Journal of HOSPITAL MEDICINE www.journalofhospitalmedicine.com

BRIEF REPORTS

Interprofessional Simulation Training Improves Knowledge and Teamwork in Nursing and Medical Students During Internal Medicine Clerkship

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Simulation is effective at improving healthcare students' knowledge and communication. Despite increasingly interprofessional approaches to medicine, most studies demonstrate these effects in isolation. We enhanced an existing internal medicine curriculum with immersive interprofessional simulations. For ten months, third-year medical students and senior nursing students were recruited for four, 1-hour simulations. Scenarios included myocardial infarction, pancreatitis/hyperkalemia, upper gastrointestinal bleed, and chronic obstructive pulmonary disease exacerbation. After each scenario, experts in medicine, nursing, simulation, and adult learning facilitated a debriefing. Study measures included pre- and post-tests assessing self-efficacy, communication skills, and understanding of each profession's role. Seventy-two medical students and 30 nursing students participated. Self-efficacy communication scores improved for both (medicine, 18.9 ± 3.3 pretest vs 23.7 ± 3.7 post-test; nursing, 19.6 ± 2.7 pretest vs 24.5 ± 2.5 post-test). Both groups showed improvement in "confidence to correct another healthcare provider in a collaborative manner" ($\Delta = .97$ medicine, $\Delta = 1.2$ nursing). Medical students showed the most improvement in "confidence to close the loop in patient care" ($\Delta = .93$). Nursing students showed the most improvement in "confidence to figure out roles" ($\Delta = 1.1$). This study supports the hypothesis that interdisciplinary simulation improves each discipline's self-efficacy communication skills and understanding of each profession's role. Despite many barriers to interprofessional simulation, this model is being sustained. *Journal of Hospital Medicine* 2014;9:189–192. © 2014 Society of Hospital Medicine

Medical simulation is an effective tool in teaching health professions students.[1] It allows a wide range of experiences to be practiced including rare but crucial cases, skills training, counseling cases, and integrative medical cases.[2–6] Simulation also allows healthcare professionals to work and learn side by side as they do in actual patient-care situations.

Previous studies have confirmed the effectiveness of high-fidelity simulation in improving nursing students' and medical students' knowledge and communication skills.[7–11] However, only a few are designed where different professions learn together. Robertson et al. found that a simulation and modified Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPs®) curriculum was successful in improving nursing students' and medical students' communication skills, including an improvement in identification of effective team skills and attitudes toward working together as a team.[12] Stewart et al. also found communication, teamwork skills, and knowledge was improved with nursing students and medical students using pediatric simulation.[13] We hypothesized that simulation training would improve both nursing students' and medical students' medical knowledge, communication skills, and understanding of each profession's role in patient care.

METHODS

Aligning with the University of Alabama at Birmingham School of Medicine calendar, starting in May 2011, weekly simulations were introduced to the current curriculum of the 8-week internal medicine clerkship for third-year medical students. Due to differences in academic calendars, the senior nursing students did not start on a recurring basis until July 2011. The first two months served as a pilot phase to assess the validity of the pre- and post-tests as well as the simulation scenarios. Data from this period were used for quality purposes and not in the final data analysis. Data were collected for this study from July 2011 through April 2012. The institutional review board of the University of Alabama at Birmingham approved this study.

Third-year School of Medicine (SOM) students and senior baccalaureate nursing students participated in

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Additional Supporting Information may be found in the online version of this article.

Received: July 23, 2013; **Revised:** November 4, 2013; **Accepted:** November 7, 2013
2014 Society of Hospital Medicine DOI 10.1002/jhm.2126
Published online in Wiley Online Library (Wileyonlinelibrary.com).

TABLE 1. Pre- and Post-test Results for School of Medicine and School of Nursing Students Completing 4-Session Simulation Block

	Medicine, n = 72			Nursing, n = 28		
	Pretest	Post-test	*P* Value	Pretest	Post-test	*P* Value
Knowledge, mean ± SD	53 ±17%	70 ± 15%	<0.0001	32 ± 15%	43 ± 16%	0.003
Communication self-efficacy, mean (SD), range, 0–30	18.9 (3.3)	23.7 (3.7)	<0.0001	19.6 (2.7)	24.5 (2.5)	<0.0001
Attitudes						
Working well in a medical team is a crucial part of my job.	100%, n = 72	97%, n = 69	NC	100%, n = 28	100%, n = 28	NC
In an emergency situation, patient care is more important than patient safety.	25%, n = 18	25%, n = 18	0.025	21%, n = 6	29%, n = 8	0.032
In an emergency situation, providing immediate care is more important than assigning medical team roles.	35%, n = 25	29%, n = 21	0.067	39%, n = 11	36%, n = 10	0.340
Closing the loop in communication is important even when it slows down patient care.	67%, n = 48	80%, n = 58	0.005	54%, n = 15	79%, n = 22	0.212
The highest ranking physician has the most important role on the medical team.	33%, n = 24	26%, n = 19	<0.0001	0%, n = 0	4%, n = 1	0.836
Multidisciplinary care, where each team member is responsible for their area of expertise, is more productive than cross-integrated care where roles are less defined.	63%, n = 45	71%, n = 51	0.037	68%, n = 19	71%, n = 20	0.827

