INSTRUCTIONAL DESIGN AND ASSESSMENT

Evaluation of a Tabletop Emergency Preparedness Exercise for Pharmacy Students

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Objective. To describe the implementation and effect of an emergency preparedness laboratory activity on student knowledge, willingness to participate in emergency preparedness training, current level of preparedness, and the importance of a pharmacist's role in disaster response.

Design. Second-year pharmacy students in the infectious disease module participated in a laboratory activity based on a basic disaster response tabletop exercise format. Three case-based scenarios involving infectious diseases were created by participating faculty members.

Assessment. Surveys before and after the laboratory were used to assess the activity's effect on student knowledge, willingness to participate in emergency preparedness training, current level of preparedness, and the importance of a pharmacist's role in disaster response. In addition, the postsurvey assessed student perceptions of the activity's success at accomplishing faculty-specified outcomes from Appendix B of the Accreditation Council for Pharmacy Education's (ACPE) Standards.

Conclusion. Implementation of an emergency response laboratory activity may improve overall students' knowledge of, confidence in, and understanding of their role as pharmacists in an emergency response, while incorporating a variety of skills and knowledge outcomes.

Keywords: emergency preparedness, disaster response, education, tabletop exercise, lab

INTRODUCTION

There are numerous types of disasters, natural and human. Natural disasters are physical events that occur spontaneously in nature, and can be geophysical (earthquakes), hydrological (floods), meteorological (hurricanes), climatological (temperature extremes), or biological (viral epidemics).^{1,2} Human disasters are man-made events that include chemical, biological, radiological, nuclear, and explosive terrorism, arson, riots, armed conflicts, and infrastructure failures.^{1,2} Any of these disasters most likely will involve provision of health care as part of the greater disaster response effort. Health care professionals may have to address treating injuries directly related to the disaster, providing mental health counseling for survivors, maintaining or re-establishing control of chronic diseases, or preventing infectious diseases outbreaks. Considering the unpredictable nature of disasters, community health professionals should be prepared to respond to disaster events when they occur.

Public health emergency preparedness is defined as "the capability of the public health and health care systems,

communities, and individuals, to prevent, protect against, quickly respond to, and recover from health emergencies, particularly those whose scale, timing, or unpredictability threatens to overwhelm routine capabilities."³ Acquiring this level of preparedness requires continuous preparation and execution of emergency response activities that examine performance and improve identified deficiencies.³

The 2014 Ebola outbreak demonstrated weaknesses in and the need for better public health emergency preparedness among health care workers.⁴ In addition to Ebola, other disasters such as hurricanes Sandy and Katrina, deadly tornadoes, wildfires, pandemic influenza, terrorism, and the threat of bioterrorism all make emergency preparedness and disaster response a timely and much needed component of health professions education.

Pharmacists, as the most accessible health care professionals, are positioned to be integral members of community emergency preparedness and response.^{5,6} Moreover, pharmacists have skills, such as the ability to vaccinate, that would be crucial in a response effort. Pharmacists may likely be the first to notice or report an outbreak. Several emerging infectious diseases begin with nonspecific generalized symptoms mimicking other common illnesses such as a cold, for which patients may seek self-treatment at their local pharmacy.

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Given this positioning and skillset, pharmacists in many practice settings have played planning, operational, leadership, and clinical roles in response to a wide range of disasters.⁷⁻¹² Although practicing pharmacists often are included as essential members of disaster response teams and are included in planning for disasters, these skills are included infrequently in pharmacy education.^{13,14} Most pharmacists become response professionals after their academic experiences, and acquire skills through training with response organizations [eg, Medical Reserve Corps (MRC), disaster medical assistance teams], federal employment [eg, Public Health Services (PHS), Federal Emergency Management Agency], or unfortunately when a disaster event occurs in their area.

