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ORIGINAL RESEARCH

Emergency on Campus! Quantitative Analysis of the Effects of an Interprofessional Simulation on Health Care Students

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Context: Simulation is a frequently used technique for interprofessional education, allowing students from multiple professions to work together in providing quality patient care. However, little is known about the impact of interprofessional simulation with the inclusion of athletic training students because of the lack of literature.

Objective: This study explored the impact of an interprofessional simulation on athletic training, nursing, and occupational therapy students' attitudes toward interprofessional collaboration after participation in an interprofessional simulation.

Design: Quasi-experimental mixed-methods study, using a single-group, pretest-posttest design. The quantitative results are reported here.

Setting: Private mid-sized Midwestern university.

Participants: Seventy-nine students, representing athletic training, nursing, and occupational therapy, participated in the simulation; 32 of these students completed pretest/posttest questionnaires.

Intervention: Students in all professions cared for or observed the care of a standardized patient from the time of a spinal cord injury on the football field through an ambulance ride and subsequent emergency and inpatient care. Students completed pretest/posttest questionnaires in the week before and immediately after the simulation.

Main Outcome Measure: The Jefferson Scale of Attitudes Toward Interprofessional Collaboration (JeffSATIC) measured attitudes toward interprofessional collaboration. It consists of 2 subscales: Accountability and Working Relationships. Higher scores indicated more orientation toward teamwork and collaboration.

Results: Participants demonstrated significant change on the JeffSATIC's Working Relationship subscale ($P = .003$). The Cohen d effect size was calculated for presimulation and postsimulation change, which showed a medium effect for the overall scale ($d = 0.46$), a negligible effect for the Accountability subscale ($d = 0.02$), and a large effect for the Working Relationship subscale ($d = 0.79$).

Conclusions: This study demonstrates the utility of the simulation in improving attitudes toward interprofessional working relationships. Further research should explore the differences noted between athletic training students and other health care profession students.

Key Words: Interprofessional education, patient simulation, health occupations

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KEY POINTS

- Simulation is an effective means of improving student attitudes toward interprofessional working relationships.
- Athletic training students had fewer positive attitudes toward interprofessional collaboration than nursing or occupational therapy students.
- More opportunities need to be developed for athletic training students to be involved interprofessional education simulation-based learning.

INTRODUCTION

The Institute of Medicine[1] and the *Future of Nursing: Leading Change, Advancing Health* publication highlighted the importance of interprofessional education (IPE) for health care providers and detailed the benefits of interprofessional education in prelicensure programs through team building, improvement of communication skills between disciplines, and role clarification. Individual health care professions, such as athletic training, nursing, and occupational therapy (OT), also recognize the importance of IPE in preparing students for real-world practice. For example, the American Occupational Therapy Association[2] promotes the inclusion of IPE in prelicensure curricula to prepare practitioners to function in multidisciplinary teams. Likewise, the accreditation standards for athletic training programs require students to interact with other health care professionals.[3] The National League for Nursing,[4] a professional organization for nurse educators, promotes the inclusion of opportunities for prelicensure nurses to learn alongside students from a variety of health professions. It is clear that health care educators recognize the increasing importance of IPE in the preparation of students for professional practice. While accrediting agencies for athletic training, nursing, and OT programs underscore the importance of interprofessional collaboration and there is evidence demonstrating that interprofessional practice improves patient care,[5,6] there remains a lack of consensus on how to best implement and evaluate interprofessional education.

The Interprofessional Education Collaborative[7] developed 4 core competencies to be applicable across professions, including Values/Ethics for Interprofessional Practice, Roles/Responsibilities, Interprofessional Communication, and Teams and Teamwork. In order to meet these core competencies, health care educators use a variety of approaches with students. Some of the most commonly used IPE strategies include small group discussion, problem-based learning, clinical teaching, direct patient interactions, community-based projects, and simulation-based learning.[8] Simulation in health care education has advanced with developments in technology, and it offers students many opportunities to improve their learning.[9] Interprofessional simulations can reduce patient care mistakes due to poor communication and provide students with a learning opportunity similar to that obtained during clinical practice.[9]

In order for IPE to continue to be implemented when entering clinical practice, it is important to examine students' attitudes toward IPE. Renschler et al[10] assessed a variety of health care students' attitudes toward teamwork skills after interprofessional clinical education programs, including students from athletic training and nursing. These authors found that attitudes toward teamwork skills improved overall, but the results varied by profession.[10] While athletic training, nursing, and OT students have often been involved in interprofessional learning activities like introductory courses and case discussions,[11,12] athletic training students have frequently been excluded from simulation-based learning experiences.[13] In September of 2018, there were no studies that incorporated athletic training, nursing, and OT students into an interprofessional simulation.

