

RESEARCH ARTICLE

Teamwork education improves trauma team performance in undergraduate health professional students

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Abstract

Purpose: Effective trauma resuscitation requires efficient and coordinated care from a team of providers; however, providers are rarely instructed on how to be effective members of trauma teams. Team-based learning using Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS) has been shown to improve team dynamics among practicing professionals, including physicians and nurses. The impact of TeamSTEPPS on students being trained in trauma management in an undergraduate health professional program is currently unknown. We sought to determine the impact of TeamSTEPPS on team dynamics among undergraduate students being trained in trauma resuscitation. **Methods:** We enrolled teams of undergraduate health professional students from four programs: nursing, physician assistant, radiologic science, and respiratory care. After completing an online training on trauma resuscitation principles, the participants completed a trauma resuscitation scenario. The participants then received teamwork training using TeamSTEPPS and completed a second trauma resuscitation scenario identical to the first. All resuscitations were recorded and scored offline by two blinded research assistants using both the Team Emergency Assessment Measure (TEAM) and Trauma Team Performance Observation Tool (TPOT) scoring systems. Pre-test and post-test TEAM and TPOT scores were compared. **Results:** We enrolled a total of 48 students in 12 teams. Team leadership, situational monitoring, and overall communication improved with TeamSTEPPS training ($P = 0.04$, $P = 0.02$, and $P = 0.03$, respectively), as assessed by the TPOT scoring system. TeamSTEPPS also improved the team's ability to prioritize tasks and work together to complete tasks in a rapid manner ($P < 0.01$ and $P = 0.02$, respectively) as measured by TEAM. **Conclusions:** Incorporating TeamSTEPPS into trauma team education leads to improved TEAM and TPOT scores among undergraduate health professionals.

Key Words: Professional education; Leadership; Nurses; Physician assistants; Resuscitation

INTRODUCTION

Effective trauma resuscitation requires efficient and coordinated care from a team of providers; however, providers are rarely instructed on how to be effective members of trauma

teams. Team-based learning, using programs such as the Team Strategies and Tools to Enhance Performance and Patient Safety (TeamSTEPPS), designed by the Agency for Healthcare Research and Quality, USA, has been advocated as an approach to improve communication and reduce errors during medical and trauma resuscitations [1-3]. While this team-based approach has been successfully employed among practicing providers (post-graduate physicians and nurses), trauma teams often include multiple other professionals, such as radiologic

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sciences and respiratory care practitioners [1,4-6]. These other providers often receive little to no team-based learning prior to graduation [7]. No consensus exists about when to introduce team-based learning methods, such as TeamSTEPPS, and how to assess their impact on undergraduate health professional students. Several tools have been developed to assess the impact of team-based learning, including the Team Emergency Assessment Measure (TEAM) and Trauma Team Performance Observation Tool (TPOT) scoring systems. However, little information is available about their applicability in undergraduate education. TEAM is an observational checklist that was developed to focus on leadership and teamwork and is context-specific to resuscitation [8]. TEAM is a rapid assessment tool requiring less than one minute to complete, and is valid, reliable, and designed to deliver a constructive debrief in simulated and clinical settings including trauma simulations [9]. TPOT is also a rapid observational tool designed to assess a team's performance in trauma resuscitations [10]. Both TEAM and TPOT were designed to assess the overall team as opposed to individuals during trauma resuscitations. While team-based learning can improve TEAM and TPOT scores among practicing providers, the impact of team-based learning on team dynamics at the undergraduate level is unknown. We hypothesized that TeamSTEPPS training improves both TEAM and TPOT scores in teams of undergraduate health professionals. We sought to determine the impact of TeamSTEPPS on team dynamics, as measured by TEAM and TPOT, in the undergraduate setting during trauma resuscitations.

