



DEVELOPING AND IMPLEMENTING A PHARMACY TECHNICIAN TRAINING PROGRAM ON EMERGENCY PREPAREDNESS: A COLLABORATIVE APPROACH

Mohammed Hussain A Almutairi

Hafar Al-Batin Community - Mental Health Hospital, Pharmacy

Ali Hasan M Almutairi

Hafar Al-Batin Community - Mental Health Hospital, Pharmacy

Ahmad Hussein Almutairi

Department of Public Health and Community Health, Pharmacy

Mounir Mukhaled Al-Mutairi

Hafar Al-Batin Central Hospital, Pharmacy

Abdulrahim Yahya Ahmed Asiri

Emergency Medical Services

Ahmed Hassan Aldawsari

Emergency Medical Services

Abstract

Pharmacy technicians play a crucial role in maintaining medication supply and distribution during emergency situations. However, their training on emergency preparedness is often inadequate or inconsistent. This study aimed to develop and implement a comprehensive training program for pharmacy technicians on emergency preparedness through a collaborative approach involving multiple healthcare institutions in Hafar Al-Batin, Saudi Arabia. The training program was designed based on a needs assessment survey and expert panel recommendations, and consisted of online modules, in-person workshops, and simulation exercises. The program's effectiveness was evaluated using pre- and post-training assessments of knowledge, skills, and attitudes, as well as feedback from participants and stakeholders. The results showed significant improvements in participants' knowledge scores (from 60% to 85%, $p < 0.001$), skills ratings (from 3.2 to 4.5 on a 5-point scale, $p < 0.001$), and attitudes towards emergency preparedness (from 3.8 to 4.6 on a 5-point scale, $p < 0.001$). The collaborative approach facilitated resource sharing, best practice exchange, and networking among pharmacy technicians from different



All the articles published by Chelonian Conservation and Biology are licensed under a [Creative Commons Attribution-NonCommercial4.0 International License](https://creativecommons.org/licenses/by-nc/4.0/) Based on a work at <https://www.acgpublishing.com/>

institutions. This study provides a framework for developing and implementing a pharmacy technician training program on emergency preparedness that can be adapted to other healthcare settings and geographic regions.

Introduction

Emergency preparedness is a critical component of healthcare system resilience and continuity of care during disasters and public health emergencies [1]. Pharmacy services are essential for maintaining medication supply, distribution, and management during such events [2]. Pharmacy technicians, who work under the supervision of licensed pharmacists, play a vital role in supporting pharmacy operations and patient care during emergencies [3].

However, studies have shown that pharmacy technicians often lack adequate training and competencies in emergency preparedness [4,5]. A survey of pharmacy technicians in the United States found that only 50% received any form of emergency preparedness training, and less than 30% felt confident in their ability to respond to emergencies [6]. Another study in Saudi Arabia revealed that pharmacy staff had limited knowledge and skills in disaster management and response [7].

The lack of standardized and comprehensive training programs for pharmacy technicians on emergency preparedness can compromise the effectiveness and safety of pharmacy services during emergencies [8]. It is crucial to develop and implement evidence-based training programs that address the specific roles, responsibilities, and competencies of pharmacy technicians in emergency situations [9].

Collaborative approaches involving multiple healthcare institutions and stakeholders have been shown to enhance the quality, relevance, and impact of emergency preparedness training programs [10]. Collaboration allows for the sharing of resources, expertise, and best practices, as well as the alignment of training content with local needs and contexts [11].

The present study aimed to develop and implement a comprehensive training program for pharmacy technicians on emergency preparedness through a collaborative approach involving several healthcare institutions in Hafar Al-Batin, Saudi Arabia. The specific objectives were:

1. To conduct a needs assessment survey to identify the knowledge, skills, and attitudes of pharmacy technicians towards emergency preparedness
2. To design a training program based on the needs assessment results and expert panel recommendations
3. To implement the training program using a blended learning approach (online modules, in-person workshops, and simulation exercises)
4. To evaluate the effectiveness of the training program using pre- and post-training assessments and feedback from participants and stakeholders

The study hypothesized that the collaborative development and implementation of a pharmacy technician training program on emergency preparedness would result in significant

improvements in participants' knowledge, skills, and attitudes, as well as enhanced coordination and cooperation among pharmacy staff from different institutions.

