

## LETTER TO THE EDITOR

## An innovative approach to collaborative simulation training on teamwork skills for pediatric residents and nursing students

To the editor,

We wish to submit our brief findings on the use of collaborative simulation training to enhance teamwork skills of pediatric residents and nursing students.

Physicians and nurses are commonly educated independently but are expected to demonstrate teamwork skills in professional practice. Nursing, medical, and other healthcare organizations have called for a movement away from educating medical and nursing students in isolated academic environments.<sup>1</sup> This is because a lack of interprofessional collaboration and communication is cited as one cause for medical errors that results in poor patient outcomes.<sup>2</sup> The literature suggests that collaboration between physicians and nurses can be linked to decreases in morbidity and mortality, reduced healthcare costs, and medical errors.<sup>3</sup> Additionally, several studies have shown that interdisciplinary education increases patient satisfaction.<sup>4 5</sup> Education with mixed-modality simulation can prepare nursing students and resident physicians for collaborative professional practice.<sup>6-8</sup> In general, and historically, there often is a lack of effective teaching strategies for interprofessional education in medical schools and nursing schools. The proposed new accreditation standards from Liaison Committee on Medical Education (LCME) recommend that the core curriculum of a medical education program must prepare medical students to function collaboratively on healthcare teams that include other health professionals. Members of the healthcare teams from other health professions may be either students or practitioners.<sup>9</sup> We hypothesized that mixed-modality high-fidelity simulation (HFS) with critical event scenarios and the use of a standardized participant (SP) as parent/guardian coupled with a standardized

intervention addressing teamwork would be an effective learning activity to facilitate the development of teamwork skills in pediatric undergraduate nursing students with pediatric resident physicians.

We used learner groups consisting of third semester undergraduate pediatric nursing students and pediatric residents were randomly divided into participants and observers. Participants formed teams consisting of pediatric residents and nursing students and were assigned simulation case scenarios. Observers were able to observe the video performance of the team in the debrief room. Pediatric manikins and SPs as parents were used to simulate the clinical practice environment and both pediatric residents and nursing students were assigned to care for the patient as a team. The first simulation was completed in a standard/routine format. The second simulation of the same case was completed after the team received the intervention. The SP was unaware of the intervention. For the intervention, we used Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS), which is an evidenced-based teamwork system designed to improve the quality, safety, and efficiency of healthcare.<sup>7 10 11</sup> There is evidence in the literature that supports the effectiveness of teaching TeamSTEPPS in professional practice for both nurses and physicians.<sup>10 11</sup> However, the survey of the literature did not provide evidence of use of this approach of educating nursing students and resident physicians as teams on TeamSTEPPS principles using mixed-modality HFS.

Teams were evaluated on a formal teamwork scale (High Performance Teamwork Scale (HPTS)); and a separate questionnaire to evaluate performance principles was completed by the SP who portrayed the parent/guardian role (Teamwork Scale (TS)). The HPTS instrument was completed by both participants and observers to evaluate the performance of the team on a formal TS. The HPTS is a Likert-type scale of 0 ('Never or rarely'), 1 ('Inconsistently'), 2 ('Consistently'), or 3 ('N/A'). The TS instrument was completed by the SPs to evaluate the team on TeamSTEPPS performance principles. The TS results in a sum score measured by a Likert-type scale of 'Unsatisfactory' (score 0-2 depending

on domain) to 'Outstanding' (score 3-5 depending on domain).

To evaluate change in scores pre-to-post on the HPTS instrument, marginal homogeneity of frequency responses was tested for 37 participants, ignoring those responses scored as 'N/A', as they were non-informative. For this test, the Stuart-Maxwell test was used. Additionally, responses for each individual were summed, and the mean pre-to-post differences were tested using a paired t-test with a bootstrap 95% CI calculated from 10,000 resamples to account for small sample size.

To evaluate change in the scores on the TS instrument, and owing to a very small sample size (n=8) for this instrument, the median responses were tested using a non-parametric Wilcoxon test based on a permutation distribution to provide exact p values.

The total score on the HPTS instrument was significantly higher after the TeamSTEPPS intervention (t=11.76, p<0.0001, 95% CI of mean difference to 4.49 to 6.27). Additionally, seven of the nine questions were scored higher (ie, higher level of consistency in performance) after the intervention. For the TS instrument, performance by the team on leadership and on situation monitoring significantly improved after the intervention (table 1).

Interprofessional education on teamwork principles and skills using mixed-modality HFS and SP encounters with a standardized TeamSTEPPS intervention resulted in a significant improvement in teamwork skills as judged by the SP. Improvements were most notable in leadership and situation monitoring as well as in the roles that team members undertake when working in teams to treat patients. One of the limitations of the study is the small sample size. Improvements in this small sample were seen, but more studies are needed to properly assess other performance areas and to replicate these findings. However, using a standardized participant with high-fidelity simulation outcomes indicated that teamwork skills in nursing students and residents improved after a TeamSTEPPS intervention. To our knowledge, this is the first study involving SPs and mixed-modality HFS scenarios to evaluate the effectiveness of an innovative teaching strategy for interprofessional education.

**Table 1** Summary of results for the two pre-to-post scales used to evaluate the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) intervention in collaborative simulation training for pediatric residents and nursing students

Question	Test statistic value	p Value
<b>High Performance Teamwork Scale*</b>		
A leader is clearly recognized by all team members	3.00	0.0833
Each team member demonstrates a clear understanding of his/her role	16.00	<0.001
When team members are actively involved with the patient, they verbalize their activities aloud	31.80	<0.001
Team members repeat back or paraphrase instructions and clarifications to indicate that they heard them correctly	25.00	<0.001
All members of the team are appropriately involved and participate in the activity	16.20	0.0003
Disagreements or conflicts among team members are addressed without a loss of situation awareness	3.67	0.1600
When appropriate, roles are shifted to address urgent or emergent events	12.00	0.0025
When directions are unclear, team members acknowledge their lack of understanding and ask for repetition and clarification	17.20	0.0002
Team members ask each other for assistance prior to or during periods of task overload	18.00	0.0001
<b>Team evaluation†</b>		
Team structure	1.89	0.0630
Leadership	2.46	0.0080
Situation monitoring	2.43	0.0080
Mutual support	1.34	0.2500
Communication	1.13	0.2500

\*Questionnaire adapted from the Mayo High Performance Teamwork Scale, results based on the Stuart-Maxwell test ( $\chi^2$ ) for equivalence of frequencies pre-to-post with exact p values reported (n=37 matched pairs).

†Questionnaire adapted from the TeamSTEPPS Teamwork Attitudes Questionnaire; results based on a Wilcoxon signed-rank test (z) for testing scores pre-to-post and with exact p values reported (n=8 matched pairs)

The approach we have presented is a significant step toward having an effective teaching strategy for interprofessional education and may be implemented by medical schools to meet the requirements of LCME. There are plans to replicate the research at multiple institutions through national collaborative efforts, as this has the potential to be an effective tool for teaching teamwork skills and for interprofessional education in general.

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