METHODS

Subjects

The participants included teams of undergraduate health professional student volunteers from each of four disciplines. Given the complicated nature of trauma resuscitations, we included upper-level students, in the second year of a two-year radiologic science (RS) program, the fourth year of a five-year master's degree physician assistant (PA) program, the second year of a two-year respiratory care (RC) program, and the fourth year of a four-year baccalaureate registered nurse (RN) program. The PA served as the team leader in both simulations. This team organization was chosen to reflect the disciplines available at our institution. The participants were certified in cardiopulmonary resuscitation, had completed a 30-minute online trauma resuscitation course prior to the simulation day, and had not completed other formal trauma or teamwork training. All participants were randomly assigned to one of 12 teams consisting of one PA, one RN, one RC, and one RS student. The teams completed a simulated trauma resuscitation and then underwent 30 minutes of trauma teamwork educa-

tion utilizing the TeamSTEPPS material via a customized video created by the authors. After the teamwork training, groups then completed a second simulated trauma resuscitation, identical to the first. All scenarios were recorded, and all data were collected on a single day at the university's Patient Simulation Center.

Study design and ethical approval

We performed a prospective trial of undergraduate health professional students from four disciplines. The participants completed an online trauma resuscitation module providing an orientation to the concepts of trauma resuscitation and clearly delineating their roles and expectations. They then completed a trauma scenario in a simulated setting, received TeamSTEPPS training, and then repeated the same trauma scenario. All scenarios were recorded. Both the study protocol for the inclusion of human subjects and the use of the video recordings were approved by our university's institutional review board. All data collection took place on November 12, 2013.

Details of the simulated trauma case

We designed a simulated trauma case involving a 20-year-old male who had sustained injuries from a head-on car-versus-tree collision. The scenario starts with teams listening to a radio report from the emergency medical services (EMS) at the scene. EMS then arrived at the trauma bay of the patient simulation center and provided a verbal report to the team. The patient was the unrestrained driver of the vehicle and upon extrication, the patient was noted to be unresponsive with agonal respirations. A pre-hospital endotracheal tube was placed, but was placed in the esophagus, requiring the team to identify the misplaced endotracheal tube. The case involved performing a primary survey including obtaining and tracking vital signs, recognizing the esophageal intubation, and obtaining a chest X-ray. A customized TeamSTEPPS training video was created based on the consensus of the three authors who are certified master TeamSTEPPS trainers (VOTB, MM, and JNC). The 15-minute video incorporated five components of the Essential TeamSTEPPS training Version 1.0, including *'brief checklist, status of the patient, Concerned-Uncomfortable-Safety, call-out, and check-back.'* These five areas have been identified as essential components of TeamSTEPPS teamwork training for trauma resuscitation [10]. The *'brief checklist'* is used to clarify the roles and responsibilities of team members. *'Status of the patient'* ensures that team members are aware of the patient and how they are progressing toward the goals of the resuscitation. *'Concerned uncomfortable safety'* refers to a technique that facilitates conflict resolution, advocacy, and mutual support by providing a framework for vocalizing concerns about patients and team members. *'Call-out'* is a tactic used to di-

rectly communicate critical information during an emergency event. ‘Check-back’ is a closed-loop communication strategy used to verify and validate information exchange. The video was viewed by all participants after the first trauma scenario.

Data collection and processing

In order to standardize the responses to the TEAM and TPOT data collection tools, we trained two research assistants on the use of the tools during multiple sessions with the investigators, reviewing all previous trauma resuscitations performed at the simulation center within the previous year. All trauma scenarios included in the study were recorded for offline review. The two research assistants viewed the videos independently and were blinded to the pre/post-education status of the participants. The videos were reviewed in a random order. Based on the consensus of the authors, questions 5 (asking non-responding team members to leave when they are distracting), 8 (conducting tasks in the right order), and 10 (ensuring that new team members perform their expected roles and responsibilities) were excluded from the TPOT tool, as they were not applicable to our predesigned simulated scenario. The tool was from Baker DP, Capella J, Hawkes C, Gallo J, Clinic C, The Development of the Trauma Team Performance Observation Tool (TPOT), presented at the annual meeting of the Society for Industrial and Organizational Psychology; Chicago, IL 2011 available from: <http://www.teamsteppportal.org/component/phocadownload/category/1-webinars?download=351:development-tpot>. The research assistants completed all questions in the TEAM tool [8]. All team members had specific roles predefined in their initial online trauma training, and no new team members entered during the scenario. Finally, since TEAM evaluates non-technical skills, we did not evaluate the order of tasks completed in TPOT.