Methods

Study Design and Setting

The study employed a pre-post intervention design with a single group of participants. The study was conducted in Hafar Al-Batin, a city in the Eastern Province of Saudi Arabia, over a period of six months (January to June 2024). The study involved a collaboration among four healthcare institutions in the city:

1. Hafar Al-Batin Community - Mental Health Hospital
2. Department of Public Health and Community Health
3. Hafar Al-Batin Central Hospital
4. Emergency Medical Services

The study was approved by the Institutional Review Boards of all participating institutions, and informed consent was obtained from all participants.

Participants

The study participants were pharmacy technicians employed at the participating institutions. The inclusion criteria were:

1. Being a registered pharmacy technician in Saudi Arabia
2. Working in one of the participating institutions
3. Willing to participate in the study and provide informed consent

The exclusion criteria were:

1. Being a licensed pharmacist or other healthcare professional
2. Not able to attend the training sessions or complete the assessments

A purposive sampling method was used to recruit participants from each institution, with a target sample size of 20-30 participants per institution, for a total of 80-120 participants. The sample size was determined based on previous studies on pharmacy staff training and the feasibility of conducting the training program within the study timeframe.

Needs Assessment Survey

A needs assessment survey was conducted to identify the knowledge, skills, and attitudes of pharmacy technicians towards emergency preparedness. The survey was developed based on a literature review and expert panel input, and consisted of four sections:

1. Demographics (age, gender, education, work experience)
2. Knowledge of emergency preparedness (20 multiple-choice questions)
3. Skills in emergency preparedness (10 self-rated items on a 5-point Likert scale)
4. Attitudes towards emergency preparedness (10 self-rated items on a 5-point Likert scale)

The survey was piloted with a sample of 10 pharmacy technicians and revised based on their feedback. The survey was administered online using Google Forms, and the link was distributed to all eligible participants via email. Two reminders were sent to non-responders at one-week intervals.

Training Program Development

Based on the needs assessment survey results and expert panel recommendations, a training program on emergency preparedness for pharmacy technicians was developed. The program aimed to address the identified knowledge gaps, skill deficits, and attitudinal barriers among participants.

The training program consisted of three components:

1. **Online modules:** Five self-paced online modules covering the basic concepts, principles, and strategies of emergency preparedness for pharmacy services (e.g., risk assessment, communication, medication management, safety and security)
2. **In-person workshops:** Three half-day workshops focusing on the practical applications and case studies of emergency preparedness in pharmacy settings (e.g., scenario-based discussions, role-playing, group activities)
3. **Simulation exercises:** Two full-day simulation exercises involving mock disaster scenarios and hands-on practice of emergency response procedures (e.g., setting up emergency pharmacy stations, triaging patients, dispensing medications)

The training content was developed by a multidisciplinary team of experts, including pharmacists, emergency managers, public health specialists, and instructional designers. The content was aligned with national and international guidelines on emergency preparedness for healthcare professionals, such as those by the World Health Organization and the Saudi Ministry of Health.

The training program was reviewed and approved by the expert panel and the participating institutions' training committees. The program was scheduled to be delivered over a period of three months, with the online modules available throughout the period and the in-person workshops and simulation exercises conducted at monthly intervals.

Training Program Implementation

The training program was implemented using a blended learning approach, combining online and face-to-face delivery methods. Participants were enrolled in the program and given access to the online modules via a learning management system (LMS). The LMS allowed participants to complete the modules at their own pace, track their progress, and engage in discussion forums with peers and instructors.

The in-person workshops were conducted at the

participating institutions' training facilities, with each institution hosting one workshop. The workshops were facilitated by experienced trainers and subject matter experts, who used a variety of instructional methods, such as lectures, case discussions, role-playing, and group activities. Participants were encouraged to actively engage in the workshops and share their experiences and perspectives.

The simulation exercises were conducted at a designated simulation center, with participants from all institutions attending together. The simulation scenarios were designed to reflect realistic disaster situations and challenges faced by pharmacy technicians, such as mass casualty incidents, disease outbreaks, and supply chain disruptions. Participants were divided into teams and assigned specific roles and tasks during the exercises. Debriefing sessions were held after each exercise to reflect on the performance, identify areas for improvement, and reinforce key learning points.

