

Brief Report

Cite this article: Arce L, Hale G, Khanfar N, Pérez Ayala N, Aponte Torres G, Acosta Medina H. Earthquakes, hurricanes, pandemics: Pharmacy students impacting pharmacy practice in Puerto Rico through medication therapy management services during disasters. *Disaster Med Public Health Prep.* 18(e31), 1–4. doi: <https://doi.org/10.1017/dmp.2024.24>.


Keywords:

pharmacy; medication therapy management; Emergency Preparedness; Health Education; Public Health

Corresponding author:

Genevieve Hale; Email: gh341@nova.edu.

Earthquakes, Hurricanes, Pandemics: Pharmacy Students Impacting Pharmacy Practice in Puerto Rico Through Medication Therapy Management Services During Disasters

Lillian Arce PharmD RPh BCMTMS¹, Genevieve Hale PharmD BCPS BCCP CPh¹ , Nile Khanfar PhD MBA², Nicolle Pérez Ayala PharmD¹, Gabriela Aponte Torres PharmD¹ and Harriel Acosta Medina PharmD¹

¹Department of Pharmacy Practice, Nova Southeastern University College of Pharmacy, Puerto Rico Regional Campus, San Juan, Puerto Rico and ²Department of Sociobehavioral and Administrative Pharmacy, West Palm Beach Gardens, FL, USA

Abstract

Background: Community-based medication therapy management advanced pharmacy practice experiences (MTM APPE) can engage pharmacy students in public health initiatives, including emergency response preparedness, to successfully impact patient care. This study aimed to evaluate pharmacy students' perceptions of their experience on an MTM APPE during disasters in Puerto Rico.

Methods: After completing the MTM APPE during times of hurricanes, earthquake or pandemic, pharmacy students were asked to voluntarily participate in a questionnaire about their perception of assisting during a disaster. The survey consisted of 5 questions. Four questions were based on a Likert scale with answers choices ranging from Agree, Not Sure, Disagree, or Not Applicable. One question requested free text comments from participants.

Results: Sixteen students completed the survey. Pharmacy students agreed that the MTM APPE taught them the clinical skills needed to assist and educate individual patients and the community that suffered from a disaster, and that the role of the pharmacist is vital when a disaster disrupts a community's health-care system.

Conclusions: Training in emergency response to disasters should be a considered component of MTM APPE.

In September 2017, Puerto Rico, an island nation within the Caribbean Sea, was devastated by 2 category 5 hurricanes within 2 wk of each other, Irma and Maria, leaving 3.4 million residents without power, potable water, transportation, and/or a phone to communicate with health-care professionals, family members, and community. Some individuals were left without electricity for more than 6 mo. While still rebuilding from these devastating events, in January 2020 the southwestern region of the island was struck by an earthquake leaving the entire island without electricity and water once again. Months later, minor earthquakes ranging from 3 to 4 in magnitude added to continued electricity outages. Two years later in the present day, some areas of Puerto Rico are still dealing with the aftermath of these disasters. When the coronavirus disease 2019 (COVID-19) pandemic was declared in March 2020, an already battered population endured another period of unrest. During these turbulent times the availability and stability of medications, particularly refrigerated medications, such as insulin, put patients in a compromised situation.

Essential attributes for future pharmacists consist of having a patient-centered mentality, excellent communication skills, the ability to build relationships, and acquiring organization and leadership skills.¹ In Puerto Rico, the role of the pharmacist is accentuated during extraordinary events when delays in care, doubts surrounding imperative preventive therapies (ie, COVID-19 vaccines), or economic, physical, and emotional hardships are experienced. As the experts in medication, pharmacists are skilled health professionals trained to address these circumstances and can put patients' concerns at ease. In a patient survey conducted at 3 community pharmacies in Puerto Rico, pharmacy patrons were asked which health-care provider was mostly sought out by the public to resolve medication needs during the hurricanes. A total of 73.80% answered pharmacists.² Because pharmacists are 1 of the most accessible health-care professionals and provide education on proper medication use, nutrition, and lifestyle modifications, they are an essential part of the community and frontline response efforts during disasters.¹ As such, community pharmacies are central during these times of need and

have continued to evolve to focus on patient-centered care and the improvement of public health.

