EDUCATION BRIEF

Simulation-based Crisis Resource Management in Pharmacy Education

Marie-Laurence Tremblay, MSc, MScEd, BPharm

Laval University, Quebec City, Quebec, Canada

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Objective. To describe strategies for implementation of simulation-based crisis resource management (CRM) in pharmacy education and present students' appreciation of an interdisciplinary CRM training at a university in Canada.

Methods. In fall 2016, third-year undergraduate pharmacy students at Laval University and pharmacy technician students from Fierbourg school participated in a CRM activity and completed a five-item survey to assess the quality of the CRM activity they had just experienced. Paired t-tests were computed to detect differences of appreciation between pharmacy technician students and pharmacy students.

Results. Students rated each item as very good or excellent varying from 81% to 97%. The only difference found between the two types of students was on their overall appreciation of the experience. Pharmacy technician students rated their experience as very good while pharmacy students rated it as excellent.

Conclusion. CRM training can easily be adapted to the context of pharmacy education because its key concepts of team management, resource allocation, awareness of environment and dynamic decision-making directly apply to pharmacy practice. Based on the results of this study, students greatly value their CRM training experience. Future research is needed to measure the transfer into practice of CRM principles.

Keywords: crisis resource management, simulation, team training, pharmacy

INTRODUCTION

Crisis resource management (CRM) in health care is the articulation of individual and team behaviors in routine and crisis situations that focuses on dynamic decision-making skills, interpersonal skills, and team management.^{1,2} The purpose of CRM is to train crews to collaborate effectively and adopt behaviors promoting patient safety. Since its beginnings in the 1990s, simulation-based CRM has grown in health professions education across multiple domains. Numerous studies have reported positive results in the implementation of team-oriented and CRM programs; however, most of these studies were conducted with a small sample size, using a one-time training of short duration.³⁻⁵ Larger studies with rigorous performance assessments are needed to measure the true impact of CRM training in health care.

Teamwork is central to safety in health care and team performance is directly linked with the quality of interactions between workers.^{6,7} Pharmacy programs throughout

the world have established learning outcomes fostering intra- and interprofessional collaboration.⁸ Even in the simplest situations, pharmacists have to communicate effectively with their teams and maintain effective workload distribution to ensure that patients will receive the appropriate medications and professional services. It is therefore imperative that pharmacy students be educated on CRM principles.

Over the past five years, second- and third-year undergraduate pharmacy students at Laval University in Canada have experienced collaborative simulation-based team training with pharmacy technician students targeting CRM basic principles (eg, team management, resource allocation, environmental awareness, and dynamic decision-making). To our knowledge, Laval University is the first institution to have integrated an interdisciplinary CRM activity in their Doctor of Pharmacy program (PharmD) curriculum. This education brief describes strategies for a successful implementation of simulation-based CRM in pharmacy education and presents students' appreciation of the activity.

METHODS

The key concepts of CRM are organized in four broad categories that interact and overlap. These key

Corresponding Author: Marie-Laurence Tremblay, 1050 Ave de la Médecine, local 3760, Pavillon Ferdinand-Vandry, Université Laval, Quebec City, Québec, Canada G1V 0A6. Tel: 1-418-656-2131, ext. 3256. E-mail: marie-laurence.tremblay@pha.ulaval.ca

concepts are team management, resource allocation, awareness of environment and dynamic decision-making.⁹ Team management involves the establishment of a team leader who prioritizes and distributes tasks among team members. Roles and responsibilities of team members must be clear, understood and enacted. Effective communication within the team is crucial to establish a shared mental model, which might require asking for clarification when needed or requesting timely help. Resource allocation and environmental awareness pertain to knowing one's environment to help anticipate and plan for all eventualities and allocate resources where they are most needed. Decision-making in crisis situations can be extremely challenging because the information is constantly changing, which contributes to clinical uncertainty. Strategies to avoid fixation errors and continuous reassessment of situations help promote patient safety behaviors.