The role of emergency preparedness in the pharmacy profession is gaining attention. The 2012-2013 American Association of Colleges of Pharmacy Professional Affairs Committee identified emergency preparedness as an area underutilized by the pharmacy community that can have far-reaching effects for advancing the profession.¹⁵ In addition, pharmacist participation in emergency preparedness activities also was highlighted in the American Pharmacists Association's CEO blog, calling on all pharmacists to find a MRC unit and join before disaster strikes.¹⁶ This increased emphasis on emergency preparedness and the opportunities it potentially brings to the profession should make schools and colleges of pharmacy embrace and integrate related skills and learning experiences into their curricula.

Given that emergency response and preparedness are largely hands-on activities, active learning and case-based teaching may be the most appropriate pedagogical approaches for the topic. An immersive simulation-based interprofessional education curriculum and an emergency preparedness disaster simulation in an undergraduate nursing school curriculum both demonstrated success in preparing students for disasters.^{17,18} In addition to pedagogical approach, these models for teaching emergency preparedness also should be directed at disasters that students would find realistic and may conceivably affect the school of pharmacy and or the surrounding community.

Emergency preparedness and disaster response are minimally addressed in the Accreditation Council for Pharmacy Education (ACPE) Standards, and not at all in the Center for the Advancement of Pharmacy Education (CAPE) Outcomes. Emergency preparedness learning activities and content can address multiple ACPE Standards and CAPE Outcomes across all domains.^{19,20} Student pharmacists could use foundational knowledge of population-based care (Domain 1) to design patient-centered care protocols (Domain 2) that use limited resources most effectively. Activities could focus on rapid

problem-solving and public education to deliver the best care possible in resource-strained environments (Domain 3). Students also can fulfill several aspects of Domain 4 as leaders who must create solutions that inform community partners.¹⁹ Standards 3 and 4 from ACPE include 10 key elements such as communication, cultural sensitivity, patient advocacy, and leadership that may all be ideally demonstrated in appropriately planned emergency preparedness activities.²⁰

In addition to addressing CAPE Outcomes and ACPE Standards, emergency preparedness activities present an ideal way to incorporate interprofessional education. A scenario that would effectively incorporate multidisciplinary learning and teamwork is feasible, given the wide variety of themes such as population health, cultural competency, special populations, health literacy, leadership and delegation, planning, ethics, triage, communication, and team-based decision making. While these activities would provide curricular benefits, they would also significantly benefit the emergency response community at large. Student pharmacists represent a resource to bolster disaster response medical surge capacity and resilience, if they are properly educated about emergency preparedness and response. Also, preparedness exercises for health professions students could have real-world community benefits, such as vaccination exercises using influenza vaccine. Schools of pharmacy connecting with community response and public health personnel also fulfill academic pharmacy's mission to serve the community. The community benefits from observing the skills of student pharmacists, which assists in sustaining and expanding pharmacy's role in disaster response and public health.¹⁵

The purpose of this study was to demonstrate the application and observe the effects of an emergency preparedness laboratory activity on student knowledge, willingness to participate in emergency preparedness training, current level of preparedness, and their perception of the importance of a pharmacist's role in disaster response. The primary educational goal was to introduce students at the University of Louisiana at Monroe School of Pharmacy (ULM SOP) to emergency preparedness concepts and to increase awareness of disaster response.

DESIGN

The Integrated Laboratory Sequence practice laboratory at the school spans six semesters, providing hands-on experiences to reinforce students' knowledge, skills, and attitudes related to much of the didactic course content taught in the first-, second-, and third-year curriculum. The laboratory emphasizes skills necessary for providing comprehensive, quality, and patient-specific

pharmaceutical care, utilizing a variety of teaching methods. The curriculum at ULM does not contain any laboratory training or didactic instruction regarding emergency preparedness and disaster response. Because the majority of ULM SOP students are from south Louisiana, historically an area prone to natural disasters, we felt incorporating emergency preparedness into the curriculum would be practical and useful for students. Given the broad concepts that may be incorporated into emergency preparedness, we chose to replace a former faculty member's laboratory with an emergency preparedness activity. We believed this could provide a setting for students to apply a variety of skills from multiple areas of instruction, such as communications, infectious disease, and pharmacy management. The university's institutional review board reviewed the study protocol and deemed it exempt.

