

Impact of Group Leaders on Medical Student Performance in Simulation Patient TrainingLogan D Glosser^{1*}, Wade A Hopper², Jackson L Saddemi³, Conner V Lombardi¹, Yixing Chen⁴, Elliott Oberneder⁴ and Coral D Matus⁵¹University of Toledo College of Medicine and Life Sciences, 3000 Arlington Ave, Toledo, OH, 43614 USA²Edward via College of Osteopathic Medicine, 350 Howard St, Spartanburg, SC 29307 USA³Department of Medical Education, Cooper Medical School of Rowan University, Camden, NJ USA⁴Lloyd A. Jacobs Interprofessional Immersive Simulation Center, 2920 Transverse Dr, Toledo, OH, 43614, USA⁵University of Toledo College of Medicine and Life Sciences, Department of Family Medicine, 3000 Arlington Ave, Toledo, OH, 43614 USA***Corresponding author:**

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1. Abstract**1.1. Rationale, Aims and Objectives**

Simulation is increasingly being used in modern medical education to facilitate the transfer of classroom knowledge to clinical practice. Although institutions are incorporating simulation for leadership development, the impact of leaders on simulation performance assessments is not well elucidated. The aim of this observational study was to determine the impact of team leaders on performance scores in a simulation patient experience.

1.2. Methods

170 second-year medical students randomized into 35 groups participated in a two-part cardiac-focused simulation exercise using a CAE METIman mannequin. The impact of leaders on group performance scores was assessed using standardized checklists. Leader identification occurred in PT-2. The primary outcome was the performance score in PT-2 comparing leader groups (LGs) vs non-leader groups (NLGs). Secondary outcomes were PT-1 performance scores and identification of the correct diagnosis.

1.3. Results

A total of 15 LGs were identified in PT-2 and 20 NLGs. LGs had higher average performance scores than NLGs in PT-2, scoring 75% vs 56% respectively ($p < 0.001$). Secondary outcomes showed LGs scored higher than NLGs in PT-1, scoring 42% vs 38% respectively. The odds of obtaining the correct diagnosis were 17.1 times higher among LGs than NLGs ($p = 0.01$).

1.4. Conclusions

Groups with leaders perform better, independent of whether they are clearly identified during simulation exercises. Medical schools must make an active effort to incorporate team building and leadership training as part of the pre-clinical education.

2. Introduction

Over the last decade, healthcare organizations have called for an increase in physician leadership capabilities [1,2]. Team dynamic and leadership training is important for physicians as they are centerfold to the healthcare team and hold responsibility for patient outcomes [3-5]. Research suggests that such training improves patient outcomes [6-8]. In today's era of the SARS-CoV-2 pandemic medical students have had less interpersonal and patient interactions, and therefore less opportunity to practice clinical leadership [9]. Studies indicate medical students and residents value leadership-based simulation training as they feel it facilitates professional growth [10,11]. Medical student success on the wards necessitates not only strong foundational knowledge and clinical awareness, but also so called 'soft skills' such as interpersonal communication and leadership [7,12,13,14]. The definition of leadership in healthcare encompasses an individual's ability to motivate, inspire, and facilitate a group to manage problem-solving strategies to optimize patient care [15]. Several core competencies have been identified in medical student leadership including: recognizing and utilizing effective leadership styles, communicating with a healthcare team, receiving and providing feedback, delegating responsibilities, and directing others in the clinical setting [16]. Within

medical schools, few reported curricula have included simulation training as a means of developing, or evaluating, medical student leadership skills [17,18]. American medical schools have progressively focused on early exposure to clinical skills training which has coincided with an increased use of mannequin-based simulations [19-21]. Despite the increase in use of simulation, its impact on development of medical students' non-technical soft skills has not been well studied.²² This is important as medical students' abilities to translate classroom knowledge into the clinical setting are lacking [2,17,23-26]. Simulation patients offer the opportunity to simultaneously develop soft- and hard-skills for medical student education. Moreover, simulation exercises may prove to be vital in the objective assessment of medical leadership. We sought to determine if the presence of a medical student leader impacts group performance scores in a simulation patient experience. We hypothesized that teams with leaders would have improved performance.

3. Methods

3.1. Setting

170 second-year medical students at the University of Toledo College of Medicine and Life Sciences participated in a two-part simulation, part-1 (PT-1) and part-2 (PT-2). The study was explained to the group and students were assured of confidentiality of their personal information. Students were randomized into 35 groups, with four to six students per group. The groups were then randomized to one of four standardized simulation rooms. A CAE METIman mannequin was used for the simulations. Prior to the simulations, operators underwent a brief training to standardize the presentation of the scenarios. Operators ran the same room and mannequin for the duration of the study. PT-1 and PT-2 had a maximum time limit of 15 minutes.

3.2. Simulation Structure

In PT-1 students were given instructions to gather information from the patient and that they could verbally order any labs/tests/imaging/treatments for the initial work up. The students were provided with the scenario of “you are seeing a patient who presented

to the emergency department with shortness of breath.” The final diagnosis was lobar pneumonia. PT-2 students were provided with the scenario that their patient was unresponsive and needed to be seen immediately. Students were to recognize and perform cardiopulmonary resuscitation (CPR) according the ACLS algorithm. This included identifying shockable vs non-shockable rhythms and administering the appropriate medications.

