IMPLEMENTING a Multidisciplinary Disaster Simulation for Undergraduate Nursing Students

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GIVEN THE COMPLEXITIES OF TODAY'S WORLD, NURSES MUST BE ABLE TO RESPOND TO UNEXPECTED CHALLENGES, BOTH IN ACUTE CARE AND COMMUNITY SETTINGS. Whether induced by man or nature, the potential for disaster requires nursing education programs to prepare future nurses for emergency situations (Weiner, 2006; Weiner, Irwin, Trangenstein, & Gordon, 2005). This need became evident following the terrorist attacks of September 11, 2001, with the enactment of the Public Health Security and Bioterrorism Response Act of 2002 (Public Law No. 107-188).

This article reports on efforts at a private liberal arts college to address the need for disaster preparedness through a simulation learning activity for undergraduate health care professionals in nursing, public health, and psychology. The yearlong process entailed curriculum review for the three disciplines, planning and implementation of an hour-long disaster simulation (an explosion on the university campus), and an analysis of the effectiveness of the program. The need for students to understand the respective roles each discipline plays in the event of a disaster was implicit in the process. THIS ARTICLE FOCUSES SPECIFICALLY ON DISASTER PREPAREDNESS TRAINING FOR UNDERGRADUATE NURSING STUDENTS.

RESEARCH

ABSTRACT A liberal-arts-based undergraduate nursing program engaged in curriculum enhancement activities that led to the implementation of a disaster simulation for 81 multidisciplinary undergraduate students. A pretest/posttest design was used to determine the effectiveness of preparation for the simulation. Nursing students in three levels of the program received didactic preparation in disaster preparedness and were assigned to five different simulation response teams. One-way ANOVA revealed statistically significant differences for pretest and posttest scores, $p = 0.05$. An evaluation of student performance indicated that five of the eight nursing students assigned to the disaster site correctly triaged 81.2 percent of the victims; all eight nursing students assigned to the emergency department correctly reassessed the victims. Classroom didactic content, followed by a simulated learning experience, was found to be an effective teaching strategy for preparing undergraduate nursing students in disaster preparedness.

Sidebar. Resources for Implementing a Multidisciplinary Disaster Simulation

Centers from Disease Control and Prevention. *CDC Chemical Agents: Facts About Evacuation.* www.bt.cdc.gov/

Centers from Disease Control and Prevention. *CDC Explosions and Blast Injuries: A Primer For Clinicians.* www.bt.cdc.gov/

Centers for Disease Control and Prevention. Helping Patients Cope with a Traumatic Event. www.cdc.gov/masstrauma/factsheets/professionals/coping_professional.pdf

Centers from Disease Control and Prevention. *Mass Trauma Data Instrument.* www.cdc.gov.masstrauma/response/rapid assessment.htm

Centers for Disease Control (Producer). (2004). *Emergency Preparedness: What's Your Competency?* [Motion picture]. Available from Public Health Information Network, 1600 Clifton Rd., Atlanta, GA 30333.

Langan, J. C., & James, D. C. (2005). *Disaster Preparedness for Nurses.* Upper Saddle River, NJ: Pearson Education.

START Triage Method. Newport Beach, CA: Hoag Hospital and Newport Beach Fire Department.

University of Albany Center for Public Health Preparedness. *Terrorism, Preparedness, and Public Health: An Introduction* (e-course). www.ualbanycphp.org/learning/

University of Albany Center for Public Health Preparedness (Producer). (2004). *Psychological Aspects of Bioterrorism* [Motion picture]. Available from Public Health Information Network, 1600 Clifton Rd., Atlanta, GA 30333.

Veenema, T. G. (2003). *Disaster nursing and emergency preparedness for chemical, biological, and radiological terrorism and other hazards.* New York: Springer Publishing.

Curriculum Enhancement All students received disaster preparedness content during classroom lectures and learning activities. A number of approaches to learning were used, including e-learning, computer assisted-instruction (CAI), videos followed by discussion, and role play. Learning materials were adapted from course texts (Allender & Spradley, 2005; Lewis, Heitkemper, & Dirksen, 2004), other literature (Veenema, 2003), and resources from the Centers for Disease Control and Prevention (CDC) and other organizations. The University of Albany School of Public Health Center for Public Health Preparedness e-course, "Terrorism, Preparedness, and Public Health: An Introduction," was also used. (See Sidebar above for resources.)

