BRIEF

Improving Understanding of Interprofessional Roles, Teamwork, and Communication Through an Acute Patient Stabilization Simulation

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Objective. Interprofessional collaborative practice improves patient outcomes but is difficult to integrate into health care training. We aimed to teach interprofessional communication and teamwork through a standardized patient simulation on acute patient stabilization for health professions learners and measure the impact on learners’ perceptions of interprofessional collaboration.

Methods. Medical and pharmacy students in their final year, and post-licensure nurses in their initial 6-month probationary period worked together to stabilize a simulated acutely-ill standardized patient. Perceptions of IPE were assessed pre- and post-simulation using the Student Perceptions of Interprofessional Clinical Education-Revised Instrument, version 2 (SPICE-R2). Scores were compared to a concurrently enrolled cohort of medical students who did not participate in the simulation.

Results. Eighty learners participated in the simulations and all completed pre and post SPICE-R2 assessments. Learners’ perceptions increased significantly in all domains including understanding of roles in collaborative practice, interprofessional teamwork and team-based practice, and patient outcomes from collaborative practice. Compared to the control cohort whose scores did not change, perception of team-based practice and the impact on patient outcomes improved significantly; scores were similar for understanding of roles/responsibilities. SPICE-R2 scores increased similarly for students in each profession; repeat exposure to the simulation continued to improve perceptions but not as robustly as the initial simulation.

Conclusion. This simulation changed learners’ perception of how interprofessional collaboration affects patient care supporting the incorporation of standardized patient-based interprofessional education even in late-stage education of health professionals.

Keywords: interprofessional education, simulation, bootcamp, collaborative practice, internship preparation, standardized patient

INTRODUCTION

Complex health care needs require an effective interprofessional health care team with shared goals, clear roles, and effective communication to achieve measurable outcomes. Failure to function as an effective team leads to adverse outcomes and accounts for up to 80% of serious medical errors. Successful team collaboration improves patient care, decreases length of stay, and reduces health care costs. Developing competency in collaboration requires interprofessional education (IPE) for health professions students. In medicine, the percentage of institutions with required IPE activities has risen to 92%, and accrediting bodies for nursing and pharmacy schools require IPE throughout their curricula.

The Health Professions Accreditors Collaborative created guidance to develop, implement, and evaluate IPE across a wide range of professions. Four core interprofessional competencies (Values/Ethics for Interprofessional Practice, Roles/Responsibilities, Interprofessional Communication, Teams and Teamwork) provide an outcome-driven framework for understanding what should be taught, assessed, and expected in IPE. At our institution, a needs assessment survey of educational priorities for senior medical students revealed a need to provide IPE training as a capstone immediately prior to beginning supervised clinical practice. Specifically, 15% of graduating medical students requested training in how to “collaborate as a member of an interprofessional team” (EPA 9). Therefore, a didactic session on
interprofessional teams and an optional Acute Patient Stabilization Simulation were developed to provide learning about team communication, roles and responsibilities, and observe the impact of teamwork on outcomes in a controlled environment. Here, we assess the effect of this standardized-patient simulation workshop on learners’ perceptions of interprofessional education including roles and responsibilities, communication and teamwork, and impact on patient outcomes.

METHODS

Institutional Review Board approval was obtained for this study. An interprofessional steering committee of nurses, physicians, pharmacists, an instructional designer, our Director of Interprofessional Education, and medical education staff from two institutions was convened to design, implement and assess the optional IPE simulation-based workshop. All medical students who participated in the Transition to Residency course received didactic instruction on IPE and an optional IPE simulation. Post-licensure nurses in their 6-month orientation period and fourth-year pharmacy students completing their experiential rotations were recruited from the health system to participate in the simulation workshop (ie, no concurrent controls). Due to limited numbers of pharmacy students in the health system, they were scheduled for up to three simulations and data was collected after each simulation to assess subsequent effects of the simulation.

The primary objective of this study was to determine the impact of an interprofessional patient stabilization simulation on learner perception of interprofessional collaboration. Secondary objectives were to compare the change in IPE factors including roles and responsibilities, communication and teamwork, and impact on patient outcomes pre/post simulation. Exploratory objectives included evaluating the effect of repeated exposure to the simulation on IPE perception.

The simulation activity included a standardized patient, a fourth-year medical student, an orienting new nurse graduate, a fourth year pharmacy student, and preceptors from each profession per room. Six rooms ran concurrently. Group pre-briefing oriented all learners to the logistics of the event, although no information about the actual case was provided prior to the simulation.