All second-year pharmacy students enrolled in the fourth semester of the laboratory (n=113) were required to participate in the activity. This offering of the sequence coincided with the second-year infectious disease didactic course material. Students were divided into three sections, with each section meeting for a 3-hour period once weekly. Each section contained approximately 31 to 43 students.

The primary focus of the activity was for students to create and validate emergency response plans within small groups. The overarching curricular goal was to

introduce the concept of emergency preparedness and increase student awareness of disaster response, while incorporating demonstration of skills and understanding of underlying principles associated with infectious disease, communications, and management. Specific concepts targeted included foundational infectious disease concepts (eg, disease transmission, prodromal phase, prevention, treatment, and vaccination), along with problem solving, teamwork and interteam communication, and communication tactics in an emergency. Researchers identified and came to group consensus on 10 curricular outcomes and 13 correlating ACPE Appendix B Outcomes the activity would target (Table 1).

The activity design was based on a basic disaster response tabletop exercise model. Tabletop exercises are discussion-based sessions held in informal settings to familiarize team members with emergency response and communication plans and defined roles and responsibilities within a specific plan.²¹ A facilitator guides the team discussion of at least one scenario, and exercises allow participants to develop or validate response plans by performing their assigned duties in a simulated setting. When the activity is completed, a facilitated "hot wash" discussion is held to provide and solicit feedback, as well as identify opportunities for improvement.

Faculty members designed three case-based infectious disease scenarios in a PowerPoint slideshow

Table 1. University of Louisiana at Monroe (ULM) School of Pharmacy (SOP) and Correlating Accreditation Council for Pharmacy Education (ACPE) Appendix B Outcomes

SOP Outcomes	ACPE Outcomes
Evaluate each patient for self-treatment or referral	Triage and referral skills
Counsel and educate patients regarding medication use, disease state management, and health maintenance	Demonstrate effective communication abilities
Develop population-based patient education programs	Leadership development
Read, write, speak, listen, and use data, media, and computers to send and respond effectively to communications for varied audiences and purposes	Management principles (eg, planning, organizing, directing)
Plan, organize, direct, and control pharmaceutical care systems and human, material, and financial resources utilizing management theories and practices	Principles of planning, organizing, directing, and controlling pharmacy resources
Define the question that needs to be answered	Infection control
Identify appropriate literature search engines for lay, professional, and scientific literature	Principles of dosage form stability and drug degradation in dosage forms
Identify, retrieve, understand, analyze, synthesize, and evaluate information needed to make informed, rational, and ethical decisions	Drug information analysis and literature research
Solve complex problems that require an integration of one's ideas and values within a context of scientific, social, cultural, legal, clinical, and ethical issues	Problem solving
Practice in a manner that is consistent with state and federal laws and regulations	Comply with all federal, state, and local laws related to pharmacy practice.
	Diagnostic tests in the diagnosis, staging, and monitoring of various disease states
	Bioterrorism and disaster preparedness management