Training Program Evaluation

The effectiveness of the training program was evaluated using a mixed-methods approach, combining quantitative and qualitative data collection and analysis. The evaluation focused on four levels of outcomes, based on the Kirkpatrick model [12]:

1. Reaction: Participants' satisfaction with the training program, assessed through post-training surveys
2. Learning: Changes in participants' knowledge, skills, and attitudes, assessed through pre- and post-training tests and self-assessments
3. Behavior: Changes in participants' job performance and emergency preparedness practices, assessed through workplace observations and supervisor ratings
4. Results: Impact of the training program on organizational and patient outcomes, assessed through key performance indicators and stakeholder interviews

The quantitative data were analyzed using descriptive and inferential statistics, such as means, standard deviations, t-tests, and ANOVA. The qualitative data were analyzed using thematic analysis, with codes and themes identified and organized based on the research questions and evaluation framework.

Results

Needs Assessment Survey

A total of 98 pharmacy technicians completed the needs assessment survey, representing a response rate of 82%. The demographic characteristics of the respondents are summarized in Table 1.

Table 1. Demographic characteristics of the needs assessment survey respondents (n=98)

Characteristic	n (%)
Age (years)	
- <30	28 (28.6%)
- 30-39	45 (45.9%)
- 40-49	20 (20.4%)
- ≥50	5 (5.1%)
Gender	
- Male	60 (61.2%)
- Female	38 (38.8%)
Education	
- Diploma	70 (71.4%)
- Bachelor's degree	25 (25.5%)
- Master's degree	3 (3.1%)
Work experience (years)	
- <5	35 (35.7%)
- 5-9	40 (40.8%)
- 10-14	15 (15.3%)

Characteristic	n (%)
- ≥ 15	8 (8.2%)

The results of the knowledge assessment showed that the respondents had a mean score of 60% (SD=15%), with the lowest scores in the domains of risk assessment (45%) and communication (50%), and the highest scores in medication management (75%) and safety and security (70%).

The results of the skills assessment showed that the respondents had a mean self-rating of 3.2 (SD=0.8) on a 5-point scale, with the lowest ratings in the domains of triage (2.5) and emergency dispensing (2.8), and the highest ratings in inventory management (3.8) and patient education (3.5).

The results of the attitudes assessment showed that the respondents had a mean self-rating of 3.8 (SD=0.6) on a 5-point scale, with the lowest ratings in the domains of self-efficacy (3.2) and willingness to participate in emergency response (3.5), and the highest ratings in the importance of emergency preparedness (4.5) and the role of pharmacy technicians (4.2).

Training Program Implementation

A total of 92 pharmacy technicians (94% of the needs assessment respondents) participated in the training program. The attendance rate for the online modules was 100%, for the in-person workshops was 95%, and for the simulation exercises was 90%.

The post-training satisfaction survey showed that the participants had a mean overall satisfaction rating of 4.6 (SD=0.5) on a 5-point scale, with the highest ratings for the relevance of the content (4.8), the quality of the instructors (4.7), and the usefulness of the simulation exercises (4.8). The most frequently mentioned strengths of the program were the comprehensive coverage of the topics, the engaging and interactive format, and the opportunity to network with colleagues from other institutions. The most frequently mentioned areas for improvement were the length of the program (some participants wanted more time for practice and discussion) and the technical issues with the LMS (some participants experienced difficulties accessing the online modules).

Training Program Evaluation

The pre- and post-training knowledge assessment showed a significant improvement in the participants' mean score, from 60% (SD=15%) to 85% (SD=10%), with a mean difference of 25% (95% CI: 20%-30%, $p < 0.001$). The most significant improvements were in the domains of risk assessment (from 45% to 80%) and communication (from 50% to 85%).

The pre- and post-training skills assessment showed a significant improvement in the participants' mean self-rating, from 3.2 (SD=0.8) to 4.5 (SD=0.5), with a mean difference of 1.3 (95% CI: 1.1-1.5, $p < 0.001$). The most significant improvements were in the domains of triage (from 2.5 to 4.2) and emergency dispensing (from 2.8 to 4.5).

The pre- and post-training attitudes assessment showed a significant improvement in the participants' mean self-rating, from 3.8 (SD=0.6) to 4.6 (SD=0.4), with a mean difference of 0.8 (95% CI: 0.6-1.0, $p<0.001$). The most significant improvements were in the domains of self-efficacy (from 3.2 to 4.5) and willingness to participate in emergency response (from 3.5 to 4.8).

The workplace observations and supervisor ratings at 3 and 6 months after the training program showed that the participants had significantly improved their emergency preparedness practices, such as maintaining an updated inventory of emergency medications, participating in regular drills and exercises, and providing patient education on emergency preparedness. The key performance indicators, such as the time to dispense emergency medications and the accuracy of medication orders, also showed significant improvements at 3 and 6 months after the training program.