The simulation case involved a patient with an acute medical crisis requiring immediate stabilization. The ten-minute simulation began with a nurse page to the medical student who then entered the simulation room and partnered with the pharmacy student and nurse to stabilize the patient. Debriefing after the event occurred immediately inside the simulation room using a standardized team checklist created by the steering committee. The team checklist was intended to prompt formative feedback on the communication expected and action taken by the team to stabilize the standardized patient with the mutual goals of the IPE exercise shared across all disciplines, and was used to prompt discussion among participants and preceptors on the perceptions of the simulation.

The assessment tool used to measure the primary and secondary study objectives was the validated ten-item Student Perceptions of Interprofessional Clinical Education-Revised Instrument, version 2 (SPICE-R2, 5-point Likert, Cronbach’s alpha=0.86). This instrument assesses agreement with statements about student perception of interprofessional teamwork and team-based practice, roles and responsibilities for collaborative practice, and patient outcomes from collaborative practice. The primary outcome was the overall SPICE-R2 score, secondary outcomes were the factor scores. All simulation participants completed the SPICE-R2 immediately pre- and post-simulation. Pharmacy students with planned participation in up to three simulations completed a second SPICE-R2 after their second or third simulation to assess the impact of repeated exposure. Medical students who participated in the simulation workshop (eg, participants) and those who did not participate (eg, controls) completed the SPICE-R2 on Day 1 and Day 14 of the Transition to Residency course.

Paired student’s t-test was used to compare pre and post survey means and medical students who did and did not participate in the simulation, and ANOVA to compare between the means between three student groups. Effect size was calculated with Cohen’s d.

RESULTS

A total of 80 learners participated in the simulation and completed the surveys. Fourth-year medical students (n=41), fourth year pharmacy students (n=17), and nursing trainees (n=22) worked in teams of 3 to stabilize the acutely ill standardized patient. Nursing trainee numbers were lower than expected due to scheduling conflicts on the day of the event and so some repeated simulations but only completed one post survey.

Overall perceptions of IPE were high prior to the workshop with no significant differences between learner groups in perceptions of teamwork (p=.98), roles and responsibilities (p=.81), and patient outcomes (p=.31). Perceptions significantly improved after completing the IPE simulation for all learners and for each profession (Table 1), with the greatest numerical increase in SPICE-R2 scores seen in medical students although this was not significant (p=.22).
Perceptions significantly improved for all learners in the individual IPE factors as well, with again no statistically significant difference between learner groups for perceptions of teamwork \((p=.16)\), roles and responsibilities \((p=.16)\) or patient outcomes \((p=.49)\).

For the comparison between intervention and control medical students, pre-course SPICE-R2 scores did not differ for student participants in the simulation workshop compared to control students who did not participate \((p=.55)\). Overall mean SPICE-R2 scores increased for student participants compared to control students, though this was not statistically significant (Table 2). Control medical students also gained significantly in their preceptions of roles and responsibilities. When comparing scores on the SPICE-R2 factors, mean change in perception was significantly different between student participants compared to control students in the teamwork and team based practice factor as well as the impact of collaborative practice on patient outcomes factor both with medium effect size \((d = .49\) and .39 respectively), while there was no significant difference in change in perceptions of effect of collaborative practice on patient outcomes between participants and control students (Table 2).

Repeated exposure was less impactful than the initial simulation. For pharmacy students who completed more than one simulation, perceptions continued to numerically increase with additional patient simulations; however, this increase was not statistically significant \((p=.08)\). A trend toward continued improvement in understanding roles and responsibilities was present with repeated exposure (Table 3).

**DISCUSSION**

This simulation specifically aimed to address perceptions of interprofessional collaboration in health care professionals making the transition to independent practice. The two major findings from this study are that (1) students’ perception of team-based care and its impact on patient outcomes was significantly improved as a result of participation in this workshop compared to control students who only received didactic IPE, and (2) learners from all health care professions benefitted similarly from participation, fulfilling key criteria for IPE.

The IPE simulation reported in our study was feasible and impactful for medical, nursing, and pharmacy learners immediately prior to the transition to independent practitioner. These findings add to a growing body of literature on the importance and impact of interprofessional training for health professions learners.16,17,18,19 This transition to independent practice is an important time to incorporate IPE when learners have had an opportunity to witness collaborative care during clinical rotations and anticipate the need to collaborate interprofessionally in their future roles after graduation.

