






Original Research

Pharmacy students' readiness and preparedness to contribute during disasters: a cross-sectional two institutional study from the UAE

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Abstract

Background: Pharmacists involvement in disaster management has been acknowledged in the literature for their involvement in various clinical and non-clinical services. Future pharmacists are expected to be skill full in handling medicine disasters. This study aimed at investigating the knowledge, attitude, and readiness of pharmacy students to contribute to disasters in the United Arab Emirates (UAE). **Methods:** A quantitative, descriptive, cross-sectional study was conducted in two pharmacy colleges in the UAE using a pre-validated electronic questionnaire. Data were collected using simple random sampling from February 2021 to November 2021. The questionnaire consisted of five sections: demographic information, knowledge, attitude, and readiness to practice with perceived barriers. The Likert data were not normally distributed (Shapiro-Wilk test, $p < 0.05$) and hence analyzed using the Mann-Whitney U test and Kruskal Wallis test at $\alpha = 0.05$. **Results:** A total of 258 pharmacy students were surveyed. The majority were fourth-year students (51.2%, $n = 132$) with a mean (SD) age of 20.46 [2.35] years. The average score for total knowledge was 155.3 (60.2%), with no statistical differences between groups. The median interquartile range (IQR) scores for total attitude, total readiness to practice, and barriers to disaster medicine were 4. **Conclusions:** Students exhibited varying levels of knowledge and expressed a positive attitude and willingness to practice disaster medicine. Inclusion of various educational modules in pharmacy curricula could help to better prepare students for the practice of disaster medicine.

Keywords: disaster management; pharmacy student knowledge; pharmacy student attitude; pharmacy student readiness; pharmacists

INTRODUCTION

Natural and manmade disasters have been part of human being life throughout history. According to the latest statistics, there were 401 natural disasters worldwide in 2021 where Haiti experienced the most devastating earthquake that resulted in 2,248 deaths.¹ Australian wildfires between 2019 and 2020 are another deadly natural disaster example that accounted for thousands of deaths and burnt more than 19 million hectares.² Many factors are claimed to increase the disaster rate including climate changes, urbanization, ecosystem degradation, and pandemics.³ Whether they are natural (e.g., earthquakes,

hurricanes, tornados, floods) or man-made (e.g., radiological, nuclear, and chemical agents), consequences of disasters can lead to crisis, thus management systems should be always alert, ready, and prepared.⁴ The Healthcare network is one of those management systems that possess a key role in emergency response to cover the urgent demand by providing medical services to the affected people.⁵ One of the best examples of emergency preparedness has been lately witnessed in United Arab Emirates (UAE). It was ranked the 8th position globally in managing COVID-19 pandemic where its success referred to its efficient governance, effective integration of public-private health sectors, and healthcare team efforts.⁶ Likewise, healthcare facilities should have comprehensive plans for emergency situations that involve different disciplines including medicine, pharmacy, nurse, and administration.

Pharmacists play a key role in the healthcare system. Their involvement in disaster management has been acknowledged in the literature where they can be engaged in various clinical and non-clinical services.⁷⁻¹¹ Being the most accessible healthcare providers and their wide distribution in communities, pharmacists can effectively assist during disasters by assuring continuity of patients' care and availability of necessary medicines and other supports that can fulfill the community requirements. In the Katrina hurricane that affected the U.S in 2005, pharmacists significantly helped alleviate the burden when there was a possible collapse in healthcare services.¹² Pharmacists had experienced many disasters worldwide and what happened in the United States (US) on September 11,

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2001, supported their recognition in contributing to patient care management.¹³

According to many global organizations,^{10,11} pharmacists can participate during different phases of disasters wherein the prevention phase, for example, they can educate the public on the adverse events of disasters on their health outcomes.¹⁴ Additionally, pharmacists' role can be extended to direct patient care, administering vaccinations, inventory management, and logistical support.¹⁴ Although the pharmacists' role in disasters has been identified and accepted by many international organizations, it is mainly dependent on individual jurisdiction considerations.^{8,10,11} To advocate for more pharmacists' involvement in medicine disaster management, they should be well prepared, trained and educated. Therefore, the scope of pharmacy education globally has been shifted towards competency-based education where more pharmacy practice and training courses are added.¹⁵ Moreover, in many developed countries, different teaching modules about disaster management were developed and introduced as elective courses or in the training courses in undergraduate pharmacy colleges.¹⁶⁻¹⁸