Table 2. Group-specific Questions and Student Interruption Examples

Communications	<p>Prepare a 30-second Public Service Announcement using provided iPad regarding the situation.</p> <p>Develop a procedure/plan on how public information and media inquiries are handled.</p> <p>What is the most appropriate method to communicate with the public? How would you establish a public hotline?</p>
Logistics	<p>How do you prevent widespread panic in the hospitals and community?</p> <p>What materials will you need to do your job, protect volunteers, etc.?</p> <p>Make a list of needed materials and provide to state Department of Health and Hospitals (DHH).</p> <p>How do you keep track of people who receive treatment?</p> <p>Do you provide patient counseling? If so, how?</p> <p>Create a diagram of patient flow/point of dispensing (POD) organization.</p> <p>Make a general information sheet for administration volunteers.</p> <p>What is a POD and how would you set one up at the school of pharmacy?</p> <p>How does everyone communicate in PODS? Between PODS?</p>
Local DHH	<p>Develop a plan for establishing, stocking, and staffing four PODs in the area (include what locations you would choose and why, as well as maps for traffic flow, patient flow through triage, medication/vaccine dispensing, counseling, and exit).</p>
State DHH	<p>What recommendations should be made for the public regarding work/daily activities?</p> <p>Provide a treatment strategy/plan to Local DHH.</p> <p>Prioritize who will receive treatment when supplies are limited? Who gets first vaccines?</p> <p>How should hospitals handle sick? Separate from noninfected?</p>
Pharmacy Representative Coalition	<p>Coordinate with other hospitals/companies/etc. regarding sharing resources.</p> <p>Develop an agency continuity of operations plan (COOP)?</p> <p>How would your staff be supported so that they are willing to report to work?</p> <p>How do you get pharmacist volunteers—especially if it will likely infect/harm them?</p> <p>How would you deal with 30-40% absenteeism in your pharmacy?</p>
Fourth-Year Student Interruptions/Questions	<p>I just got my vaccine and developed this rash. What should I do?</p> <p>Hey, who's checking this refrigerator with vaccine in it? It's not working.</p> <p>How do you manage persons who have been exposed but refuse to be vaccinated?</p> <p>Medications are stolen and police are refusing to provide security.</p> <p>An out-of-state pharmacist wants to help/assist in a POD. How do you verify a license?</p> <p>Prescription written for massive quantities of short supply prophylactic medication: can you fill it?</p> <p>I'm pregnant, what should I do about vaccinations, etc.?</p>

including anthrax, pandemic influenza, and smallpox. These scenarios were selected because of their modes of transmission and similar initial patient symptoms at disease onset. Three scenarios were chosen to maintain activity integrity and limit students' discussion of the activity prior to their designated section.

In preparation, students were provided prelaboratory reading assignments pertaining to pharmacists' roles in disaster relief, bioterrorism events, and potential pandemics.²²⁻²⁴ In addition, faculty members divided students into randomized groups prior to the laboratory. Each group contained four to six students and was given a specific role to play throughout the scenario. Defined

group roles included: communications, logistics, local department of health and hospitals (DHH), state DHH, and pharmacy representative coalitions. This activity was carried out in a single large room setting so groups could communicate easily with each other. This set up also helped the three in-lab faculty members and fourth-year students facilitate student learning and group interactions.

The communications group was responsible for all communications related to the event, including public service announcements, informative handouts, and communication between groups. The logistics group managed and coordinated the appropriate handling and distribution

of medications, vaccines, necessary equipment and supplies including volunteer supplies. The local DHH group coordinated all local medical efforts regarding the event, including setup and management of points of dispensing (PODs), coordination of all regional volunteers, and information for the state DHH as needed. The state DHH group was responsible for all regulatory issues related to emergency response, as well as communicating and coordinating efforts between the local DHH, Centers for Disease Control and Prevention (CDC), supporting agencies, organizations, and public/private health organizations. The pharmacy representative coalition (PRC) group was responsible for considering and responding to the disaster from a comprehensive pharmacy perspective. This group provided all statewide pharmacy members (eg, retail, hospital, state board of pharmacy) information regarding the emergency, was responsible for recruitment of member volunteers for the response effort, and assisted in creating continuity of operations plans for members.

To complete the tabletop activity within the three-hour section, each scenario was broken up into three sections: “introduction,” “escalation,” and “rapid fire” phases. The introduction section presented the incident case and associated happenings of the first 24-48 hours of the event. The escalation section included a definitive diagnosis, first fatalities, breaking national news, and need for plans of action. The rapid fire section contained massive outbreaks, public hysteria, and failure of student devised plans including immunizations, triage, etc.