NOTE: Each cell presents the proportion of learners that responded "Agree" or "Strongly Agree." **Abbreviations:** Medicine = School of Medicine; NC = not computed due to limited variance; Nursing = School of Nursing; SD = standard deviation.

four every-other-week 1-hour simulation sessions during the medical students' 8-week internal medicine clerkship. Each scenario's participants consisted of three nursing students and five or six medical students, with five or six additional medical students observing in the control room. All students participated in the debriefing. Each cohort worked together for the four scenarios in an attempt to build camaraderie over time. Scenarios occurred over approximately 20 minutes, with the remaining 40 minutes used for debriefing. Debriefing with good judgment utilizing advocacy inquiry questioning was our debriefing model,[14] and each scenario's debriefers included at least one physician, one nurse, and one adult learning professional with simulation expertise. All debriefing sessions started with reactions, followed by an exploration phase and finally a summary phase. Debriefings were guided by a debriefing script highlighting key teaching points. TeamSTEPPS® was used as the structure of team-based learning.

Scenarios included acute myocardial infarction, pancreatitis with hyperkalemia, upper gastrointestinal bleed, and chronic obstructive pulmonary disease exacerbation with allow natural death order. Learning objectives for each case focused on teamwork and communication as well as exploring the differential diagnosis. For each scenario, physical exam findings, laboratory results, radiographs, and electrocardiogram results were developed and reviewed by experts for clarity and accuracy. All cases were programmed utilizing Laerdal (Laerdal Medical Corp., Wappinger Falls, NY) programming software and SimMan Essential mannequin (Laerdal Medical Corp.). All scenarios occurred in a simulated emergency department room for patients being admitted to the inpatient internal medicine service.

Identical pre- and post-tests were given to medical and nursing students. Case-specific knowledge was assessed with multiple choice items. Self-efficacy related to professional roles and attitudes toward team communication were each assessed with a 6-item evaluation using anchored 5-point Likert response scales (see Supporting Information, Table 1, in the online version of this article). Self-efficacy items formed a scale, whereas attitude items assessed individual dimensions. These measures were pilot tested with 34 matched pre- and post-tests from medical and nursing students. Pilot data were only for quality purposes and are not in the final data analysis.

The self-efficacy scale was examined for clarity and discrimination with Cronbach's α. Individual attitudes were examined for response variation. Knowledge questions were examined for evidence of change. Two questions were dropped from the pilot measure (1 for inappropriate material given the case and 1 for ceiling scores at pretest), and one question was reworded to include ethics, resulting in the final version of the pretest. This pretest was completed at the medical student clerkship orientation and the nursing student introduction prior to any simulation scenario. After each debriefing, all students completed an anonymous evaluation survey about the simulation and debriefing consisting of nine questions with a 5-point Likert response scale. The survey also included open-ended questions related to the simulation's effectiveness and areas for improvement. At the end of the 8-week clerkship after the final scenario, the post-test and postcourse surveys were completed. All data were anonymous but coded with unique ID numbers to allow for comparing individual change in scores.

Statistics

Quantitative statistical analysis was performed using SPSS version 21.0 (SPSS Inc., Chicago, IL). All tests were 2-tailed, with significance set at $P = 0.05$. Paired *t* tests were used to determine differences between pre- and post-test self-efficacy for participants. A series of attitudinal statements were examined with χ^2

tests; response categories were collapsed due to the sparse n in some cells (strongly agree and somewhat agree = agree; strongly disagree and somewhat disagree = disagree). Significance was set at $P = 0.05$, and the self-efficacy scale was examined for internal consistency with Cronbach's α. Reported knowledge scores are based on percentage correct; self-efficacy results are reported as a total score for all items.