In the UAE, there are nine pharmacy colleges whose curricula had been updated recently towards patient's oriented in recognition of the global shifts from being "drug-centered" to "patient-centered".^{19,20} These curricula had been retrieved through their colleges' official websites and none of the current BPharm study plans incorporate medicine disaster management and preparedness. It is worth mentioning that many pharmacy colleges have increased the training hours and added many professional rotations such as ambulatory care and critical care courses.²¹ However, to overcome the need for disaster preparedness, all colleges offering health programs, including pharmacy, should specify courses and training on disaster management to have more competent graduates who can contribute safely and efficiently in catastrophe events, therefore, it is important to study the current knowledge, and readiness of pharmacy students about disaster medicine. This study examines the pharmacy students' knowledge, attitude, and readiness to contribute during disasters.

METHODOLOGY

Study design

This is a quantitative, descriptive, cross-sectional study carried out from February 2021 to November 2021 using a pre-validated questionnaire after getting permission from the author.

Ethical approval

Ethical approval was granted from the Research Ethics Committee of Ajman University (Reference Number: P-H-F-Feb-12, Date: 17th of February, 2021). Confidentiality and anonymity of participants were maintained throughout the study.

Study setting

This study was conducted in two pharmacy colleges in the

UAE, at Al Ain University, Al Ain campus and Ajman University, Ajman. A representative sample of all undergraduate pharmacy students was included in both colleges. Because of the safety concerns due to COVID-19 pandemic, an online google survey form was created to collect the responses from participants.

Sampling method

The researchers used a non-probability purposive sampling technique in selecting the samples. During the data collection process, it was not feasible to approach all pharmacy colleges in the UAE due to COVID-19 pandemic, thus only two pharmacy colleges were included in this study.

The total number of pharmacy students in both colleges was 377 from the first college and 350 students from the second college. As the studied sample was small, the sample size was calculated based on the modified Cochran's formula. Therefore, the population size in this study was the total number of pharmacy students in both colleges, which was 727. First, the Cochran formula was used to calculate the required sample size as the following:

Where n_0 is the required sample size, Z is 1.96 considering 95% confidence interval and 0.05 as the marginal error. (p) is a value of expected proportion considered as 50% and e is a 5% precision, so we got:

$$((1.96)^2 (0.5) (0.5)) / (0.05)^2 = 385$$

Because the required population is small, the sample size calculated above was modified by using the modified Cochran's formula:

Where n_0 is Cochran's sample size recommendation and it was 385, N is the population size and it was 727, then the new sample size required can be calculated as the following:

$$385 / (1 + (384 / 727)) = 252$$

Inclusion and exclusion criteria

The study included all undergraduate pharmacy students who are enrolled in both selected colleges and willing to participate in the study.

Data collection tool

A pre-validated questionnaire was used in collecting the data after obtaining permission from the original author (Annexe 1).²² Definitions of 'Disaster management' and 'disaster medicine' were included in the first part of the questionnaire. The questionnaire consists of 4 main components. Part I included 4 questions about the sociodemographic data of participants, followed by some general questions. Part II was a knowledge assessment consisting of 22 items and was assessed using 'yes/no' questions. Part III was about students' attitudes toward medical disasters. Sixteen items were included in the attitude part. Students were asked to state their extent of agreement using a 5-point Likert scale (5 = strongly agree to 1 = strongly disagree). For part IV, the students were evaluated on their readiness to practice in medicine disaster situations using a 5-point Likert scale. The last 3 questions of this part were about the perceived barriers toward readiness to practice in



medical disaster situations. The scoring of these 3 barrier items was reversed since the statements were negatively phrased.

Survey distribution

A simple random sampling technique was applied while selecting the participants in each college. The lists of all enrolled students were requested from correspondent colleges and the participants were selected by generating random numbers using excel software. The randomly selected students were then contacted via email. A consent form was sent to those willing to participate in the study. Then, the questionnaire was sent by email to those students in a google form link along with the participants' information sheet explaining the purpose of the study explaining the study. Additionally, the investigator's contact details were provided for participants if they have inquiries about the study.