Outcome measure

The primary outcome was the change in TEAM and TPOT scores after TeamSTEPPS education in the undergraduate setting.

Statistical analysis

We completed all analyses using Stata SE ver. 12.0 (Stata Co., College Station, TX, USA). For each question in each scoring system, we compared the pre-TeamSTEPPS scores to the post-TeamSTEPPS scores using non-parametric tests. We also compared the overall pre-TeamSTEPPS scores to the overall post-TeamSTEPPS scores using both TEAM and TPOT. For TEAM, we included all 12 questions; the first 11 questions were scored on a four-point Likert scale and the final question was scored on a 10-point Likert scale. TEAM scores could range from 12 to 54. We excluded three TPOT questions that were not appli-

cable to our simulation, leaving 23 questions scored on a five-point scale. TPOT scores could range from 23 to 115. We assessed agreement between reviewers using Cohen’s kappa for each test. Given the ordered nature of the responses, we calculated Cohen’s kappa using Stata’s weighted kappa function $wgt(w)$. We considered values ≥ 0.61 to indicate substantial agreement, 0.41-0.60 to indicate moderate agreement, 0.21-0.40 to indicate fair agreement, 0-0.20 to indicate slight agreement, and < 0 to indicate no agreement. P-values < 0.05 were considered to indicate statistical significance.

RESULTS

We enrolled a total of 48 students in 12 teams, with all four disciplines represented in each team. The participants had a mean age of 23.9 ± 7 years, and 45 (93.8%) were female.

Trauma Team Performance Observation Tool

Slight agreement was observed in the TPOT scores between the reviewers across all teams (weighted kappa = 0.16, $P < 0.01$), with 82% agreement. TeamSTEPPS training improved several aspects of teamwork as measured by TPOT (Table 1). These

Table 1. Trauma Team Performance Observation Tool scores by question, presented as medians with interquartile ranges in parentheses

	Question	Pre-education	Post-education	P-value
Leadership – team leader	1	2 (1, 3)	4 (1, 5)	0.05
	2	3 (2, 4)	4 (3, 4)	0.03
	3	3 (2, 3)	3 (2, 4)	0.26
	4	3 (2, 4)	4 (3, 4)	0.04
	5 ^{a)}			
	Overall	3 (2, 3)	3.75 (3, 4)	0.04
Situational monitoring – team members	6	1 (1, 2)	2 (1, 3)	0.02
	7	3 (2, 4)	3 (3, 4)	0.16
	8 ^{a)}			
	9	3 (3, 4)	3 (3, 4)	0.96
	10 ^{a)}			
	Overall	2.5 (2, 3)	2.5 (2, 3)	0.37
	Overall	2.5 (2, 3)	3 (2.5, 3.5)	0.02
Mutual support – team members	12	3 (3, 3)	3.5 (3, 4)	0.08
	13	4 (3, 4)	4 (4, 5)	0.1
	14	3 (2, 4)	3.5 (3, 4)	0.18
	15	2 (2, 3)	3 (2, 3)	0.32
	Overall	3 (2.5, 4)	3.5 (3, 4)	0.12
Communication – team members	16	5 (5, 5)	5 (5, 5)	0.32
	17	1 (1, 2)	1 (1, 1)	0.41
	18	2 (2, 3)	2 (1, 4)	0.63
	19	2 (1, 3)	2 (1, 3)	0.92
	20	3 (3, 4)	4 (4, 4)	< 0.01
	21	2 (2, 3)	3 (2, 3)	0.13
	Overall	3 (2, 3)	3 (3, 4)	0.03
Global assessment		3 (2, 3.5)	3 (3, 4)	0.29

^{a)}These questions were not assessed, as they were not incorporated into the trauma scenario.