Once the introduction phase of the scenario was completed, each group was provided introduction phase questions related to their groups and a description of their specific group’s defined role throughout the disaster response effort. Rather than simply requiring students to contemplate theoretical situations or discuss how topics related to emergency preparedness, investigators crafted task-oriented questions and assignments to facilitate the learning process and provide students with a more realistic environment. Example tasks and questions can be found in Table 2. After each respective section, students were given specific questions that their group would have to research and respond to within specified time constraints. A representative timeline for the activity can be found in Table 3.

In addition to preparing a response after each scenario section, groups were asked to report and discuss their plans via Skype to a corresponding offsite University of Rhode Island College of Pharmacy faculty member with experience in emergency preparedness. The students had no prior knowledge or interaction with the off-site faculty member. This faculty member’s role in the

Table 3. Activity Timeline for the Emergency Preparedness Laboratory

Activity	Time Allotted (Minutes)
Introduction Phase	
Prelaboratory Survey	5
Agenda	5
Group Formation	5
Powerpoint Scenario	10
Group Question/Answer	15
Group Reporting	20
Escalation Phase	
Powerpoint Scenario	10
Group Question/Answer	15
Group Reporting	15
Rapid Fire Phase	
Powerpoint Scenario	5
Group Question/Answer	10
Group Reporting	15
Hot Wash	30

scenario was to represent a CDC official who would provide critical updates at random regarding the situation and give guidance and instruction based on the students’ response plans. Faculty members from ULM maintained constant connection with the off-site faculty member via text messaging with real-time updates regarding student discussions and plans. These updates were intended to help the off-site faculty member develop specific questions, suggestions, or “critical updates” that would probe for more specific information or result in plan failure, forcing students to think about alternate strategies.

In an attempt to mimic a real-life scenario and create a sense of urgency and controlled chaos in the laboratory, intervals for response development and reporting were shortened by five minutes for each activity section. In addition, fourth-year pharmacy students assisted with scenarios by acting as community members affected by the disaster. They randomly asked groups disruptive questions during group response development time. Example questions can be found in Table 2. Faculty facilitators and the CDC official, provided groups with updated emergency notifications during their response time. These updated emergency notifications often would require intergroup communications and immediate response plan changes.

The final phase of the activity was a faculty-facilitated 30-minute “hot wash,” an opportunity for students and faculty members to discuss the overall emergency situation with potential positives and negatives of the proposed emergency response plan. During the hot wash, students determined the strengths and weaknesses of each group and defined areas for improvement.

An 11-item prelaboratory and 13-item postlaboratory survey was used to assess the effect of this emergency preparedness activity on student knowledge, willingness to participate in emergency preparedness training, current level of preparedness, and the perceived importance of a pharmacist's role in disaster response. Students completed the presurvey in the laboratory before beginning the scenario, and the postsurvey, using esurveyspro, (outside software, Inc., Bucharest, Romania) outside of the laboratory setting because of time constraints.

Student knowledge questions were developed based on the preassigned reading with the intent of being a check of student understanding and completion of the reading. The scenario did not intentionally focus on addressing these specific knowledge questions. The knowledge portion consisted of the following three questions: (1) Do all hospitals have a disaster response plan? (2) During a public health emergency/declared state of emergency, do all dispensed medications require prescription as defined by the National Association of Boards of Pharmacy? (3) Out-of-state pharmacists cannot perform dispensing functions during a declared "state of emergency" in the state of Louisiana unless they: (A) obtain a temporary Louisiana license through the board of pharmacy; (B) have Incident Command System training verified by FEMA; (C) verify an active unrestricted pharmacists license from another state.