Table 1. Nursing Student Level, Content Received, and Assigned Roles

NURSING STUDENT LEVEL OF PREPARATION	ADDITIONAL DISASTER PREPAREDNESS CONTENT	ASSIGNED ROLE
Level I / Sophomore	Terrorism, Preparedness, and Public Health: An Introduction www.ualbanycphp.org (all levels). Data collection techniques	Evaluators and Indirect Victims
Level II / Junior	Mental health issues (posttraumatic stress disorder, rescuer fatigue, shock, hysteria)	Direct Victims
Level III / Senior	Treatment of burn victims, blast injuries, and START and emergency room triage methods	Triage Team, Emergency Department (ED), and University Emergency Response Teams (ERT)

Table 2. Comparison of Disaster Site/Pre-Hospital and Hospital Triage Codes Used by Undergraduate Nursing Students Assigned to the Triage and Emergency Department Teams

TRIAGE CLASSIFICATION	DISASTER SITE / PREHOSPITAL	HOSPITAL
Emergent – Red	Critical; life threatening; transport immediately.	Requires treatment within 15-30 minutes.
Urgent – Yellow	Acute problem and stable, may deteriorate; requires treatment within 20 minutes to two hours; transport after red cases.	Serious illness or injury that must be attended to, but may wait up to two hours.
Non-urgent – Green	Care may be delayed two hours or more; transport after red and yellow; walking wounded.	Any condition that can wait more than two hours without the likelihood of deterioration.
Black – Expectant	Dead or expected to die; lowest transport priority.	NA

Table 3. Mean Pretest and Posttest Scores for Sophomore, Junior, and Senior Nursing Students

Nursing Student Level	N	Pretest Mean	SEM	Posttest Mean	SEM
Sophomore	26	60.97*	3.12	95.60*	1.73
Junior	31	54.81	1.99	93.52	1.97
Senior	24	49.97*	2.72	85.70*	3.54

*Significant difference between means

Prior to the introduction of the disaster content and learning activities, students were given a pretest to determine baseline knowledge of disaster preparedness content. The University of Albany's e-learning lessons 1 and 4 were then completed, followed by classroom lectures and learning activities. Students were again tested, one week prior to the simulation, to determine what they had learned.

Multidisciplinary Undergraduate Disaster Simulation

A multidisciplinary approach (Dyer, 2003) was used in developing the disaster simulation. Weekly faculty planning sessions were scheduled to address all details. Faculty also collaborated with university security personnel, information technology and telecommunication staff, and members of the local fire department regarding the best way to implement the simulation on the university campus.

Students were assigned to one of five disaster response teams: a) University Emergency Response Team, b) Triage Team, c) Emergency Department Team, d) Victims (direct and indirect), and e) Evaluators. Assignments were based on the disaster preparedness content students had received in their nursing courses and their level of undergraduate nursing preparation. Three weeks prior to the simulation, students selected specific roles by drawing from a deck of labeled index cards. They then had the opportunity to familiarize themselves with their roles during didactic sessions and in-class learning activ-

ities. Those who selected the evaluator role received additional training in how to record data. (Student roles are outlined in Table 1.)

University Emergency Response Team (ERT) participants, two senior nursing students (assigned the roles of campus nurse and dean of nursing) and other health care majors, met to address the continued functioning of the university and the needs of the victims affected directly and indirectly by the explosion. The ERT was responsible for distributing human and medical supplies and resources.

Members of the Triage Team (TT) wore hospital scrubs and used nursing clinical packs containing gauze dressings, sterile water, tape, bandage scissors, saline, gloves, face masks, pen lights, and rebreather masks. The team was responsible for correctly identifying triage codes for victims and completing triage cards accurately.

TT nurses assigned to the disaster site used the START method (Super, 1984), adhering to the following codes for tagging victims at the site: red/emergent, yellow/urgent, green/not urgent, and black/expectant (Veenema, 2003). After conducting assessments, they assigned triage codes and secured triage cards to the victims. Green-tagged victims were sent to the non-urgent area located in the vicinity of the emergency department (ED). Victims with red and yellow tags were sent to the nursing skills lab, which served as the ED. Victims tagged with black were covered with paper gowns (face exposed) and remained at the disaster site until the simulation ended. (See Table 2.)

Level-three seniors assigned to the ED team were responsible for reassessing victims for further treatment. It was their responsibility to reassign triage codes based on a three-tier triage system: emergent, urgent, and non-urgent (Qureshi & Veenema, 2003; Super, 1884; Veenema, 2003.).

Victims were either direct or indirect victims (Allender & Spradley, 2005). Direct victims were individuals injured by the explosion or health care workers experiencing mental health issues associated with providing care. This group consisted of junior-level nursing students who had completed two medical-surgical nursing courses and psychology courses, and were in the final week of obstetric and pediatric courses. Level I sophomore nursing students were the indirect victims. These were individuals affected by the explosion who were not physically injured — panicked dormitory residents, concerned parents inquiring about their children, or community volunteers (Allender & Spradley, 2005).

Evaluators were assigned to collect qualitative and quantitative data. Quantitative data consisted of assigned triage codes and the number of victims triaged at the disaster site. Qualitative data consisted of students' comments regarding observed student and faculty behaviors during the simulation activity. Evaluators were assigned to the area where ERT members met, the disaster site, and the ED. Nurse faculty supervisors were also assigned to each area, to maintain the flow of the simulation and resolve potential problems.