The purpose of this study was to determine the impact of an IPE simulation experience, which included students from athletic training, nursing, and OT programs, on participants' attitudes toward interprofessional collaboration. To address this purpose, the following objectives were created: (1) determine if students who participated in the IPE simulation had a significant change in attitudes toward interprofessional collaboration, as measured by the Jefferson Scale of Attitudes Toward Interprofessional Collaboration (JeffSATIC), and (2) determine if there was a difference in attitudinal changes among the various student professional programs (undergraduate athletic training students; undergraduate, accelerated-degree nursing students; and graduate OT students).

METHODS

Research Design

This study used a mixed-method design; qualitative study findings can be found in a separate manuscript. This was a mixed-methods study that used an explanatory concurrent design. The quantitative data were collected using a quasi-experimental, single-group, pretest-posttest design. The results of the quantitative portion of the study were used along with qualitative focus group findings to form a more complete understanding of the impact of the simulation. This article focuses on the quantitative results. The IPE simulation occurred at a mid-sized Midwestern university. Data collection began 7 days before the simulation and ended immediately after the simulation. The study was determined to be exempt by the Human Research Protections Program at the university in which the study took place.

A convenience sample of university students were recruited from courses in an bachelor of science in Athletic Training program, undergraduate accelerated second-degree bachelor

of science in nursing (BSN) program, and graduate OT program. To be eligible for this study, students needed to be at least 18 years of age and enrolled in the course in which the simulation experience occurred. Prior to the event, faculty from each program read a scripted description of the research study to their students; the instructor explained that participation was voluntary and that being a part of the research study was not required to participate in the simulation. The students did not receive formal education on interprofessional collaboration in these courses before the simulation.

Simulation and Standardized Patient Encounter

Nine athletic training students, 9 nursing students, and 7 OT students were in participatory roles in a multipart emergency simulation involving the spinal cord injury of a simulated patient, while all other students observed the simulation. Students who observed viewed a streamed video of real-time events and followed along with an observational guide. For the purposes of this study the simulated patient was a student who had been coached on the simulation objectives of how to display the clinical manifestations relative to the scenario. The objectives for the simulation were to (1) integrate the knowledge, skills, abilities, and experiences of other professions—appropriate to the specific care situation—to inform care decisions that provide care that is ethical, safe, timely, efficient, effective, and equitable; (2) respect and embrace the unique cultures, values, roles/responsibilities, and expertise of one's own and other health professions; (3) work in cooperation with those who receive care, those who provide care, and others who contribute to or support the delivery of prevention and health services to forge interdependent relationships to improve care and advance learning; (4) act with honesty and integrity to develop trusting relationships with patients, families, and other team members.

Athletic training students with participatory roles in the simulation provided on-field emergency care to an injured patient during a simulated football game. This care included an initial field assessment for a patient with a spinal cord injury. Students then used the spine board and spinal motion restriction stabilization measures. Athletic training students collaborated with emergency personnel to move the patient to a stretcher and transfer the simulated patient via ambulance to the emergency department in the simulation center, where nursing students provided care. These nursing students conducted a neurological assessment and completed a preoperative safety checklist before sending the patient to surgery. Postoperatively, nursing and OT students engaged in nursing assessment and OT evaluations, respectively. They collaborated to teach the patient about the central cord injury that occurred and worked to move and transfer the patient safely.

Data Collection

Students were invited to complete the JeffSATIC both before and after the simulation. An email explaining the study to students participating in the simulation was sent 1 week before the simulation. This email stated that participation in the research component of the simulation was voluntary and that the decision to participate or not would have no impact on course grade. The email contained a link to an online Qualtrics survey. Identical reminder emails were sent 2 days, 1 day, and a few hours before the beginning of the experience.

The students then participated in or observed the multipart emergency simulation involving the spinal cord injury of a simulated patient. Although simulation is an effective hands-on learning tool for students, the observer role offers a way for students to be involved in order to include a larger number of students in the learning activity. The observer role, which is considered to constitute any student who is viewing the simulation without being actively involved, is supported by Bandura's social learning theory.[14] Bandura[14] suggests that individuals learn from one another by way of observation, or on a vicarious basis. O'Regan et al[15] found that use of observer tools during a simulation activity is strongly associated with role satisfaction and learning outcomes. To enhance the observer experience during this study, participants in the observer role were given a Simulation Observation Guide. The Simulation Observation Guide allowed students to focus on aspects of the simulation, leading them from merely watching to becoming more engaged. The guide also served as reference material when the observers participated in the debriefing discussion.