The first step to designing simulation-based CRM training for undergraduate pharmacy students is to establish clear learning objectives and associate CRM principles to possible scenarios to be simulated. Typically, high-acuity situations are included in CRM training because the dynamic nature of such situations and the highly complex environment can lead to critical incidents that best illustrate the key CRM principles.⁹ Although it might be tempting to incorporate multiple stressors and information in the scenario, task complexity should be adapted to account for the learner's expertise level to maximize the learning outcomes.¹⁰ Given the stress and complexity associated with these activities, the scenarios should be sequenced from simple to complex to help learners familiarize themselves with the environment and with other team members before facing more complex situations.¹¹ One of the biggest challenges in developing CRM scenarios in pharmacy is to ensure a convincing and stimulating sequence of events that will emphasize specific behaviors. To facilitate this chain of events, instructors should be able to communicate with the actors to give them cues and adapt their scenario so that each action occurs at the right moment and will engender specific behaviors.

Laval University has developed more than 20 scenarios of various complexity level targeting different CRM principles. As an introduction to CRM, the first scenario is usually simple and targets a maximum of three basic principles, typically leadership, role clarity, and task priority. For example, a clinical handover between pharmacy teams (pharmacists and technicians) at rush hour while a patient comes in with new prescriptions following hospital discharge can be simulated. Teams who communicate effectively and share the same priorities might perform better at this stage, improving their confidence and engaging them in the activity, while teams who experi-

ence difficulties organizing the tasks will quickly understand the importance of good communication and task distribution. Other cases during the 3-hour sessions display situations where the team is exposed to risks of errors. For instance, a computer shutdown occurs in a pharmacy packed with patients forces the team to reassess their plan, decide which patients require immediate assistance and assess what risks the shutdown exposes them. This situation allows students to discuss at a deeper level effective communication principles, leadership, shared decision-making, and constant reassessment of the situation. Over the years, the CRM curriculum has expanded to include situations such as false prescriptions, a breach in the medication circuit, an uncooperative team member, a patient who collapses in the waiting room, a parent who insists on having information about their child who has reached the age of consent, etc. Each scenario lasts approximately 10 to 15 minutes.

As simulation-based CRM activities are highly integrative, a successful curricular implementation requires that students are minimally familiar with all four domains of the American Association of Colleges of Pharmacy's Center for the Advancement of Pharmacy Education (CAPE) educational outcomes.¹² More specifically, CRM scenarios will require the participants to apply scientific knowledge (Domain 1) to solve problems (Domain 3) and provide patient-centered care (Domain 2) while working collaboratively and communicating effectively (Domain 3), and apply leadership and self-awareness skills (Domain 4). Ideally, students should have been exposed to simulation-based education prior to a CRM training to avoid stress and distraction from the unfamiliar environment.¹³ In the PharmD curriculum, students participate in two sessions of simulation-based CRM during their second and third year. These simulations are typically reserved for more experienced participants, but can be successfully implemented at the undergraduate level.¹⁴

CRM-training is resource intensive. To promote learner engagement and suspension of disbelief, a simulated environment that resembles both physically and functionally an authentic clinical setting is required.¹⁵ Scenarios should be adapted to account for the technological limitations of the simulated environment. At Laval University, pharmacy workstations are fully equipped with computer software commonly used in community pharmacies, real medications, telephones, e-resources, etc. Two simulation technicians orchestrate the technical aspects of the scenarios (eg, writing the prescriptions, configuring patients' pharmacy records, and setting up the environment prior to the cases). Groups of six to eight pharmacy and technician students are formed for a 3-hour

session during which three CRM scenarios are performed. The scenarios require the participation of four students at the time, leaving the rest of the group to observe the simulation. Each participant can contribute to the debriefing sessions afterward. One pharmacist who has received training on debriefing techniques and CRM principles accompanies each group.

Debriefings usually occur immediately after each simulation and last approximately 30 minutes per case. As depicted by Fanning and colleagues, “debriefing is the heart and soul of the simulation experience.”¹⁶ Its purpose is to make explicit the CRM principles that have been applied or could have been applied during the simulation that just occurred. Among the many debriefing approaches, *Debriefing with Good Judgement* was adopted at Laval University, an evidence-based and theory-driven structure of formative feedback and reflection that drives the learning process.^{17,18} This technique consists of organizing the session into three phases: reactions, analysis and summary. The facilitator uses inquiry and curiosity to offer performance critique without being excessively critical of one’s performance. Debriefers should not try to fix the problem, but rather understand the frame that has led to the observable action. Video playback can be helpful to show a particular moment in the simulation and generate discussions. Controlling individual passions and frustrations, avoiding personal assessment and refocusing on team performance are some examples of the many challenges facilitators might experience during CRM debriefings.