Data analysis

The filled google survey was transferred to SPSS Version 28 (IBM Corp. Released 2021. IBM SPSS Statistics for Windows, Version 28.0. Armonk, NY: IBM Corp) and data were analyzed quantitatively using descriptive and inferential statistics. Since the Likert responses were not normally distributed [Shapiro-Wilk test, P-value less than 0.001 (knowledge, P = 0.019; attitude, P= 0.010; and barriers, P < 0.001], Kruskal-Wallis, and Mann-Whitney U tests were applied at alpha=0.05. Likert responses were converted into numbers to calculate participants' median score for each domain: strongly agree =

5, agree = 4, neither agree nor disagree = 3, disagree = 2, and strongly disagree = 1.

RESULTS

Demographic

In this research, 258 pharmacy students from two different universities participated, 205 (79.5%) were female and 53 (20.5%) were male. Of these, 8.5% (n = 22) were first-year students, 20.5% (n = 53) were second year students, 12.8% (n = 33) were third-year students, 51.2% (n = 132) were fourth year students and 7% (n = 18) were fifth year students. The mean age was 20.46 [SD ±2.35].

Knowledge assessment

The average score for total knowledge was 155.3 (60.2%). The median score of total knowledge was (13, 11-16) for males and (13, 10-16) for females. There is no statistically significant difference between males and females in total knowledge (P = 0.498, Mann-Whitney U test). In terms of academic level, the median was (13.5, 10-17.25) for first-year students, (13, 10-16) for second-year students, (13, 10-15) for third-year students, (13.5, 10-16) for fourth-year students, and (15.5, 10-18.25) for fifth-year students, with no statistically significant difference (P = 0.634) using the Kruskal-Wallis test. Table 1 describes the participant's responses to the individual questions on the disaster medicine knowledge assessment.

Table 1. Knowledge among pharmacy students on medicine disasters

Knowledge assessment	Yes	No
1. I have previous exposure to this topic (Disaster Medicines Preparedness).	61 (23.6%)	197 (76.4%)
2. I have previous experience in dealing with disasters.	77 (29.8%)	181 (70.2%)
3. I think UAE is at risk of disasters (natural or human made).	101 (39.1%)	157 (60.9%)
4. Disasters come in many shapes and sizes.	245 (95%)	13 (5%)
5. Disaster medicine is the sole responsibility of pharmacy organization.	156 (60.5%)	102 (39.5%)
6. I read journal articles related to medicines disaster preparedness.	77 (29.8%)	181 (70.2%)
7. I am aware of classes about disaster medicine preparedness and management that are offered for example at either my college, or community.	117 (45.3%)	141 (54.7%)
8. I find that the research literature on disaster medicines preparedness and management is easily accessible.	153 (59.3%)	105 (40.7%)
9. I find that the research literature on disaster medicines preparedness is understandable.	178 (69%)	80 (31%)
10. Finding relevant information about disaster medicines preparedness related to this country needs is an obstacle to my level of preparedness.	155 (60.1%)	103 (39.9%)
11. I know where to find relevant research or information related to disaster medicines preparedness and management to fill in gaps in my knowledge.	160 (62%)	98 (38%)
12. I know referral contacts in case of a disaster medicines situation (e.g. health department).	157 (60.9%)	101 (39.1%)
13. In case of a disaster medicines situation I think that there is sufficient support from local officials on the governance level.	212 (82.2%)	46 (17.8%)
14. I am aware of what the potential risks emergencies in this country are (e.g: natural disaster, embargo, terror, war...etc).	193 (74.8%)	65 (25.2%)
15. I know how such emergencies or disaster can affect the medication supply system (selection, quantification, procurement, storage, distribution).	201 (77.9%)	57 (22.1%)
16. I know the limits of my knowledge, skills, and readiness as a university student to act in disaster medicines situations, and I would know when I exceed them.	193 (74.8%)	65 (25.2%)
17. In case of the war, I know how to overcome the access to medicines problem to benefit my society.	125 (48.4%)	133 (51.6%)
18. I am familiar with the local emergency response system for medicines disasters.	142 (55%)	116 (45%)