Participants completed the postintervention survey online upon the conclusion of the simulation. The survey remained open for approximately 45 minutes and closed at the start of the debriefing session. Then all students participated in the simulation debriefing. In order to not have the debriefing affect students' individual perceptions, all students then participated in a group debriefing. Debriefing sessions lasted approximately 45 minutes and addressed issues of feelings during the simulation, the ability to fulfill objectives and use necessary knowledge and skills in the simulation, and interprofessional communication.

The JeffSATIC measures attitudes toward interprofessional collaboration. This 20-item questionnaire uses a 7-point Likert scale, indicating level of agreement to items.[16] Possible scores range from 20 to 140, with higher scores indicating more orientation toward teamwork and collaboration.[16] The JeffSATIC instrument consists of 2 subscales: Working Relationships and Accountability. The Working Relationships subscale items address perceptions of components and contributors to interprofessional collaborative practice.[16] The Accountability subscale includes items related to perceptions of individual and group responsibility for patient care, teamwork, and clinical judgment.[16] Face validity of the JeffSATIC was established by 12 interprofessional faculty from the Jefferson Center for Interprofessional Education.[16] Content validity was established based on the responses of 1976 students, representing 3 universities and several health care professions, including nursing, occupational therapy, and medicine, among others.[16] Cronbach alpha coefficients demonstrated strong internal consistency, with scores of 0.84 to 0.90 for total scores, 0.84 to 0.91 for factor 1 related to Working Relationships, and 0.78 to 0.90 for factor 2 related to Accountability.[16] Female participants in the sample of Hojat et al[16] sample had higher scores than males, which the authors noted to be consistent with findings in some profession-specific literature, such as that involving medical students and nursing students, but not consistent with literature involving medical and pharmacy students. Additionally, physician participants did not have as high of ratings as did other

Table 1. Comparison of Presimulation and Postsimulation Scores (N = 32)

	Presimulation, Mdn (IQR)	Postsimulation, Mdn (IQR)	*P* Value
Overall Jefferson scale	121.5 (28.3)	126.0 (35.5)	.074
Accountability subscale	46.5 (14.5)	46.5 (28.5)	.946
Working Relationship subscale	79.5 (10.8)	82.0 (6.0)	.003

Abbreviations: IQR, interquartile range; Mdn, median.

groups, which is expected based on other literature about physician approaches to collaboration.[16] The JeffSATIC instrument is psychometrically sound to assess interprofessional educational programs and to compare attitudes toward collaboration and teamwork among students from all health professions.[16]

Data Analysis

Descriptive statistics were used to describe the baseline characteristics of the total-sample presimulation and postsimulation JeffSATIC scores. The number of participants in each student professional program is reported as frequencies and percentages, while the JeffSATIC scores (overall scale, Accountability subscale, Working Relationship subscale) are reported as medians and interquartile ranges since the data were not normally distributed. Wilcoxon signed-ranks tests were used to compare presimulation and postsimulation JeffSATIC scores. To compare the amount of change in scores from presimulation to postsimulation among the student professional programs, a change score was calculated (postscore minus prescore). Change scores for the JeffSATIC overall scale, Accountability subscale, and Working Relationship subscale were compared using a Kruskal-Wallis test. For significant Kruskal-Wallis results, pairwise post hoc analyses, using the Mann-Whitney *U* test with the Bonferroni correction at an adjusted alpha significance of .017, were conducted. Effect size was calculated to establish the size of the differences between presimulation and postsimulation scores. Normality of data were determined using the Shapiro-Wilk test. Data were analyzed using IBM SPSS Statistics for Windows, Version 24.0 (IBM Corp, Armonk, NY). All comparisons were 2-tailed, and a significance level of less than .05 was considered statistically significant.

Ethical Considerations

All students who participated in the simulation were made aware that participation in the study was voluntary and in no way affected the course grade. Information obtained through the online survey would be confidential and protected by a student-developed identifier. Researchers were not aware of the identifier and were therefore blind to survey results with student name.