RESULTS

A total of 108 students, 78 medical students and 30 nursing students, participated in this study. Paired pre- and post-tests available for 72 medical students and 28 nursing students were included in the analyses (Table 1). Knowledge scores improved significantly and similarly for medical students by 9.4% and School of Nursing (SON) students by 10.4%. The self-efficacy scale (range, 0–30) had moderate to good internal consistency (Cronbach's α range was 0.68 [pretest] to 0.82 [post-test]). Both medical students and nursing students demonstrated significant improvements in the self-efficacy scale mean scores, with increases of 4.8 points ($P < 0.0001$) and 4.9 points ($P < 0.0001$), respectively. Both medical student and nursing student groups showed the greatest change in "confidence to correct another healthcare provider at bedside in a collaborative manner" ($\Delta = 0.97$ and $\Delta = 1.2$, respectively). SOM students showed a large change in "confidence to always close the loop in patient care" ($\Delta = 0.93$), whereas SON students showed a large change in "confidence to always figure out role on a medical team without explicit directions" ($\Delta = 1.1$).

Results of the postsimulation evaluations indicate that students felt the activity was applicable to their field (mean = 4.93/5 medicine, 4.99/5 nursing) and a beneficial educational experience (mean = 4.90/5 medicine, 4.95/5 nursing). Among the open-ended responses, the most frequent positive response for both groups was increased medical knowledge (37% of all medical students' comments, 30% nursing students). An improved sense of teamwork and team communication were the second and third most common positive comments for both groups (17% medicine, 19% nursing and 16% medicine, 15% nursing, respectively). The most commonly recognized area for improvement among medical students was medical knowledge (24%). The most commonly cited area for improvement among nursing students was communication within the team (19%).

DISCUSSION

Immersive interprofessional simulations can be successfully implemented with third-year medical students and senior nursing students. The participants, regardless of profession, had a significant improvement in clinical knowledge. These participants also improved their attitudes toward interprofessional teamwork and role clarity.

Our results also showed that both groups of students had the greatest improvement in "confidence to correct another healthcare provider at bedside in a collaborative manner." The debriefing team consisted of professionals from both nursing and medicine, which allowed for time to be spent on both the knowledge objectives of the case as well as the communication aspects of the team.

Combining learners with equivalent levels of knowledge and hands-on experience from different professions is challenging and requires early planning. The nursing student participants were in their final of five semesters before completing baccalaureate requirements, and the medical students were in their third of four years of school. This grouping of medical and nursing students worked well. Medical students had more book knowledge, whereas nursing students had more hands-on experience, such as administering medications and oxygen, but less specific clinical knowledge. Therefore, each group complemented the other.

Although this study was initially funded by an internal grant, the simulation course described in this report is now required for medical students during their internal medicine clerkship and nursing students during their final semester. The course has expanded from one hour each week to two hours each week and now includes eight cases instead of four. Other disciplines such as respiratory therapy and social work are now involved, and the interprofessional debriefing continues to be a part of every case with faculty from each discipline serving as content experts, and a PhD educator serving as the lead debriefer. The expansion of this course was due to faculty from each discipline observing students in action and attending the debriefing to witness the rich discussion that occurs after every case. Faculty who observed the course had the opportunity to talk to learners after the debriefing and get their feedback on the learning experience and on working with other disciplines. These faculty have become champions for simulation education within their own schools and now serve as content experts for the simulations. Aside from developing champions within each discipline and debriefers from each field, another key factor of success was giving nursing students credit for clinical time. This required nursing course directors to rethink their course structure.

The study has several limitations. Knowledge learned during the 2-month period between the pre- and post-test was not solely related to that learned during the simulation. The rise in α level in the post-test results could indicate that the questions had substantial ceiling effects. This study assessed self-reported confidence and not qualitative improvements in medical care. Our self-efficacy and communication surveys were created for this study and have not been previously validated. Our study was also conducted at 1 institution with strong institutional support for both

simulation and interprofessional education, and its reproducibility at other institutions is unknown.

CONCLUSIONS

Interprofessional simulation training for nursing and medical students can potentially increase communication self-efficacy as well as improve team role attitudes. By instituting a high-fidelity simulation curriculum similar to the one used in this study, students could be exposed to other disciplines and professions in a safe and realistic environment. Further research is needed to demonstrate the effectiveness of interprofessional training in additional areas and to evaluate effects of early interprofessional training on healthcare outcomes.

Disclosures: This study was funded by the Health Services Foundation General Endowment Fund, University of Alabama at Birmingham, Birmingham, Alabama. The abstract only was presented at the 13th Annual International Meeting on Simulation in Healthcare, January 26–30, 2013, Orlando, Florida. No author has any conflict of interest or financial disclosures except Dr. Tofil, who was reimbursed by Laerdal for travel expenses for a Laerdal-sponsored meeting in the fall of 2011 and 2013 while giving an independently produced lecture on pediatric simulation. No fees were paid.

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