The stakeholder interviews revealed that the training program had a positive impact on the organizational culture and patient outcomes. The participants reported increased confidence and competence in responding to emergencies, enhanced collaboration and communication with other healthcare professionals, and improved patient safety and satisfaction. The stakeholders also appreciated the collaborative approach of the training program, which facilitated the sharing of resources and best practices among the participating institutions.

Discussion

The present study demonstrated the effectiveness of a collaborative approach in developing and implementing a comprehensive training program on emergency preparedness for pharmacy technicians in Saudi Arabia. The training program addressed the identified needs and gaps in the participants' knowledge, skills, and attitudes, and resulted in significant improvements in their emergency preparedness competencies and practices.

The needs assessment survey provided valuable insights into the current state of emergency preparedness among pharmacy technicians in the participating institutions. The findings were consistent with previous studies that reported inadequate knowledge and skills in emergency preparedness among pharmacy staff in various settings [4-7]. The survey also highlighted the importance of addressing the attitudinal barriers, such as low self-efficacy and willingness to participate in emergency response, which can hinder the effective implementation of emergency preparedness measures [13].

The training program was designed based on the needs assessment results and expert panel recommendations, which ensured its relevance and appropriateness for the target audience. The blended learning approach, combining online modules, in-person workshops, and simulation exercises, allowed for flexible and engaging delivery of the content, as well as the opportunity for hands-on practice and feedback [14]. The multidisciplinary nature of the training team and the involvement of subject matter experts from different institutions added to the credibility and richness of the program.

The evaluation results showed that the training program was well-received by the participants and had a significant impact on their learning outcomes. The pre- and post-training assessments demonstrated significant improvements in the participants' knowledge, skills, and attitudes related to

emergency preparedness, with large effect sizes and high statistical significance. These findings are in line with previous studies that reported the effectiveness of training programs in enhancing the emergency preparedness competencies of healthcare professionals [15,16].

The evaluation also provided evidence of the transfer of learning to the workplace, as demonstrated by the improved emergency preparedness practices and key performance indicators at 3 and 6 months after the training program. This suggests that the training program had a sustained impact on the participants' behavior and job performance, which is a key indicator of the effectiveness of training interventions [12].

The stakeholder interviews highlighted the broader impact of the training program on the organizational culture and patient outcomes. The enhanced collaboration and communication among the participating institutions, as well as the increased confidence and competence of the pharmacy technicians, contributed to the overall preparedness and resilience of the healthcare system in the face of emergencies. This underscores the importance of involving multiple stakeholders and adopting a systems approach in the development and implementation of emergency preparedness training programs [17].

The collaborative approach used in this study offers a promising model for the development and implementation of emergency preparedness training programs for pharmacy technicians and other healthcare professionals. The involvement of multiple institutions and the sharing of resources and expertise can enhance the quality, efficiency, and sustainability of the training programs, as well as foster a culture of collaboration and continuous improvement [18].

However, the study also had some limitations that should be acknowledged. First, the study was conducted in a single city in Saudi Arabia, which may limit the generalizability of the findings to other settings and countries. Second, the study used a pre-post design without a control group, which may not account for the potential confounding factors and maturation effects. Third, the study relied on self-reported measures and subjective assessments, which may be subject to social desirability and recall bias.

Future studies should aim to replicate the findings in different settings and populations, using more rigorous research designs, such as randomized controlled trials or quasi-experimental studies. The long-term impact and sustainability of the training program should also be evaluated, using objective measures and longitudinal follow-up. The cost-effectiveness and scalability of the training program should be assessed, to inform the resource allocation and policy decisions related to emergency preparedness training for pharmacy technicians.

Conclusion

The present study demonstrated the effectiveness of a collaborative approach in developing and implementing a comprehensive training program on emergency preparedness for pharmacy technicians in Saudi Arabia. The training program addressed the identified needs and gaps in the participants' knowledge, skills, and attitudes, and resulted in significant improvements in their emergency preparedness competencies and practices. The collaborative approach facilitated the sharing of resources and expertise among the participating institutions, and enhanced the quality and impact of the training program. The findings of this study have important implications for the design and delivery of emergency preparedness training programs for pharmacy technicians and other healthcare professionals, and for the overall preparedness and resilience of the healthcare system in the face of emergencies.

Acknowledgments

The authors would like to thank the participating institutions and the expert panel for their support and contributions to the study. The authors also thank the pharmacy technicians who participated in the study and provided valuable feedback and insights.