RESULTS

A total of 79 students participated in or observed the simulation. Of these, 45 students (57%) were BS athletic training students, including 19 sophomore, 9 juniors, and 17 seniors, and 27(34%) were accelerated BSN students, including 17 sophomores and 10 seniors. The remaining 7 students (9%) were graduate OT students. Of these students, 32 (40.5%) completed both the presimulation and postsimulation questionnaire. Of the 32 study participants, 18 (56.25%) were BS athletic training students, 10 (31.25%) were accelerated BSN students, and 4 (12.50%) were graduate OT students. Demographics such as gender, age, and previous experience with IPE were not obtained in this study.

Presimulation and postsimulation scores were compared for the entire sample. The results can be found in Table 1. The only outcome score that changed significantly ($P = .003$) was the Working Relationship subscore. The Cohen d effect size was calculated for the change from presimulation and postsimulation, which showed an effect size of $d = 0.46$ for the overall Jefferson scale, an effective size of $d = 0.02$ for the Accountability subscale, and an effect size of $d = 0.79$ for the Working Relationship subscale. Presimulation and postsimulation scores were also compared by student type. For the OT students, there was no significant difference in presimulation and postsimulation scores for any of the outcome measures ($P < .05$). The athletic training and BSN student scores were similar, with the only significant difference occurring for the Working Relationship subscale ($P = .030$ and $P = .028$, respectively).

Presimulation, postsimulation, and change scores were compared between the student types; results are found in Table 2. There was not a significant difference in the Working Relationship subscale scores presimulation or postsimulation between student types. Furthermore, no significant difference in change scores was found. Significant differences among the student types for the overall Jefferson scale scores and Accountability subscale scores presimulation and postsimulation were found; however, the amount of change from presimulation to postsimulation was not statistically different. Pairwise post hoc tests were conducted for the significant presimulation and postsimulation results for the overall Jefferson scale scores and Accountability subscale scores. The results showed significant differences between athletic training and BSN scores for all 4 outcomes (presimulation: Jefferson $P = .004$, Accountability $P < .001$; postsimulation: Jefferson $P = .016$, Accountability $P = .001$) and significant differences between athletic training and OT scores for presimulation scores only (Jefferson $P = .005$, Accountability $P = .010$). There were no significant differences in BSN and OT scores for any of the outcomes.

DISCUSSION

Similar to the work of Hertweck et al[17] and Renschler et al,[10] our study found differences between professional groups with regard to their attitudes toward other professions. Athletic training students had lower pretest and posttest scores than did both the OT and BSN students on the entire scale and both subscales. Previous studies[16–19] found that gender may play a role in differences between groups, with females having

Table 2. Comparison of Presimulation, Postsimulation, and Change Scores by Student Professional Program

	AT (n = 18), Mdn (IQR)	BSN (n = 10), Mdn (IQR)	OT (n = 4), Mdn (IQR)	*P* Value
Presimulation				
Overall Jefferson scale	110.0 (28.5)	133.5 (16.3)	132.0 (11.8)	.003
Accountability subscale	39.0 (28.3)	52.5 (6.8)	52.0 (8.3)	<.001
Working Relationship subscale	76.0 (12.8)	82.0 (8.0)	80.5 (4.0)	.370
Postsimulation				
Overall Jefferson scale	120.0 (34.3)	135.5 (15.3)	132.5 (14.0)	.022
Accountability subscale	41.5 (30.5)	52.5 (8.0)	50.5 (9.3)	.004
Working Relationship subscale	79.0 (6.8)	83.5 (2.3)	83.0 (5.8)	.068
Change score				
Overall Jefferson scale	2.0 (7.3)	0.50 (5.0)	0.50 (4.8)	.412
Accountability subscale	0 (8.0)	0 (4.0)	-1.0 (1.5)	.683
Working Relationship subscale	1.5 (5.0)	1.0 (2.5)	1.0 (4.3)	.844

Abbreviations: AT, athletic training; BSN, undergraduate accelerated second-degree bachelor of science in nursing program; IQR, interquartile range; Mdn, median; OT, occupational therapy.

a more positive attitude toward IPE. It is not clear if gender may have played a role in the responses, as demographic data were not obtained.

Ward et al[18] found that students with a previous degree had more positive perceptions of IPE than did other groups. All of the nursing students who participated in the study were in the accelerated second-degree BSN program, and all OT students were graduate students. These programs require previous bachelor degree attainment for entrance, although the previous degree does not need to be in the medical field. This degree prerequisite may account for the higher ratings on the JeffSATIC in the nursing and OT group when compared with the athletic training group.