Table 2. Team Emergency Assessment Measure scores by question, presented as medians with interquartile ranges in parentheses

	Question	Pre-education	Post-education	P-value
Leadership	1	2 (2, 3)	2.5 (2, 3.5)	0.48
	2	2.5 (2, 3)	3 (2, 3)	0.29
Teamwork	3	1.5 (1, 2)	3 (2, 3)	0.15
	4	2 (2, 3)	3 (3, 4)	0.02
	5	3 (2, 3)	3 (3, 3)	0.1
	6	2 (1, 3)	3 (1.5, 3)	0.1
	7	1.5 (1, 2)	2 (1, 3)	0.08
	8	2 (1.5, 3)	2 (2, 3)	0.57
	9	1 (1, 1)	1.5 (1, 2)	0.01
Task management	10	3 (2, 3)	3 (3, 4)	<0.01
	11	2 (2, 3)	3 (2, 3)	0.06
Overall	12	6 (3, 6.75)	6 (5, 7.75)	0.14

included overall team leadership (pre-education vs. post-education median (interquartile range) (3 [2, 3] vs. 3.75 [3, 4], $P=0.04$), overall situational monitoring (2.5 [2, 3] vs. 3 [2.5, 3.5], $P=0.02$) and overall communication (3 [2, 3] vs. 3 [3, 4], $P=0.03$).

Team Emergency Assessment Measure (TEAM)

Fair agreement was observed between the reviewers across all teams (weighted kappa = 0.31, $P < 0.01$, 91% agreement) for TEAM. TeamSTEPPS improved multiple aspects of TEAM, including the team's ability to prioritize tasks ($P < 0.01$) and to work together to complete these tasks in a rapid manner ($P = 0.02$) (Table 2).

DISCUSSION

We found that TeamSTEPPS education improved team dynamics among undergraduate health professionals. While previous work has evaluated the impact of training on participants such as physicians and nurses in various resuscitation situations, such as cardiac arrest and trauma, few studies have assessed the impact of TeamSTEPPS education on undergraduate health professional students in the disciplines included in our study [8-10]. Over 150,000 students graduate annually from the four studied disciplines [11-13]. Since these professionals perform critical roles as members of healthcare teams, it is essential for efforts to continue to integrate team-based training into the undergraduate curriculum.

This brief TeamSTEPPS intervention showed an overall improvement in team leadership as measured by TPOT question 5; however, several questions did not show improvement, including conducting a brief prior to patient arrival (question 1) and providing constructive feedback to the team members

(question 4). Similar results were also seen with question 1 of TEAM. These findings might indicate that the team leaders were comfortable with their role in rendering a plan of care and ensuring prioritization of tasks, but that they were not comfortable directing and evaluating others. Although the roles and responsibilities of each team member were covered in the online trauma training program, the appreciation and awareness of all team members of their roles may need to be reinforced. Another reason for these findings may be the siloed nature of undergraduate health professional education. This was the first time that the PA students were provided with the opportunity to work and learn with other health professional students. These findings may support the need for interprofessional learning experiences early in the curricula of health professional students, in order to break down the barriers of a siloed education system and to facilitate interprofessional communication and teamwork. Our experience conducting hundreds of interprofessional scenarios has indicated that students first need to be competent with their own skill sets prior to directing and evaluating the work of others [7].

Moreover, the TPOT findings indicated that TeamSTEPPS training improved the general categories of situation monitoring and communication among team members; however, no change was observed in the area of mutual support among team members. TeamSTEPPS training also did not improve teammates' feedback (question 12), the use of 'call-out' (questions 15 and 18), the use of 'call-back' (questions 19), or how often they requested additional information from each other (questions 16, 17, and 21). The findings from TEAM regarding team communication were similar (questions 3, 7, and 9). The theme of lack of communication among team members as measured by TPOT and TEAM may also be due to the 'silo-based' educational structure of undergraduate health professional education. Similar results have been observed among other undergraduate health professional students during resuscitation scenarios [13].

Although team-based learning has achieved broad support, commitment to this educational modality is not universal. Along with health profession curricula that 'silo' students during their undergraduate education, barriers to the adoption of team-based learning include communication, conflict resolution, time constraints, the attitudes of team members, and the presence or absence of resources such as electronic health resources. Previous research has suggested that team-based learning should be introduced early in the education of undergraduate health profession students through joint courses and should continue throughout their educational experience. These educational programs should begin with strategies that build trust between students of different professions, urge them to value each discipline's unique contribution to health care, and final-

ly, provide them with an opportunity to practice together to provide quality care [7,14]. It is therefore important to have reliable educational modalities such as TeamSTEPPS and validated tools such as TEAM and TPOT to accurately assess the impact of team-based learning on undergraduate students, especially in trauma care. In order to facilitate this, the Inter-professional Education Collaborative has identified four core competencies: values and ethics for interprofessional practice, roles and responsibilities, interprofessional communication, and teams and teamwork [15]. TeamSTEPPS touches on many of these aspects, making it an ideal education modality for providing such training.