19. I am familiar with the accepted process of 'examining problems in order to decide which ones are the most serious and must be dealt with first (triage principles)' used in disaster medicines situations.	146 (56.6%)	112 (43.4%)
20. I am familiar with the organizational logistics and roles among local and national agencies in disaster medicines response (i.e. taking decisions and measures) situations.	144 (55.8%)	114 (44.2%)
21. Realistic on-scene training is vital to an efficient and effective disaster medicines plan.	205 (79.5%)	53 (20.5%)
22. Disaster medicine is truly a systems-oriented specialty, and involved multiple responding agencies.	219 (84.9%)	39 (15.1%)
The average score for the total knowledge assessment	155.3 (60.2%)	102.7 (39.8%)

Attitude assessment

The median total score for the attitude assessment was 4. The median total attitude score was (62, 55.5-65.5) for males and (59, 52-64) for females. There is no statistically significant difference between males and females in the total attitude score ($P = 0.074$; using the Mann-Whitney U test). In terms of academic level, the median score for first-year students was (61, 51.75-67.75), for second-year students was (60, 53.5-64), for third-year students was (54, 51-61), for fourth-year students were (59, 52-64), and for fifth-year students was (63, 53.5-66) with no statistically significant difference ($P = 0.050$) using the Kruskal-Wallis test. Table 2 shows the median of participants' responses to the attitudinal rating of disaster medicines.

Readiness to practice assessment

The following table (Table 3) shows the participants' responses to the readiness to practice rating to use disaster medicines. The majority agreed that their role is clear in disaster medicines situations and they are ready to handle potential emergency risks that may occur in the community. When asked about their willingness to attend workshops or take courses in

the university on medicine disasters, the majority showed a positive response.

Barriers assessment

The median total score for barriers was (31, 27-32) for males and (29, 25-32) for females. There is a statistically significant difference between males and females in the total barrier score ($P = 0.0047$; using the Mann-Whitney U test). In terms of academic level, the median score for first-year students was (28, 25.75-32.50), for second-year students was (30, 26-32), for third-year students was (28, 24-30.5), for fourth-year students were (30, 25-32), and for fifth-year students was (31.5, 28.5-34.25) with no statistically significant difference ($P = 0.111$) using the Kruskal-Wallis test. Table 4 shows the median of the participant's responses to the rating of the barriers to disaster medicines. Students were asked 3 questions to identify the barriers that may render them from being prepared during medicine disasters and the results show a high agreement level among them that lack of knowledge in addition to the time and efforts required to be prepared are perceived barriers.

Attitude Assessment	Median (IQR)
1. I consider myself prepared for the management of disasters medicines.	3 (3-4)
2. I would feel confident in my abilities as a healthcare student in disaster medicines situation.	4 (3-4)
3. I would be interested in educational classes on disaster medicines preparedness that relate specifically to the country situation	4 (4-5)
4. I would be considered a key leadership figure in my community in a disaster medicines situation.	4 (3-4)
5. I have personal/family emergency plans in place for disaster medicines situations.	3 (2-4)
6. I have an agreement with loved ones and family members on how to execute our personal/family emergency and disaster medicines plans.	3 (2-4)
7. I am able to describe my role in the response phase of a disaster medicines in the context of my college, the general public, media, and personal contacts.	4 (3-4)
8. I would feel confident as a future manager or coordinator of a shelter/healthcare/ medication supply facility.	4 (3-4)
9. I would be willing to be a future member of a healthcare facility/team in case of a medicines disaster.	4 (4-5)
10. I feel reasonably confident I can care for patients independently without supervision of a physician in a medicines disaster situation.	4 (3-4)
11. I would feel confident implementing emergency and disaster medicine plans and procedures.	4 (3-4)
12. I would feel confident in providing medicine-related education in case of disaster or emergency.	4 (3-4)
13. As an Ajman and Al Ain Universities health student, I consider myself prepared for the management of medicines disasters.	4 (3-4)
14. As an Ajman and Al Ain Universities health student, I would feel confident in my abilities as a future healthcare provider and first responder in medicines disaster situation.	4 (3-4)
15. There's enough awareness on "ways to stand wars and other humanity and natural emergencies among undergraduate students in Ajman and Al Ain Universities	4 (3-4)
16. I need more workshops and simulated training to be ready for dealing with disaster medicines.	4 (4-5)