Implementation of the Simulation and Debriefing Prior to the start of the simulation, the university notified the neighboring community that a simulation would be conducted on the front lawn of the campus. All areas were clearly identified, including the ERT staging area, from which personnel and supplies were dispersed, and the area for non-urgent victims.

Students were briefed before the simulation and reminded of the seriousness of the activity. They were urged to focus on their assigned roles and instructed to ignore the evaluators, individuals videotaping the simulation, and curious community members who might gather on the university's outer perimeter. Faculty answered students' questions regarding designated areas. Finally, students completed a faculty-developed questionnaire on perceptions regarding preparation for the simulation.

The mock explosion happened in a chemistry lab located on the second floor of the Natural Science and Nursing Building. The local fire department set off a fire alarm, indicating that there had been an explosion. The building was evacuated and victims were directed to the front lawn of the campus. The disaster ended with the sounding of the siren and an all-clear from the fire department. At the sound of the siren, students went to the amphitheater for debriefing.

During the debriefing, the multidisciplinary faculty team encouraged students to verbalize thoughts and feelings regarding their perceptions of the event, including how their peers reacted. Students who served as evaluators also provided feedback. Students then completed a postsimulation questionnaire. The debriefing session ended with the psychology department faculty engaging students in guided imagery. The full simulation (briefing, drill, and debriefing) lasted one hour.

Data Analysis and Findings A pretest/posttest design was used to measure knowledge gained for the 81 undergraduate nursing students who participated in the multidisciplinary disaster simulation. Twenty-six students (32.1 percent) were sophomores, 31 were juniors (38.3 percent), and 24 were seniors (29.6 percent). Statistical Package for Social Sciences (SPSS®) data analysis was used to determine if there was a difference between pre- and postsimulation test scores.

Mean posttest scores for the three groups of nursing students were higher than pretest scores. An ANOVA was conducted to determine differences between pretest and posttest mean scores. One-way ANOVA and post-hoc analysis revealed statistically significant differences for pretest and posttest scores between groups ($p = 0.05$). Post-hoc analysis also revealed statistically sig-

nificant differences between mean pre- and posttest scores for sophomore (pretest mean 60.97; posttest mean 95.6, $n = 26$) and senior nursing students (pretest mean 49.97; posttest mean 85.70, $n = 24$; $p = .05$). While differences did exist between pretest and posttest scores for junior-level students, the difference was not significant. (See Table 3.)

Sixteen seniors were assigned to assess/triage victims; eight were TT members and eight were assigned to the ED. The evaluation of student performance showed that five TT students (62.5 percent) correctly triaged 81.2 percent of 35 victims using the START (Super, 1984) method for triage. All eight nursing students assigned to the ED correctly reassessed the victims sent to the ED. Sixty-one students (75.3 percent) completed the postsimulation evaluation. Findings indicated the majority (80.2 percent, $n = 49$) were comfortable with their assigned roles and understood the nursing skills utilized in the various roles. Faculty did not collect postsimulation evaluations from all nursing students, nor did the postsimulation tool indicate the level of the nursing student completing the form, a limitation of these findings.

Implications for Nursing Education Eighty-one nursing students participated in a multidisciplinary disaster simulation that also involved public health and psychology majors. The e-course, "Terrorism, Preparedness and Public Health: An Introduction, Lesson 1," was used as a pretest to determine students' knowledge of bioterrorism and other public health emergencies. All nursing students completed lessons 1 and 4. Nursing students were then provided with classroom didactic, CDC training videos, role-playing exercises, and CAI learning activities in preparation for the multidisciplinary drill. A posttest was administered one week prior to the simulation.

The majority of the seniors were able to correctly triage victims using the START (Super, 1984) and emergency room triage methods (Veenema, 2003). While pretest/posttest scores indicate a significant increase in knowledge gained regarding bioterrorism, sophomore nursing students had higher pretest and posttest scores than junior- and senior-level nursing students. These differences could be attributed to prior knowledge and variations in faculty teaching styles.

All professional nurses need to understand their role in the event of a bioterrorist act or other public health emergency. The Nursing Emergency Preparedness Education Coalition (2003) competencies address the need for nurses, whether novice or expert, "to have a basic knowledge and ability to appropriately respond to mass casualty incidents" (p. 4) and public health emergencies. The basic preparation for nurses to respond to such events should begin in their prelicensure training and continue throughout their professional careers. It should be part of the curriculum and consist of both didactic and simulated learning experiences. The use of a pretest/posttest study design, followed by a simulation learning experience and student self-evaluation, provides a sound paradigm for curriculum enhancement. Although the study findings were limited to the sample population, the ability to use a single day to instruct students at multiple levels is a positive outcome, promising to provide the country with a better prepared nursing workforce.

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