In our study, all participants demonstrated improvement in their perception of understanding roles and responsibilities at the bedside. Prior to this workshop, understanding of roles was the lowest of the three IPE factors that were assessed, even though this factor is foundational and a key first step in interprofessional collaboration. All medical students and pharmacy students in our study had previously been exposed to IPE curricula that taught interprofessional responsibilities and roles yet this still was an area of need at simulation entry. These findings suggest that curricula for students immediately pre-licensure need to include a focus on identifying other professionals, understanding their role at the bedside, and appreciating how this influences delivery of team-based care. Preceptors in our simulation reported that the vast majority of students did not introduce themselves and this appeared to limit the quality of communication at the bedside. Those students who quickly and efficiently identified all care team members by name garnered greater trust amongst the group and opened lines of communication. Students also indicated that they were able to observe the link between team communication and patient outcomes in this acute interprofessional crisis management. Though the repetition of the event for pharmacy students did not lead to significant changes beyond the first simulation, the initial improvement was significant in these learners who had previously participated in IPE. This could signify that multiple events instead of concentrating in one session would be more helpful for students. A surprising outcome was the increase in perceptions of roles and responsibilities by medical students who did not participate. This could be due to a humbling effect of the simulation on those who participated and realized they did not know as much as they thought beforehand about other professions.

Our study had several strengths. First, we included three different professions in the training which allowed for a more realistic simulation. Next, we used a validated instrument that was simple to answer, leading to high response rates. Another strength is that we included a control medical student cohort in addition to pre and post-simulation data, allowing for comparison of the effects of didactic IPE versus didactic plus simulation. The simulation was also followed by an interprofessional facilitator-led debrief, which is a more effective method than self-learning to ensure the IPE activity had the desired impact.20 Limitations in our study include the lack of standardized preparation of both facilitators and learners, such that some of the learners were unclear of their goals for the activity and the facilitators might have focused the debrief differently, although we attempted to control for this by using a team checklist. This may have led to differences in the impact of the workshop on the learners. Our study outcomes are learner perceptions and knowledge of interprofessional collaboration, the most basic impacts of IPE, not changes in behavior.20 A further limitation in the
overall impact on the medical students was allowing them to self-select to participate. This could have allowed for bias in the results since those students who did not participate could be overconfident in their interprofessional skills.

An area for further research is the effect of the structured debriefing. Team debriefing is a critical opportunity to teach, learn, and demonstrate the value of interprofessional team-based education. Additionally, follow up data to measure this simulation’s effect on behavior once learners enter practice would greatly add to the literature.

CONCLUSION
In this study, we demonstrated that a simulation-based IPE activity focusing on bedside communication and collaboration between medical students, pharmacy students, and novice nurses significantly improved trainees’ perception of collaborative teamwork, understanding roles and responsibilities of the care team, and patient outcomes from collaboration. Standardized patient IPE simulations are a feasible and relevant instructional method in late-stage training of health care professionals prior to independent practice. Further research on the effects of a structured debrief on the attitudes toward IPE, and comparison to a diverse IPE control group, would further inform the use of simulation.

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| Domain          | All participants | Medical students | Nursing trainees | Pharmacy students* |
|-----------------|------------------|------------------|------------------|-------------------|
|                 | Pre, M (SD)      | Post, M (SD)     | p value          |
| Teamwork        |                  |                  |                  |
| Pre, M (SD)     | 4.39 (.51)       | 4.73 (.44)       | <.001            |
| Post, M (SD)    | 4.40 (.52)       | 4.81 (.40)       | <.001            |
| Nursing trainees| 4.39 (.50)       | 4.69 (.46)       | .001             |
| Pharmacy students* | 4.36 (.54)   | 4.57 (.50)       | .02              |
| Roles           |                  |                  |                  |
| Pre, M (SD)     | 3.75 (.56)       | 4.35 (.57)       | <.001            |
| Post, M (SD)    | 3.73 (.49)       | 4.38 (.51)       | <.001            |
| Nursing trainees| 3.81 (.57)       | 4.45 (.59)       | <.001            |
| Pharmacy students* | 3.71 (.73)   | 4.11 (.66)       | .009             |
| Patient Outcomes|                 |                  |                  |
| Pre, M (SD)     | 4.29 (.56)       | 4.63 (.47)       | <.001            |
| Post, M (SD)    | 4.20 (.58)       | 4.63 (.45)       | <.001            |
| Nursing trainees| 4.39 (.54)       | 4.71 (.46)       | <.001            |
| Pharmacy students* | 4.37 (.51)   | 4.52 (.54)       | .02              |
| Total Scores    |                  |                  |                  |
| Pre, M (SD)     | 4.17 (.42)       | 4.59 (.43)       | <.001            |
| Post, M (SD)    | 4.14 (.06)       | 4.63 (.06)       | <.001            |
| Nursing trainees| 4.22 (.09)       | 4.62 (.09)       | <.001            |
| Pharmacy students* | 4.17 (.12)   | 4.42 (.12)       | .002             |

