11 (28.2%)	7 (17.9%)	1 (2.6%)	2 (5.1%)
My fellowship training has positively impacted my salary	3 (7.7%)	7 (17.9%)	18 (46.1%)	7 (17.9%)	4 (10.3%)
My fellowship training allowed me to expand my niche of clinical practice	17 (43.6%)	12 (30.8%)	9 (23.1%)	1 (2.6%)	0 (0%)
I have assumed leadership roles as a result of my fellowship	7 (17.9%)	20 (51.3%)	7 (17.9%)	2 (5.1%)	3 (7.7%)

were afforded. A large portion of respondents also highlighted access to expertise and knowledge acquisition in response to this question. Respondents were also asked about what aspects of their fellowship they would like to improve, and most mentioned access to real-life and deployment opportunities.

Future of DM

Over 87% (34) of alumni respondents envision a future in which DM is an independent, stand-alone specialty with a governing body, entrance exams, and formal recognition.

Discussion

Today's society continues to face many disasters resulting from environmental and human activities and leading to the loss of lives and productivity. Along with this increase is a corresponding need for DM specialists who are not only trained in handling surge conditions but also well-versed in disaster preparedness and

mitigation efforts.⁵ The field of disaster medicine focuses on a wide variety of topics including mass casualty care, EMS disaster operations, humanitarian crisis response, chemical/biological/radiological/nuclear (CBRN), event response, hospital-based emergency management, and counter-terrorism medicine. The USA Centers for Medicare and Medicaid Services (CMS) requires health care facilities to perform all hazard risk assessments and update emergency plans annually. The Joint Commission requires USA hospitals to have emergency management criteria completed prior to accreditation. This speaks to an international and USA-based need for disaster medicine specialty-trained physicians as part of health care teams.

Currently, there are 14 USA-based disaster medicine fellowships according to the SAEM directory, the majority of which have only been operating for less than 10 years. Despite the emergence of new programs, there is still a dearth of information regarding the curriculum, training characteristics, and career trajectory of DM fellowship graduates.

Interestingly, there is general alignment among the programs on several domains surveyed, such as curriculum, affiliation, and

Table 4. Percentage of respondents who somewhat or strongly agree that their curricular offerings are in alignment with that specified by SAEM 1-year format

	% of PDs who agree	% of alums who agree
Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE)	75	100
Communications (social media and disasters, communication systems)	75	92
Disaster Medicine in the Field	88	92
Disaster Medicine Research (journal club, research basics, etc.)	75	90
Disaster Preparedness, Mitigation, Response, Resiliency	100	95
EMS and Disaster Medicine	100	95
Environmental Disasters	100	90
Ethical Issues in Disaster Medicine	100	92
Hospital Disaster Preparedness	100	97
Incident Command Systems	100	100
International Disaster Response	88	87
Introduction to Disaster Medicine	100	97
Mass Gathering Medicine	100	87
Psychological Aspects of Disaster Medicine	75	95
Public Health and Disaster Medicine	100	90
Safety & Security	88	90
Technological Disaster	88	82
Technology and Disaster Medicine (telemedicine, informatics, etc.)	88	74

Table 5. Free responses; thematic analysis with recurring themes

What was the single best aspect of your fellowship training?	Recurring Themes
Networking & Collaboration	15
Access to expertise	13
Knowledge Acquisition	13
Hands-on/Real-world experience	6
If you could have improved a single aspect of your fellowship training, what would that be?	
Hands-on/Real world exposure/Deployment	16
Structured Curriculum	8
Access to learning resources	4
Career Guidance	3
Certification	2
Cost	1

duration of training. This is particularly noteworthy given there is no formal governing body or ACGME recognition as of the time of this study.