In fall 2016, third-year undergraduate pharmacy students at Laval University and pharmacy technician students from Fierbourg school participated in a quality-assurance evaluation of the CRM activity they had experienced. Students experienced three CRM scenarios during which they faced a handover during a busy change of shift, a computer shutdown, the training of a new employee with no experience, a medication recall, a medication error, and a suspected theft of medication. All these scenarios targeted various learning objectives, such as leadership, management, communication and decision-making skills. There were 202 students from both programs (70% pharmacy

students and 30% pharmacy technician students) who completed a five-item survey developed by Shapiro and colleagues to assess the quality of CRM activities (Table 1).¹⁹ Paired *t*-tests were computed to detect difference between pharmacy technician and pharmacy students’ appreciation.

RESULTS

The overall response rate was 85%. Students rated each item of the survey as “very good” or “excellent” in a proportion varying from 81% to 97%. Paired *t*-tests revealed no statistical difference between groups of students for each item, except for the first item where pharmacy technician students rated more often very good compared to excellent for pharmacy students ($p<.001$). Results showed that the CRM activity was highly appreciated by both pharmacy and pharmacy technician students.

DISCUSSION

This local appreciation survey shows that implementing a CRM simulation-based training for pharmacy and pharmacy technician students is highly appreciated and applies the reality of pharmacy practice. According to students, environmental features could be improved to help students suspend disbelief during the simulations. Simulation has been used to expose pharmacy students to interdisciplinary team skills such as history taking and physical examination, but evidence is lacking regarding specific CRM principles.²⁰ Vyas and colleagues developed a simulation activity with health care students from various disciplines to promote teamwork skills and patient safety awareness.²¹ Their simulated environment replicated a real emergency department with supplies and services such as a pharmacy, diagnostic radiology, and a laboratory. Mannequins and standardized patients were used in the simulations. Participants were instructed to triage, assess, and provide initial evaluation and treatment plans. Students had to meet the patient’s needs within the scope of their own discipline. Although the key concepts of CRM were not central in the scenarios and debriefings, this type of simulation is an interesting

Table 1. Participants’ Post-Simulation Survey Items and Frequency of Response (N=202)

Survey items	Excellent	Very good	Adequate	Mediocre	Awful
Rate your overall experience of simulation practicum	95	93	13	1	0
Rate how easy it was for you to suspend disbelief in the simulated environment	55	107	37	2	0
Rate the realism of the scenarios	94	87	20	1	0
Rate the quality of the debriefings	130	65	7	0	0
Rate how good a method you considered the simulation to practice/reinforce your teamwork skills	92	93	15	2	0

way to educate students regarding other health care providers' roles.

In medical education, simulation-based CRM trainings are implemented in many disciplines, with anesthesiology programs acting as pioneers in the field.²² Current evidence regarding the impact of CRM trainings on transfer of learning is still limited. A recent systematic review revealed that CRM skills taught in simulation centers are transferred to clinical settings, which may translate to improved patient outcomes, including decreased mortality.²³ These findings need to be interpreted cautiously considering the small number of studies included in the review. Nevertheless, these promising results indicate that well-designed CRM trainings can positively influence patient safety.

The results from this study are only a beginning of documenting the impact of CRM trainings in pharmacy education. The quality of debriefings was only assessed through one item in the survey. Other available tools could be used to assess whether the debriefings promote learning.^{24,25} Although students perceived that simulation trainings are a good method to practice or reinforce teamwork skills, it is important to determine if students can recognize CRM situations and mobilize these skills in real-life context.

CONCLUSION

Teamwork training has become an educational imperative in health care to promote patient safety and interprofessional collaboration. The pharmacy faculty at Laval University has developed an expertise in designing and implementing simulation-based CRM for undergraduate pharmacy students. Based on this study, CRM key principles can easily be adapted to the context of pharmacy education and students greatly value this teaching method. Future research is needed to measure the transfer into practice of CRM training.

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