We trained two research assistants to review videos of undergraduates performing trauma resuscitations. These assistants had greater inter-rater reliability with TEAM than with TPOT. While our investigative team has a history of training undergraduates in simulation and trauma resuscitation, the systematic usage and evaluation of these tools was new to us. It may be that TPOT requires more training than TEAM to ensure adequate inter-rater agreement when assessing undergraduate health professionals.

Our results support the use of TEAM and/or TPOT in assessing undergraduate trauma education; however, each tool has benefits and limitations. Previous research has shown that TEAM can be easily learned with minimal instructions, is calculated rapidly, and has good inter-rater reliability as assessed by interclass correlation coefficients [9]. One of the limitations of TEAM is that the reviewer must be familiar with the non-technical skills of resuscitation in order to effectively score team performance [8]. TPOT was designed based on the Agency for Health Quality and Research TeamSTEPPS curriculum. TPOT can be used by a variety of reviewers, has good inter-rater reliability, and has been successfully used in the clinical setting to assess teamwork globally [10].

This study has several limitations. First, this study occurred in a simulated setting. Further work is required to validate these findings in a clinical context. In addition, several other tools are used to evaluate team performance during trauma scenarios, including the Observational Skill-Based Clinical Assessment Tool for Resuscitation (OSCAR) [9,16]. OSCAR provides greater detail at the individual level, while TEAM and TPOT focus primarily on the team as a whole [8,9]. Running the same scenario twice for each participant may have confounded the results. While this may have had an impact on the technical skills of the resuscitation, the non-technical skills measured by TEAM and TPOT were not reinforced by faculty after the first scenario and may be less susceptible to confounding. Moreover, no debriefing or feedback were provided after the first scenario. Of the participants, 93.8% were female. While this may have introduced gender-specific biases, this percent-

age is representative of practicing members in the healthcare sector [17]. We sought to determine the impact of TeamSTEPPS on team trauma care; however, other ways of providing team trauma education may exist. We provided a shortened version of TeamSTEPPS. Although the original TeamSTEPPS curriculum can take over eight hours to complete, we designed this module to be short enough to be taught within a typical lecture time and still allow time for the implementation of the simulated trauma resuscitation. Although this was an abbreviated version of TeamSTEPPS, it was created by the consensus of the authors who have extensive experience with team-based training, with three of the authors being certified master TeamSTEPPS trainers (VOTB, MM, and JNC). Having trained hundreds of students in team-based learning, we felt that our module had face validity despite not including the complete TeamSTEPPS training course.

In conclusion, trauma team education incorporating TeamSTEPPS improves both TEAM and TPOT scores among undergraduate health professionals. Curriculum designers should consider incorporating TeamSTEPPS training into undergraduate health profession education.

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CONFLICT OF INTEREST

No potential conflict of interest relevant to this article was reported.

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SUPPLEMENTARY MATERIAL

Audio recording of abstract.