Pharmacy students, also known as pharmacy interns, are an integral part of providing pharmacy services to patients. Presently, pharmacists' and pharmacy students' responsibilities go beyond dispensing medications to include evaluating patients' medication profiles, verifying patients' treatment regimens are based on guideline-directed medical therapy, as well as counseling patients on prescription or nonprescription medications, herbal supplements, and medical devices (eg, blood pressure monitoring machines, glucometers, at-home COVID-19 testing). In addition, pharmacists and pharmacy students can administer vaccines and perform screenings for certain conditions, such as COVID-19 and human immunodeficiency virus (HIV).

Community-based medication therapy management advanced pharmacy practice experiences (MTM APPE) can engage pharmacy students in public health initiatives, including emergency response preparedness, to successfully impact patient care. According to the Centers of Disease Control and Prevention (CDC), the structure of the MTM services consists of on 5 core elements: (1) comprehensive medication review (CMR), (2) a personal medication record (PMR), (3) a medication-related action plan (MAP), (4) intervention or referral, and (5) documentation and follow-up.³ During CMR, student pharmacists can identify drug-related problems such as drug interactions, indications, effectiveness, and safety. In 1 study, pharmacy students performed MTM services with 509 patients during times of disaster. A total of 80.00% of the patients contacted accepted the advice given by the pharmacy student and 53.00% talked to their physician about the recommendations made by the pharmacy student.⁴ Another report indicated that the assistance of pharmacy students practicing in medically underserved community pharmacies allowed preceptors to have more uninterrupted time with the patients and more engagement in patient care services.⁵ By performing MTM services, pharmacy students apply pharmacotherapeutic concepts taught within the didactic curriculum and practice communication skills. Additionally, they are exposed to direct patient care activities. Phan et al. found that pharmacy students self-reported improved professional development after having exposure to opportunities to educate patients.⁶ As common interventions of MTM are educating patients on proper administration, storage, and monitoring of medications to better control acute and chronic conditions, this is an ideal opportunity for pharmacy students to acquire the skills needed in assisting patients to take charge and be an important part of their health-care needs. In addition, pharmacy students can provide direction to patients on how to properly manage adverse events and when to seek help from other health-care providers. This study aimed to evaluate pharmacy students' perceptions of their experience on an MTM APPE during disasters in Puerto Rico.

Methods

Between September 2017 and 2023, pharmacy students at Nova Southeastern University College of Pharmacy Puerto Rico Regional Campus had the opportunity to select an elective MTM APPE precepted by a faculty member for 6 wk. As MTM is a foundational pharmacist-led service that aims to provide pharmacotherapeutic interventions related to drug interactions, indications, effectiveness, and safety to the patient and health-care team, typical patient care activities of this specific rotation included educating patients on maintaining adherence to

medications, monitoring condition- and medication-related issues, ensuring vaccinations were up to date, measuring blood pressure and body mass index, performing comprehensive medication therapy management services, and counseling on lifestyle modifications related to diet and exercise. Pharmacy students also participated in monthly "Take Care Clinics" and "Senior Day" events in a community pharmacy for geriatric patients. These interventions did not stop when disasters affected the island of Puerto Rico. Moreover, during these times of havoc, the Puerto Rican government called on pharmacists to assist with crisis management. As such, additional services were rendered to assist the public. At least 25 patients each week received these pharmacy services.