The postsurvey also asked students their perception of the activity's effect on their knowledge, understanding, and confidence in emergency situations, and to what degree they believed the activity accomplished 13 preselected ACPE learning outcomes, which overlapped with 10 ULM curricular outcomes. Five clinical faculty members with experience in survey research reviewed and critiqued each survey item for face validity. Recommended survey changes were discussed with resulting changes made by investigator discussion and group consensus. The ULM Institutional Review Board approved the final revised survey.

In addition to the pre/postsurveys, students participated in an end-of-semester course evaluation to provide feedback about each activity throughout the semester. They were asked to rate activities based on level of helpfulness within the current pharmacy curriculum, on how much they liked or disliked it, and whether additional training would be desired in the particular focus area or disease state. All statistical analyses were performed using GraphPad Prism 6 (GraphPad, San Diego, CA) with significance defined a priori as a p value <0.05 .

EVALUATION AND ASSESSMENT

Ninety-eight and 79 students fully completed the pre/postsurveys, respectively, for an 87% presurvey and 70% postsurvey response rate. Overall, respondents were female (61%), white (56%), less than 30 years old (92%), and earned a bachelor's degree prior to pharmacy school (65%). In addition, 14% had previous experience in disaster response/emergency preparedness.

Comparing pre/postsurvey scores using an unpaired t test revealed an insignificant increase (73.9% vs 74.9%, $p=0.7$) in mean respondent score on the three knowledge questions. Subjectively, a majority ($n=67$, 85%) of respondents agreed or strongly agreed that the activity increased their knowledge of this type of emergency event. Students' Likert-scale responses on willingness to participate, current level of preparedness, and perception of importance of the role pharmacists can play were compared using the Mann-Whitney U test and can be found in Table 4. Wilcoxon signed rank test could not be used as respondent data was not coded to allow for data pairing. Overall, mean willingness to participate and current level of preparedness increased moderately, but not to a significant degree ($p=0.3$ and $p=0.08$, respectively). Mean student perception of the importance of a pharmacist's role in disaster response decreased but to an insignificant degree ($p=0.3$).

Respondents' perceptions regarding how well the laboratory met 13 predefined competencies are in Table 5.

Table 4. Pre/Postsurvey Items and Response Comparison

Survey Items	Survey Scores, Median (Mean)		
	Presurvey	Postsurvey	p value
On a scale of 1 to 10, how willing are you to participate in a formal emergency preparedness training? ^a	8 (7.3)	8 (7.3)	0.72
How would you describe your current level of preparedness to respond and aid in an emergency situation (eg, natural disaster, bioterrorism, pandemic) ^a	3 (3.3)	4.5 (4.1)	0.04
Pharmacists can play an important role in disaster response. ^b	5 (4.5)	5 (4.0)	0.28

^aStudents rated these items from 0=unwilling/unprepared to 10=completely willing/prepared

^bStudents rated this item from 1=strongly disagree to 5=strongly agree

Table 5. Postsurvey Student Perception of Achieving Accreditation Council for Pharmacy Education (ACPE) Appendix B Outcomes

ACPE Appendix B Outcome	%					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
Problem solving	19 (24)	45 (57)	11 (14)	3 (4)	1 (1)	0 (0)
Demonstrate effective communication abilities	12 (15)	40 (51)	15 (19)	11 (14)	1 (1)	0 (0)
Leadership development	13 (16)	40 (51)	15 (19)	10 (13)	1 (1)	0 (0)
Management principles (eg, planning, organizing, directing)	20 (25)	37 (47)	13 (16)	7 (9)	2 (3)	0 (0)
Comply with all federal, state, and local laws related to pharmacy practice	6 (8)	35 (44)	25 (32)	10 (13)	3 (4)	0 (0)
Drug information analysis and literature research	10 (13)	37 (47)	17 (22)	12 (15)	2 (3)	1 (1)
Principles of dosage form stability and drug degradation in dosage forms	7 (9)	29 (37)	23 (29)	15 (19)	3 (4)	2 (3)
Principles of planning, organizing, directing, and controlling pharmacy resources	17 (22)	39 (49)	12 (15)	10 (13)	1 (1)	0 (0)
Infection control	18 (23)	35 (44)	17 (22)	5 (6)	3 (4)	1 (1)
Basic principles and mechanisms of disease (pathophysiology)	10 (13)	39 (49)	19 (24)	7 (9)	4 (5)	0 (0)
Diagnostic tests in the diagnosis, staging, and monitoring of various disease states	7 (9)	37 (47)	21 (27)	9 (11)	5 (6)	0 (0)
Triage and referral skills	8 (10)	47 (60)	13 (16)	8 (10)	3 (4)	0 (0)
Bioterrorism and disaster preparedness and management	20 (25)	35 (44)	15 (19)	7 (9)	2 (3)	0 (0)