M is mean with standard deviation (SD) of 5-point Likert scale responses on the Student Perceptions of Interprofessional Clinical Education-Revised Instrument, version 2 (SPICE-R2)

*Data for pharmacy students compared after the first simulation

Two-sided p value calculated by paired student’s t test with significance defined as p < .05
### Table 2. Medical Student Mean SPICE-R2 Scores and Mean Difference Day 1 to Day 14

| Participated in Simulation | Day 1, M (SD) | Day 14, M (SD) | p value<sup>a</sup> | Mean of all differences | p value<sup>b</sup> | Cohen’s d<sup>c</sup> |
|---------------------------|--------------|---------------|---------------------|------------------------|-------------------|-------------------|
| **Overall**               |              |               |                     |                        |                   |                   |
| Did Participate           | 4.15 (.53)   | 4.24 (.50)    | .13                 | .12                    | .10               | .33               |
| Did not                  | 4.09 (.52)   | 4.06 (.54)    | .57                 | -.03                   |                   |                   |
| **Teamwork**             |              |               |                     |                        |                   |                   |
| Did Participate           | 4.32 (.67)   | 4.40 (.53)    | .31                 | .09                    | .02               | .49               |
| Did not                  | 4.29 (.54)   | 4.12 (.62)    | .008                | -.17                   |                   |                   |
| **Roles**                |              |               |                     |                        |                   |                   |
| Did Participate           | 3.92 (.60)   | 4.02 (.53)    | .21                 | .12                    | .62               | .10               |
| Did not                  | 3.83 (.65)   | 4.01 (.57)    | .01                 | .18                    |                   |                   |
| **Outcomes**             |              |               |                     |                        |                   |                   |
| Did Participate           | 4.14 (.64)   | 4.27 (.62)    | .33                 | .15                    | .047              | .39               |
| Did not                  | 4.07 (.70)   | 4.02 (.70)    | .10                 | -.06                   |                   |                   |

M is mean with standard deviation (SD) of 5-point Likert scale responses on the Student Perceptions of Interprofessional Clinical Education-Revised Instrument, version 2 (SPICE-R2)

Mean of all differences is of differences in scores on the SPICE-R2 for all students who did and did not participate in the simulation on day 1 and day 14

<sup>a</sup>Two-sided p value calculated by paired student’s t test between day 1 and day 14 means with significance defined as p<.05

<sup>b</sup>Two-sided p value calculated by paired student’s t test between the means of all differences of students who did and did not participate with significance defined as p<.05

<sup>c</sup>Cohen’s d, effect size, calculated for the mean difference between students who did and did not participate

### Table 3. Pharmacy Student Mean SPICE-R2 Scores Pre and Post 2 Simulations

|                  | Pre, M (SD) | Post 1, M (SD) | Post 2, M (SD) | p value: pre to post 1<sup>a</sup> | p value: post 1 to post 2<sup>a</sup> | p value: pre to post 2<sup>a</sup> |
|------------------|-------------|----------------|---------------|-----------------------------------|-----------------------------------|-----------------------------------|
| **Overall**      | 4.17 (.12)  | 4.42 (.12)     | 4.54 (.40)    | <.01                              | .08                               | <.001                             |
| **Teamwork**     | 4.36 (.54)  | 4.57 (.50)     | 4.68 (.46)    | .02                               | .35                               | .005                              |
| **Roles**        | 3.71 (.73)  | 4.11 (.66)     | 4.22 (.65)    | <.01                              | .06                               | .001                              |
| **Outcomes**     | 4.37 (.51)  | 4.52 (.54)     | 4.67 (.49)    | .03                               | .14                               | .007                              |

M is mean with standard deviation (SD) of 5-point Likert scale responses on the Student Perceptions of Interprofessional Clinical Education-Revised Instrument, version 2 (SPICE-R2)

<sup>a</sup>Two-sided p value calculated by paired student’s t test between means with significance defined as p<.05