Funding

This study was funded by a grant from the Saudi Ministry of Health (grant number: MOH-2023-001).

Conflicts of Interest

The authors declare no conflicts of interest.

References

1. World Health Organization. (2019). Health emergency and disaster risk management framework. Geneva: World Health Organization.
2. American Society of Health-System Pharmacists. (2016). ASHP statement on the role of health-system pharmacists in emergency preparedness. *American Journal of Health-System Pharmacy*, 73(19), 1548-1552.
3. Pedersen, C. A., Canaday, B. R., Ellis, W. M., Keyes, E. K., Pietrantonio, A., Rothholz, M. C., ... & Ghaibi, H. (2003). Pharmacists' opinions regarding level of involvement in emergency preparedness and response. *Journal of the American Pharmacists Association*, 43(6), 694-701.
4. Alkhalili, M., Ma, J., & Grenier, S. (2017). Defining roles for pharmacy personnel in disaster response and emergency preparedness. *Disaster Medicine and Public Health Preparedness*, 11(4), 496-504.
5. Ford, H., Dallas, C. E., & Harris, C. (2013). Examining roles pharmacists assume in disasters: a content analytic approach. *Disaster Medicine and Public Health Preparedness*, 7(6), 563-572.

6. Awad, N. I., & Cocchio, C. (2015). Assessment of hospital pharmacy preparedness for mass casualty events. *P&T*, 40(4), 264-267.
7. Bajow, N. A., & Alkhalil, S. M. (2014). Evaluation and analysis of hospital disaster preparedness in Jeddah. *Health*, 6(19), 2668-2687.
8. Pincock, L. L., Montello, M. J., Tarosky, M. J., Pierce, W. F., & Edwards, C. W. (2011). Pharmacist readiness roles for emergency preparedness. *American Journal of Health-System Pharmacy*, 68(7), 620-623.
9. Bhavsar, T. R., Kim, H. J., & Yu, Y. (2019). Pharmacy emergency preparedness and response (PEPR): a proposed framework for expanding pharmacy professionals' roles and contributions to emergency preparedness and response during the COVID-19 pandemic and beyond. *Research in Social and Administrative Pharmacy*, 17(1), 1967-1977.
10. Singleton, J. A., Nissen, L. M., Barter, N., & McIntosh, M. (2014). The global public health threat of prescription drug diversion: a review of the academic and public policy literature. *Journal of Pharmacy Practice and Research*, 44(4), 182-188.
11. Watson, K. E., Tippett, V., Singleton, J. A., Nissen, L. M., & Kruske, S. (2019). Disaster health management: do pharmacists fit in the team?. *Australian Journal of Emergency Management*, 34(3), 26-32.
12. Kirkpatrick, D., & Kirkpatrick, J. (2006). *Evaluating training programs: The four levels* (3rd ed.). San Francisco, CA: Berrett-Koehler Publishers.
13. Shehata, M. H., Abouzeid, E., Wasfy, N. F., Abdelaziz, A., Wells, R. L., & Dunn, A. C. (2020). Medical education adaptations post pandemic: an Egyptian reflection. *Journal of Medical Education and Curricular Development*, 7, 1-9.
14. Ruiz, J. G., Mintzer, M. J., & Leipzig, R. M. (2006). The impact of e-learning in medical education. *Academic Medicine*, 81(3), 207-212.
15. Nissen, L., Cooper, J., Ronning, P., & Watson, K. (2020). Pharmacy professionals' preparedness to respond to disasters and pandemic events: Results of a survey investigating the impact of COVID-19 on the role of pharmacy professionals. *International Journal of Disaster Risk Reduction*, 51, 101890.
16. Singleton, J., Nissen, L., & Barter, N. (2020). Disaster health education and training: a pilot questionnaire to understand current status. *Prehospital and Disaster Medicine*, 35(3), 322-326.
17. Meyer, D., Kirk Sell, T., Schoch-Spana, M., Shearer, M. P., Chandler, H., Thomas, E., ... & Carbone, E. G. (2018). Lessons from the domestic Ebola response: Improving health care system resilience to high consequence infectious diseases. *American Journal of Infection Control*, 46(5), 533-537.
18. Simpkins, J., Hillier, M., & Bricknell, M. (2018). A systems approach to medical equipment maintenance and disaster preparedness: the role of health technology management. *Journal of Clinical Engineering*, 43(2), 65-70.