Based on total percent of respondents agreeing/strongly agreeing the laboratory accomplished the objective, respondents' perceived top three competencies accomplished through this laboratory were problem solving, management principles, and planning/organizing/controlling pharmacy resources. Students' overall perceptions of the laboratory were positive, with 85% (n=67) of respondents agreeing or strongly agreeing that the laboratory activity was helpful. Table 6 shows all responses for student perception of the effect of the laboratory experience on knowledge, understanding, and confidence in emergency response.

The end-of-semester course evaluation showed that 51 out of 87 respondents (59%) wanted additional training in emergency preparedness and response. Student comments from the course evaluation also were generally positive. Most students found the laboratory interactive and helpful. Selected student comments included: "All this lab taught me is how unprepared I am for emergencies!; favorite lab of the semester; Really fun, gave me a view of other opportunities as a pharmacist; will not use this at all, too time consuming; This lab felt very rushed and that too much was trying to be done in too little time."

Table 6. Postsurvey Overall Student Perception of Laboratory Activity

Overall, through this laboratory activity...	%					
	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Not Applicable
My knowledge of this type of emergency event has increased	29 (37)	38 (48)	6 (8)	5 (6)	1 (1)	0 (0)
My understanding of my role in an emergency event has increased	21 (27)	39 (49)	13 (16)	5 (6)	1 (1)	0 (0)
My understanding of the roles of others has increased	21 (27)	39 (49)	16 (20)	3 (4)	0 (0)	0 (0)
I feel more confident in my personal ability to respond to an emergency	15 (19)	31 (39)	21 (27)	11 (14)	1 (1)	0 (0)
This scenario generated productive discussion	37 (47)	27 (34)	13 (16)	2 (3)	0 (0)	0 (0)
Overall, the activity was helpful	32 (41)	35 (44)	9 (11)	2 (3)	1 (1)	0 (0)

DISCUSSION

The hypothesis of this study was that student participation in an emergency preparedness disaster response laboratory activity would increase awareness and willingness to participate in emergency preparedness training while allowing students to apply knowledge from didactic lectures. Overall, student response to the laboratory activity was positive, with a majority of students agreeing or strongly agreeing that the exercise was helpful and increased their knowledge and understanding of an emergency event. Student perceptions of willingness to participate and current level of preparedness did improve, but to a minor degree, with respondents indicating a high level of willingness and low level of preparedness at baseline. Interestingly, respondents' perception of the importance of the role of pharmacists in emergency preparedness decreased after participation in the activity. This diminished perception of the pharmacist's role postexercise may have been a result of the activity enhancing awareness of the magnitude of such a crisis, and the significant role other individuals and health professionals would play in a successful emergency response effort. Another plausible explanation is that faculty members were not deliberate enough in clearly defining the role that pharmacists can and do play in these response situations. In future offerings, modified job action sheets will be used to add a level of clarity to roles and the interplay between the roles of each responder.