Readiness to Practice Assessment	Median (IQR)
1. My role in disaster medicines situations is clear.	4 (3-4)
2. I am ready to handle whatever potential risks emergencies exist in the community.	4 (3-4)
3. I am willing to attend the emergency medicine education incorporated in the undergraduate coursework.	4 (4-5)
4. I attended workshops/seminars about disaster medicine and it is enough for me to practice in real situation.	3 (2-4)
5. My undergraduate coursework enables me to be ready to practice in the settings of disaster (natural: eg- earthquakes and floods; or human made: eg- embargo or wars)	4 (3-4)
6. Other extracurricular resources (eg: internet, TV, radio and newspapers) enables me with a sufficient degree of readiness to practice under disaster.	4 (3-4)
7. I'm ready to practice under disaster knowing that some basic medications may not be available because of the disaster situation.	4 (3-4)
8. I need to be more trained on providing patient-centered care under the situation of disaster medicines.	4 (4-5)

Barriers Assessment	Median (IQR)
1. Lack of knowledge about medications disaster. → being unfamiliar with the new medications appearing during disasters. (The previous few questions are dealing with the same issue).	4 (3-4)
2. Disasters medicines are unlikely to occur in UAE.	4 (3-4)
3. It requires effort and time to be prepared.	4 (4-5)

DISCUSSION

The current study assessed knowledge, attitude, and readiness to practice during disasters among pharmacy students in two universities in the UAE. This study is the first one in the UAE to assess pharmacy students' preparedness to handle medicine disasters. The increasing number of disasters resulted in an urgent need for all healthcare providers' readiness and preparedness, including pharmacists. The International Pharmaceutical Federation (FIP) issued a toolkit 'Responding to Disasters: Guidelines for Pharmacy' to help pharmacists prepare for emergency situations.¹¹ Prepared pharmacists can ensure the continuum of health services required in disasters when resources are over capacity.

The research findings suggest that the majority of students did not have formal exposure to disaster medicine preparedness. Although many efforts have been done recently in different pharmacy colleges in UAE to add new training courses and include ambulatory care and critical care rotations for undergraduate students, retrieving the current BPharm curricula in many colleges in UAE showed a lacking of disaster management and preparedness courses. A similar scenario can be witnessed in other countries. For example, an Australian study retrieved all the B. Pharm curricula for pharmacy degrees to search for disaster contents and concluded that none of the colleges offered disaster courses or training as part of their subjects and they claimed the failure of these curricula in adding the essential skills needed for disaster management.²³ As knowledge is one of the factors that can influence preparedness, interventions such as education and training are in demand to fulfill this gap.^{24,25}

Limited publications illicit some attempts to develop educational courses for pharmacy students on this topic.^{16,26,27} For instance, a recent online module developed by researchers in Japan used video-based materials to be delivered as a part of a disaster medicine class for second-year pharmacy students.²⁷ They administered a pre-post intervention survey using a five-point Likert scale. As a result, the students had a higher awareness level of disaster preparedness after attending the video materials. They proposed their approach and other similar interventions to serve as valuable tools in introducing pharmacy students to disaster drills.

Another example is from Canada where authors engaged their pharmacy and pharmacy technician students in simulation-based crisis management activity.²⁶ The pharmacy students rated their experience as excellent and the researchers suggested incorporating such a module in pharmacy education with implementation plans. Another group of researchers in France developed and evaluated an elective course about pharmacists' role in disaster management for third-year pharmacy students.¹⁶ Their course consisted of six modules which resulted in satisfactory knowledge of disaster preparedness among students, and they recommended including an emergency preparedness course into their curriculum. Although there is a recognition in addressing medicine disaster as a course or training in pharmacy curricula, and there are individual initiatives to build specific modules, there is a need for a comprehensive intact course to be delivered for pharmacy students during their studying journey.

As students are aware of their knowledge limitations on this topic, they can utilize the existing literature to expand their knowledge and experience about medical disasters. Upon questioning students, the majority denies reading research articles about medicine disaster preparedness. However, the majority positively appraised the available research literature as they evaluated it as understandable and easily accessible. Most university students nowadays have digital access to their university libraries to review the available literature, read, explore and enrich their knowledge with what has been published²⁸. This could also enhance their level of readiness to practice in disaster events. In addition, there are plenty of online courses on disaster planning and emergency preparedness for



students that can be accessed easily. These offered courses promote students' self-reliance and to grow independently.^{29,30}

In the present study, all students expressed their willingness to practice in medicine disaster situations and they are positive towards their role in these situations in addition to their readiness to handle potential emergency risks that may occur in the community.