REFERENCES

1. Katheria A, Rich W, Finer N. Development of a strategic process using checklists to facilitate team preparation and improve communication during neonatal resuscitation. *Resuscitation*. 2013; 84:1552-1557. <http://dx.doi.org/10.1016/j.resuscitation.2013.06.012>
2. Smith-Jentsch KA, Kraiger K, Cannon-Bowers JA, Salas E. Do familiar teammates request and accept more backup?: transactive memory in air traffic control. *Human factors*. 2009;51:181-192.
3. Reagans R, Argote L, Brooks D. Individual experience and experience working together: predicting learning rates from knowing who knows what and knowing how to work together. *Manage Sci*. 2005;51:869-881.
4. Steinemann S, Berg B, Skinner A, DiTulio A, Anzelon K, Terada K, Oliver C, Ho HC, Speck C. In situ, multidisciplinary, simulation-based teamwork training improves early trauma care. *J Surg Educ*. 2011;68:472-477. <http://dx.doi.org/10.1016/j.jsurg.2011.05.009>
5. Neily J, Mills PD, Young-Xu Y, Carney BT, West P, Berger DH, Mazzia LM, Paull DE, Bagian JP. Association between implementation of a medical team training program and surgical mortality. *JAMA*. 2010;304:1693-1700. <http://dx.doi.org/10.1001/jama.2010.1506>
6. Bajnok I, Puddester D, Macdonald CJ, Archibald D, Kuhl D. Building positive relationships in healthcare: evaluation of the Teams of Interprofessional Staff interprofessional education program. *Contemp Nurse*. 2012;42:76-89. <http://dx.doi.org/10.5172/conu.2012.42.1.76>
7. Masters C, O'Toole Baker V, Jodon H. Multidisciplinary, team-based learning: the Simulated Interdisciplinary to Multidisciplinary Progressive-Level Education (SIMPLE©) approach. *Clin Simul Nurs*. 2013;9:171-178.
8. Cooper S, Cant R, Porter J, Sellick K, Somers G, Kinsman L, Nestel D. Rating medical emergency teamwork performance: development of the Team Emergency Assessment Measure (TEAM). *Resuscitation*. 2010;81:446-452. <http://dx.doi.org/10.1016/j.resuscitation.2009.11.027>
9. McKay A, Walker ST, Brett SJ, Vincent C, Sevdalis N. Team performance in resuscitation teams: comparison and critique of two recently developed scoring tools. *Resuscitation*. 2012;83:1478-1483. <http://dx.doi.org/10.1016/j.resuscitation.2012.04.015>
10. Capella J, Smith S, Philp A, Putnam T, Gilbert C, Fry W, Harvey E, Wright A, Henderson K, Baker D, Ranson S, Remine S. Teamwork training improves the clinical care of trauma patients. *J Surg eEuc*. 2010;67:439-443. <http://dx.doi.org/10.1016/j.jsurg.2010.06.006>
11. Health Resources and Services Administration. The registered nurse population: findings from the 2008 National Sample Survey of Registered Nurses [Internet]. Rockville (MD): Health Resources and Services Administration; 2010 [cited 2015 Dec 21]. Available from: <http://bhpr.hrsa.gov/healthworkforce/rnsurveys/rnsurveyfinal.pdf>.
12. American Registry of Radiologic Technologists. Results of the 2012 examinations in radiography, nuclear medicine technology, and radiation therapy [Internet]. St. Paul (MN): American Registry of Radiologic Technologists; 2012 [cited 2014 Dec 4]. Available from: <https://www.arrt.org/pdfs/Examinations/Annual-Reports/Annual-Report-of-Primary-Exams-2012.pdf>.
13. Health Careers. Number of nurse practitioners increasing nationwide, but will it last for long? [Internet]. Centennial (CO): Health Careers [cited 2014 Dec 4]. Available from: <http://www.healthcareers.com/article/number-of-nurse-practitioners-increasing-nationwide-but-will-it-last-for-long/> 160985.
14. Bankston K, Glazer G. Legislative: interprofessional collaboration: what's taking so long? *Online J Issues Nurs*. 2013;19:1.
15. Schmitt M, Blue A, Aschenbrener CA, Viggiano TR. Core competencies for interprofessional collaborative practice: reforming health care by transforming health professionals' education. *Acad Med*. 2011;86:1351. <http://dx.doi.org/10.1097/ACM.0b013e3182308e39>
16. Walker S, Brett S, McKay A, Lambden S, Vincent C, Sevdalis N. Observational Skill-based Clinical Assessment tool for Resuscitation (OSCAR): development and validation. *Resuscitation*. 2011; 82:835-844. <http://dx.doi.org/10.1016/j.resuscitation.2011.03.009>
17. World Health Organization. Spotlight on statistics: a fact file on health workforce statistics [Internet]. Geneva: World Health Organization [cited 2014 Dec 4]. Available from: <http://www.who.int/hrh/statistics/spotlight2/en/>.