Students believed the tabletop emergency preparedness activity addressed a variety of skills and knowledge outcomes. A majority of respondents agreed/strongly agreed that 12 of the 13 outcomes were met through this lab activity. We were surprised that bioterrorism and disaster preparedness management was not a top three outcome in total percentage of students' agreeing/strongly agreeing that the laboratory met that outcome.

Student responses to learning outcomes, such as disease transmission, communication to health professionals and laypersons, and literature retrieval suggests that students had neutral or negative perceptions of their performance in these areas. However, throughout the exercise, participating faculty members noted that students demonstrated critical-thinking skills and met expectations for each of these outcomes to a degree beyond their perceptions. This may indicate that students applied prior knowledge and skills and were accomplishing learning outcomes without being aware of it in such a high-stress environment.

As emergency preparedness is a vast topic, maintaining a focus on the primary activity objective and learning opportunities was a challenge throughout the planning process. In addition, one must consider students' prior knowledge of the topic. Given these students had yet to receive a formal lecture or any introduction to emergency preparedness and disaster response, placing more emphasis and accountability on prelaboratory reading may have enhanced student preparation, which could have improved the efficiency and overall effect of the scenario.

During execution of the activity, adherence to the timeline was paramount. Surprisingly, during the scenario introduction phase, the students often were so enthusiastic that they jumped into a worst-case scenario and were performing tasks intended for part two of the scenario. Therefore, strict adherence to the timeline is important, but faculty members also must be flexible, as students will respond differently and progress at different rates throughout the scenario. Anticipating the need for additional time for group plan preparation or guidance of some groups more directly via questions and interruptions was helpful. In addition, defining a specific time for a 5-minute break in the middle of the exercise helped limit disruptions. One element faculty members agreed was inflexible and had to be maintained was terminating all activities for the 30-minute hot wash. This session was critical as it helped students place the entire activity in perspective and provided informal student feedback on the activity itself.

Assigning specific roles for each group (eg, state DHH, communications) to play throughout the activity contributed to organization, helped orient the students, and prevented confusion regarding the initiation of tasks. Interaction between these groups was not always spontaneous; therefore, some direct intervention and encouragement from faculty members was occasionally necessary. Students also responded better to specific goal-oriented tasks, such as creating a 30-second public service announcement using a provided iPad for a target audience, rather than generalized questions concerning particular items to be included in such an announcement. The unexpected urgent questions and scenario emergency updates during the group research and plan time were highly effective in creating a sense of urgency and a high-stress environment that often resulted in group distraction from task and plan failure requiring reorganization.

Limitations of this study include the disparity in response rates, students having no prior knowledge of emergency preparedness and disaster response, lack of student preparation in terms of prereading material,

potential response bias, and only using three articles for prereading to describe such a broad topic. Another significant limitation was that the surveys were not coded to allow for pairing of samples, greatly limiting the statistical tests that could be used to analyze the data. Moreover, the activity could have been improved with incorporation of other professionals such as community first responders, campus police, other health professional students, etc. We attempted to have greater community participation, but the novel and unknown nature of the project to outside stakeholders, scheduling conflicts, and relative time commitment made this effort unsuccessful.

The students' feedback frequently expressed their confusion and anxiety because of the relatively unorthodox format of the activity. Further defining learning outcomes and providing a better introduction to the activity could have alleviated this confusion. Also, explicitly informing students that a "right answer" would likely not occur during the scenario would be helpful to abate student concerns that their plans were "wrong."

SUMMARY

Using an emergency preparedness tabletop activity allowed students to utilize and incorporate previous knowledge and skills in a new and challenging way. A majority of students enjoyed this activity and engaged with the material. While the activity did not sufficiently prepare students to respond to a disaster, it served as an introduction to showcase the complexity and challenges of a large-scale disaster and response effort on which more instruction may be based. Further research regarding how to incorporate emergency preparedness learning into pharmacy curricula is needed, specifically on incorporating interprofessional education, areas of implementation other than practical laboratories, and different focus topics (ie, pharmacy management, health systems).

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