Because telephones and the Internet were unavailable, word of mouth was the only reliable form of communication during hurricanes and earthquakes. Accordingly, educational brochures were created and distributed in-person at the community pharmacy by pharmacy students and faculty preceptor that explained top public health concerns and where to find medical attention. The acquisition of zika, dengue, chikungunya, leptospirosis, or scabies was a top health concern during these times. As such, the pharmacy students and faculty preceptor prepared brochures that described symptoms of each ailment, the difference between each disease, and where to get medical attention. Pamphlets on common health topics were also prepared for patients including, "Your Health During Hurricane Season," "Management of Medicines: How to Prepare for Emergencies," "Fight Influenza: What You Need to Know and Need to Do," "You and the HIV Virus: What I Need to Know About the Virus," "Common Cold and You," and "What Vaccines I Need to Stay Healthy Among Others." During the COVID-19 pandemic, pharmacy students developed brochures that described how to prevent the spread of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) virus with social distancing and mask face coverings, how to strengthen the immune system, the benefits of COVID-19 immunizations, and steps to take if positive COVID-19 test results were revealed. All brochures were distributed at Take Care Clinics and Senior Days.

The durability of refrigerated insulin was another problem as most individuals did not have power. To address this issue, another brochure was created that explained the amount of time insulin could be stored at room temperature. This was attached to insulin packages when dispensed to patients.

Another service provided by pharmacy students was delivering food, medicines, and hygiene products to patients in need. Students also administered influenza vaccines to the public. When COVID-19 vaccines became available, pharmacy students worked alongside pharmacists to immunize patients. Over 600 patients were vaccinated during the pandemic.

After completing the MTM APPE during times of hurricanes, earthquake, or pandemic, pharmacy students were asked to voluntarily participate in a questionnaire about their perception of assisting during a disaster. A total of 16 students performed these services. All students completed the questionnaire on the last day of their rotation. This survey was approved by the NSU Institutional Review Board. Participants remained anonymous when completing this questionnaire. The survey consisted of 5 questions. Four questions were based on a Likert scale with answers choices ranging from Agree, Not Sure, Disagree, or Not Applicable. One question requested free text comments from participants. The questionnaire contained the following statements:

1. I feel I had a major impact on patients that suffered the catastrophe of hurricane Maria. (Agree, Not Sure, Disagree, Not Applicable)
2. The MTM APPE allowed me to influence not only individuals, but also the community through impacting the public health. (Agree, Not Sure, Disagree, Not Applicable)
3. I feel confident to educate patients before and after a major disaster. (Agree, Not Sure, Disagree, Not Applicable)
4. I think the role of the pharmacist is vital when a disaster disrupts a community's health-care system. (Agree, Not Sure, Disagree, Not Applicable)
5. What did you think about your MTM APPE? (Free text)

Results

Based on the Likert scale responses, all pharmacy students ($n = 16$; 100%) selected “agree” to questions 1, 2, 3, and 4, indicating agreement that the MTM APPE taught them the clinical skills needed to assist and educate individual patients and the community that suffered from a disaster, and that the role of the pharmacist is vital when a disaster disrupts a community's health-care system. One of the pharmacy students expressed that, through the APPE experience, “they improved the way they connected with patients and learned the importance of carefully listening to their health needs to better assist them with their therapies in a more patient-centered way.” Another student indicated that “this type of experience improved my knowledge and empathy.” Furthermore, students indicated on the questionnaire that “the rotation helped me increase my skills as an interviewer and critical thinker.” “This experience helped me realize how important and helpful the MTM process is to achieve better health outcomes and improve patients' quality of life.” One student expressed, “Pharmacists are an important figure in their community, especially after major disasters. During the COVID-19 pandemic, patients were saturated with new information about the virus, vaccines, statistics, and we were able to educate about those topics.” Another student stated, “. . . having the opportunity to talk about preparedness and what to do with medications in case of power outages or disasters was a great opportunity to develop communication skills.”

Discussion

Patient-centered care, communication skills, pharmacist-patient relationship building, and organizational/leadership skills development were emphasized learning experiences for pharmacy students when disasters and a global pandemic became part of the daily lives of patients. During these times of need, pharmacy students gained the opportunity to serve their communities more so than ever before.^{1,2} These skills that students developed during this MTM APPE rotation were vital lessons as pharmacy practice and health-care system continues to evolve.⁷ As future pharmacists, the MTM APPE rotations enhanced 3 important aspects of students' lives and the pharmacy profession - personal growth, development of patient skills, and importance of the pharmacist's role in caring for their communities as the most accessible health professionals. Motivational interviewing, a communication skill used by a health-care practitioner that provides a patient-centered approach to counseling on overcoming individual insecurities to promote internal motivation to change behavior, was a central focus during this experience as students learned the importance of empathy while making a difference during times of need.