Athletic training participant scores were not as high as those of participants from other professions. This could be due, in part, to the different curricular experiences and interprofessional clinical experiences athletic training students have. Breitbach and Richardson[13] acknowledged that IPE has only recently become a part of athletic training education, as well as acknowledging that other health care professions may misunderstand the role of athletic training. This might have limited students' clinical and didactic exposure to IPE. Thus, much like the findings of Hertwick et al,[17] who found that experience in the clinical practice environment can make a positive difference in attitudes toward collaboration, athletic training students may have reported lower scores on the instrument than did students from other professions because of lack of previous exposure. In this study, previous interprofessional exposure was not tracked, though the authors recommend including this consideration in future studies.

In a study with undergraduate and postundergraduate students from medical dietetics, nursing, respiratory therapy, medicine, nurse practitioner, OT, pharmacy, and physical therapy, the Readiness for Interprofessional Learning Scale was administered before and after a multi-patient simulation.[20] Combined with qualitative findings, authors[20] found that participants had a positive change in attitudes related to teamwork and collaboration, as well as understanding the roles of others after the educational session. Similar to our study, these changes in attitudes toward teamwork and collaboration are consistent with findings on the Working Relationships subscale in this study, which addresses elements and antecedents of interprofessional collaborative practice.[16]

There were no significant changes in scores on the Accountability subscale of the JeffSATIC. This was an unexpected finding, considering the goals of the simulation exercise to foster communication, collaboration, and appreciation for other professions. There are a number of possible explanations for this finding. Students may have felt rushed during the time allotted to complete the postquestionnaire, which may have been further exacerbated by the negative wording of the items in the Accountability subscale of the JeffSATIC. The order of the items on the original instrument was changed inadvertently, which may have affected the results.

LIMITATIONS

It may be difficult to compare results from this study with those of other studies that included only one level of students, for example, only graduate or undergraduate students. This study is also unique in that it included participants from athletic training, a profession newly represented in the IPE literature, especially as it relates to simulation. The tool used in the study was the JeffSATIC, which has not been used in previous IPE studies, and its responsiveness has not been established; therefore, its ability to measure change over time is unclear.

An additional limitation of this study is that it included only 32 participants, and there were not equal numbers of participants from the 3 student groups, which could have biased the results. Because of the small sample size and unequal groups, the study may have lacked sufficient power to detect a statistically significant difference over time and between groups. Post hoc power calculations found that the nonsignificant findings for within-group comparisons ranged from 5% to 40% and the power for nonsignificant findings for

the between-group comparisons of change scores ranged from 8% to 12%. Therefore, the lack of statistically significant findings for the within-group and between-group comparisons may be due to a type II error. Given the small population of OT students, results cannot be generalizable for this population. The health care professions were not equally represented in the simulation event; however, the percentage from each profession who participated in the research study was similar to overall participation rates. While it is true that the groups were not equally represented in the simulation and research study results, we believe our results are still significant to the literature because of the limited research on athletic training in interprofessional education and the limited literature on athletic training and nursing and OT groups.

This study did not collect demographic information including gender, age, previous IPE participation, or previous degree attainment. These factors may all contribute to attitudes toward interprofessional collaboration; future research should include these demographic factors in data analysis. Finally, in the presimulation and postsimulation surveys we asked participants the same questions. Students who served in the observer role were expected to provide the same feedback as those who performed in the simulation, leading to a potential skew in results.

Makino et al[21] found evidence that gains in attitudes toward interprofessional collaboration may not persist into professional practice. Therefore, it may be advisable for future research on IPE in the university setting to include longitudinal follow-up to assess the long-term effects of utilizing simulation as an interprofessional teaching strategy.

CONCLUSIONS

This study showed significant changes on the JeffSATIC Working Relationships subscale, indicating that the simulation activity improved student attitudes toward interprofessional working relationships. Overall, this study showed a positive change in attitude related to teamwork and collaboration among the various health care professions used in this simulation. Although limitations were acknowledged, the study reinforced the importance of interprofessional education in order to foster teamwork and collaboration among health care professional students.

Future research in interprofessional simulations is needed to investigate differences noted between athletic training students and the rest of the sample as well as to determine whether results are similar with a different simulation scenario and/or additional health care professions. The researchers plan on continuing the interprofessional simulation experience and associated research. Future studies will include more professional programs and will collect demographic data in order to better understand group differences. Participants will come from athletic training, nursing, and OT, with the addition of social work, physical therapy, and psychology programs, to further expand the implementation of IPE within the curricula. Demographic data seek to understand differences based on gender, previous IPE experiences, and previous degree attainment because literature shows that these aspects can affect results.

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