Starting with curriculum, most programs offer a model similar to that specified by the SAEM 1-year format. This was also echoed

by the alumni response and is likely due to the concerted effort to build a standardized curriculum, first by SAEM⁶ and again by the Council of Disaster Medicine Fellowship Directors in 2023.⁷ Understandably, there has not been a formal curriculum appraisal of these programs as such evaluation would likely require an accrediting body. However, there have been several studies looking at a DM curriculum for the medical school and residency level.⁸⁻¹² One study looked at DM curricula in EMS fellowships.⁸ This further highlights the growing attention to the field of disaster medicine.

Another area of alignment among these programs is in their affiliation with emergency medicine. The majority of the programs surveyed are a subdivision of emergency medicine. Emergency medicine is a field concerned with timely assessment, stabilization, and treatment of critically ill patients.¹³ Historically, emergency medicine personnel have been relied upon to administer care in disaster conditions and it seems a natural progression that the field of disaster medicine would maintain roots in emergency medicine. Disaster medicine as a field, looks beyond medical treatment and into matters such as logistics coordination, resource allocation, and interagency collaboration.¹⁴ These disaster medicine-related areas constitute a significant portion of emergency medicine residency curricula, further bolstering the links between the 2 specialties.

Lastly, like most emergency medicine fellowships, most DM programs surveyed are 1 year in duration and only accessible to USA-trained MD/DO candidates.

Post Fellowship Pathways

Most alumni respondents work in academic settings post-fellowship. We see a similar trend in other EM-based fellowships. For example, 89% of graduates from medical education fellowships end up in academic centers.¹⁵ A similar trend is seen among toxicology-trained fellows.¹⁶ A significant portion of DM fellowship graduates hold government positions, as expected, given the considerable interplay of government agencies in disaster response and preparedness.

Interestingly, an overwhelming majority of the alumni surveyed credit their fellowship training with giving them an advantage in the job market. Also, a significant portion mentions that fellowship training allowed them to expand their clinical practice and assume leadership roles. This is particularly helpful for new residency graduates as they consider whether to pursue fellowship training. Although the survey did not explicitly ask about the worthiness of disaster medicine training, it can be inferred from the responses that most graduates view their fellowship as worthwhile.

On the issue of salary, the respondents were neutral. The financial implications of fellowship can be difficult to quantify but often play a role in decision-making. One must account for the initial upfront cost of education as opportunity costs against the future earnings realized from fellowship training. An intangible factor that is often overlooked is the theoretical longevity with the corresponding earnings that can be realized from a DM fellowship. Furthermore, there is also the intangible benefit of pursuing one's passion.

Limitations

Owing to the relatively small size of the total fellowships, the response rates are smaller than would be needed to ensure validity. For example, we had a 57% response rate (8) out of 14 PDs. We recognize that each non-respondent constitutes a significant portion of the total pool.

A significant portion of the alumni emails originated from a single program. This is likely due to the class size and age of this program, but it has the potential to introduce a sampling bias. Furthermore, the investigators of this study included alumni from their affiliated institutions to ensure completeness but recognize there is a potential conflict of interest and bias as alumni from the investigator's institutions are more likely to participate due to familiarity.

Future Directions

This study provided a general overview of USA-based disaster medicine programs. Further work is needed to understand the specifics of the curriculum components and the development of standardized models for hands-on and simulation training for disaster medicine fellows. These practical experiences can go a long way toward bridging the gap between academic and operation disaster medicine. In addition, it would be interesting to understand the attitude of employers toward fellowship-trained individuals in DM, especially as the graduates mention the job market advantage. Similarly, it would be helpful to understand if there is an increased longitudinal interest in DM among medical students and residents alike.

Conclusion

The field of disaster medicine is continuously evolving owing to the increased recognition of the important roles DM specialists play in our society on both an international and USA hospital-based level. USA fellowship training programs are also experiencing a similar evolution with an increasing trend toward standardization and a common core curriculum. This progression of the field and the development of common training goals is a small step towards filling the needs and gaps in disaster preparedness and response in the USA. Current graduates from these programs see their training as a worthwhile investment in career opportunities. This viewpoint will help inform future DM fellows of the value and reward of further subspecialty training.

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