Pharmacy students gained a better appreciation and understanding of the importance of pharmacy within public health initiatives.

Additionally, pharmacy students practiced providing patient education and optimization of patients' medications. During patient interviews, adherence to medications was a frequent problem. Although generally a multifactorial issue, many patients were not able to pick up prescriptions due to a lack of transportation. In those cases, students offered patients to enroll in a delivery service where students and pharmacists delivered medications to their home to avoid interruptions in therapy. Another common barrier to adherence was forgetting to take medications. When this was identified, students offered pillboxes or taught patients how to use applications on a smartphone designed to remind individuals on when to take their medications. Through these services, students empowered patients to take responsibility for, and control of, their health, while developing a relationship with the pharmacy team.

MTM APPEs can provide unique opportunities within the pharmacy curriculum during major disasters including hurricanes, earthquakes, and pandemic events. The challenges faced during this type of clinical experience in times of crisis encourages pharmacy students to think beyond typical clinical practice and shift their thinking on humanity, integrity, trustworthiness, flexibility, compassion, inclusiveness, and curiosity of public health as a whole. Furthermore, this rotation instilled into future pharmacists that a lifetime of service encompasses considering the patients' welfare, relieving suffering, promoting inclusion, and embracing diversity, while applying knowledge and skills to improve care whether the community is experiencing normal daily life or disaster.

Some limitations exist within the current report. The small sample size and cross-sectional nature of the study design may lack generalizability to all pharmacy student populations. Additionally, self-reporting bias may have occurred as the questionnaire relied on pharmacy students' opinions and perception during the disasters. Ideally, future pragmatic or randomized controlled investigations with larger sample sizes will be conducted to further measure the impact of student pharmacy APPE experiences during disasters. Moreover, the current literature on using these experiences during times of disaster is lacking and outdated.

Conclusions

Foundationally, community-based MTM APPEs afford pharmacy students the opportunity to apply didactic knowledge into application-based skills when performing direct patient care. This type of learning experience focuses on the development of communication skills and optimizing medication therapy. As the current report is limited in sample size and has the potential of self-reporting bias, larger investigations in a randomized control setting should be explored for future studies. Nevertheless, training in emergency response to disasters should be a considered component of this type of clinical rotation within the pharmacy curriculum. By doing so, pharmacy students can become more prepared for future public health events and challenges of the expanding responsibilities of the pharmacists during times of need.

References

1. O'Sullivan TA, Sy E, Bacci JL. Essential attributes for the community pharmacist as care provider. *Am J Pharm Educ.* 2020;84(1):7125.

2. **Jiménez-Mangual BC, Cuevas-Acevedo DM, Quiles-Alves N, et al.** Description of patients medications needs and the community pharmacist's role in Puerto Rico following a natural disaster. *J Prim Care Community Health.* 2019;10:2150132719842701.
3. **CDC.** Community pharmacists and medication therapy management. cdc.gov. Accessed January 31, 2024. <https://hdsbpc.cdc.gov/s/article/Pharmacists-Community-Pharmacists-and-Medication-Therapy-Management>
4. **Hata M, Klotz R, Sylvies R, et al.** Medication therapy management services provided by student pharmacists. *Am J Pharm Educ.* 2012;76(3):51.
5. **White N, Galt K, Ridgway JE, et al.** Prevalence and impact of pharmacy students as patient care extenders in medically underserved community pharmacies. *J Pharm Pract.* 2021;34(3):465-471.
6. **Phan V, Frontino M, Melissen P, et al.** Student pharmacist perceptions of community advanced pharmacy practice experiences and the impact on professional development. *J Am Pharm Assoc (2003).* 2020;60(5):716-722.
7. **Dugan BD.** Enhancing community pharmacy through advanced pharmacy practice experiences. *Am J Pharm Educ.* 2006;70(1):21.