Moreover, they want to enhance their readiness and be more competent by incorporating this topic into their undergraduate study and attending seminars and workshops. Interestingly, the participants also represented a positive attitude towards future dealing with disaster medicine situations as healthcare members who can provide patients' care independently and efficiently. These findings are consistent with what had been addressed in the literature as many studies interpreted a high willingness of students to respond to disaster crises despite of their inadequate knowledge.^{31,32} On the other hand, a US study conducted to evaluate the level of disaster preparedness among medical students indicated that third and fourth-year students had skills that qualify them to respond to disasters.³³ As disaster preparedness has been defined as "the knowledge and capacities developed by a multidisciplinary team to effectively anticipate, respond to, and recover from the impacts of hazard events or conditions",³⁴ more efforts are needed to focus on health care students' preparedness as they can be effectively utilized during these events. Healthcare providers, including pharmacists, are the core members in responding to an emergency situation. To overcome the urgent need during disasters, they should be prepared and ready to practice.

Upon questioning our participants about the barriers that could render them from being prepared in medical disaster, the majority of respondents reported lack of knowledge as a main barrier. Additional barriers include time and efforts required to be prepared in these situations.

Basheti et al conducted a mixed-mode study to evaluate the pharmacists' barriers to their roles during the COVID-19 pandemic.³⁵ The students stated that lack of educational workshops and training on medicine disaster management was the main obstacle that renders them from responding effectively. The study pointed out the importance of extending the scope of the available educational workshops to include training focused on dealing with emergency events for pharmacy students. In addition, pharmacists should assertively recognize their disaster preparedness and management responsibilities. The American Society of Health-System Pharmacists (ASHP) recognized the important role of pharmacists in emergency preparedness and issued a clear statement that could be adapted in disaster events.¹⁰

LIMITATIONS

This study had some limitations.

The data in this study is unequally distributed. This could be related to the online approach to collecting data where a non-probability purposive sampling technique was used. The study

included students from two pharmacy colleges, although nine pharmacy colleges in the UAE. This is because the study period was during COVID-19 pandemic and there was a surge of Delta variant while data collection was ongoing. As a result, we could not approach those colleges to collect the data. The responses were only collected from two colleges, which could affect the generalization of our results. The study period itself may also be a limitation as students could have different negative experiences in dealing with COVID-19 pandemic and this will impact their attitudes and perceptions towards disaster preparedness and management.

RECOMMENDATIONS

Pharmacy colleges can consider the results of this study to improve their current curriculums by adding some elective, core, and training courses that focus on disaster management and preparedness. Designing and developing comprehensive educational programs is recommended that could be integrated as part of the undergraduate curriculum for pharmacy students. The available programs initiated by some researchers could serve as examples to be promoted and improved.^{16,26,27} Furthermore, replicating this study to include all health care students may better compare and understand the existing gaps in their curriculums. This understanding can promote interprofessional education where all students from different disciplines can be engaged in medicine disaster course. Cultivating such an environment will lead to better outcomes among students as there will be sharing experiences and applying real scenarios.

CONCLUSIONS

Students exhibited varying levels of knowledge and expressed a positive attitude and willingness to practice disaster medicine. While the role of pharmacists as health care providers in disaster situations is recognized worldwide, there is a need to assess the current knowledge, preparation, and readiness of pharmacy students, as they will be future pharmacists. Therefore, it is not only important to assess the current status, but also to improve it by incorporating various educational modules into pharmacy curricula and assessing their impact on students.

LIST OF ABBREVIATIONS

ASHP	American Society of Health-System Pharmacists
FIP	International Pharmaceutical Federation
UAE	United Arab Emirates
US	United States

DECLARATIONS

Ethics approval and consent to participate: Ethical approval was granted from the Research Ethics Committee of Ajman University (Reference Number: P-H-F-Feb-12, Date: 17th of February, 2021). All methods were carried out in accordance with the ethical approving body. Informed consent was



obtained from all the respondents prior to participating in the research.

Consent for publication: Not applicable

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