3.3. Clinical Performance Scores and Assessments

The groups were assessed with a 51-point checklist for PT-1 and a 30-point checklist for PT- 2. These checklists were generated by faculty physicians, independent from the research team. These were modified versions of the checklists used for curricular evaluation of live standardized patients at the institution where the study was conducted (Table 1). As part of the checklist, a record was kept of the number of times the simulation operator had to ‘prompt’ the groups to help them proceed through the simulation. Prompting phrases included statements such as: “are there any other labs/tests/treatments/diagnoses that you would want to consider?” and “is there anything else that you think you should do?” The presence of student leaders within each simulation team was determined by the research team. Leader groups (LGs) were identified as those with a student demonstrating efforts such as: taking vocal command, delegating roles, and directing the team to perform CPR. Non-leader groups (NLGs) were those that did not have a student taking these actions. Baseline knowledge was assessed using a pre-test multiple-choice questionnaire (MCQ) prior to starting the simulation experience. A fill-in-the-blank question “what is the final diagnosis for this patient?” was administered after PT-1, for which any answer that included pneumonia was given credit. A post-test MCQ assessment was administered at the conclusion of PT-2, composed of the same questions and answers as the pre-test, followed by a debriefing by a faculty physician. The reporting guidelines for health care simulation research extensions to the CONSORT and STROBE statements were utilized to guide study design and write-up [35].

Table 1. Performance score checklists for Part 1 and Part 2 of the simulation. The categories are expressed with the (maximum number of points) except for prompting. The bold text indicates category labels with the items which were given a single point (not bolded) if they were obtained or performed by the students.

Part 1 (51 points)	Part 2 (30 points)
<p>HPI (20) Patient name Chief complaint Location/radiation Quantity/severity/type Timing (Onset/frequency/duration) Setting in which it occurs Exacerbating factors Remitting factors Associated symptoms Patient perspective Medications Allergies Tobacco use/smoking Alcohol use</p>	<p>Primary Assessment Administered O2 Checked Carotid Pulse Cardiac Arrest Identifying Team Leader Maintained airway & o2 Obtained IV access Connected AED within 1st set of CPR compressions Appropriate uninterrupted CPR Administered 1 mg epinephrine Administered 300 mg amiodarone Administered 1 mg epinephrine Administered 150 mg Amiodarone Correct order of medication administration Identified PEA</p>

Illicit drug ROS (10 categories for a point) Family History Vaccinations Past medical hx Past surgical hx	-Performed CPR 2 mins Identified V-fib -1st shock -2 min CPR -2 min CPR -Checked Carotid Pulse
Vitals & Physical Exam (11) Identified tachycardic heart rate Identified tachypneic respiratory rate Temperature Identified hypotensive blood pressure Identified hypoxic oxygen saturation	Identified pulseless V-Tach -2nd shock -2 min CPR -2 min CPR -Checked Carotid Pulse Identified sinus rhythm
Cardiac PE Auscultate Palpate/percuss Checked for lower extremity edema Checked for pulse	Post Cardiac Arrest Care Treated hypotension by administrating IV fluids Transferred to ICU Maintained airway/O2 Ordered EKG -Identified ST-segment elevation
Pulmonary PE Auscultate -Identified Wheezing/Ronchi	Prompting
Assessment/Plan/interventions (20 points) Ordered CXR -Identified lobar pneumonia Ordered VBG or ABG -Identified Respiratory Alkalosis Ordered CBC -Identified elevated WBC -Identified anemia Ordered CMP -Identified elevated BUN/Creatinine Ordered EKG -Identified SVT -Performed Valsalva -Performed Carotid message -Administered Adenosine 6 mg Ordered Troponin Ordered Antibiotics Admitted to MICU Administered Fluids Administered oxygen Administered Albuterol Inhaler	
Prompting	

3.4. Data Collection and Analysis

Two independent evaluators viewed video recordings of the groups in PT-1 and PT-2 to evaluate for completion of the checklist and for the presence of leaders. Both reviewers were fourth year medical students trained by faculty for the performance evaluation to ensure accuracy of the assessment. A faculty physician mediator was available in cases of disagreement in scoring. The primary objective was to compare the performance scores as measured by the standardized checklists in groups that had a leader identified during PT-2 versus those that did not. The null-hypothesis that no difference existed by LGs versus NLGS was tested by means of independent sample t-test. Statistical tests were two-sided with a significance threshold of $p < 0.05$. Secondary objectives were to compare the subcategorization of the scoring checklist, the number of times prompted, identification of the correct diagnosis in PT-1, and comparison of the multiple-choice questionnaire pre- and post-test outcomes. The scores were expressed as means plus or minus standard deviations (SD). All statistical tests were performed using Microsoft Excel.

4. Results

In PT-2, there was a total of 15 LGs and 20 NLGs (Table 2). In PT-2, LGs had higher average performance score of 22.53 points (75.1%) vs NLGs with 16.75 points (55.8%) ($p < 0.001$) (Figure 1). Retroactively assessing the PT-1 scores by groups with a team leader identified in PT-2 also showed higher average performance scores in LGs with a mean of 21.53 points (42.2%) versus NLGs with 19.25 points (37.7%). (Figure 2). The combined score of PT-1 and PT-2 of the groups with team leaders identified were significantly higher than groups without a team leader with average point scores of 44.07 (54.4%) vs 36.00 (44.4%) respectively ($p < 0.001$). In PT-1, LGs had a lower average number of prompts with 2.5 ± 1.2 versus 3.2 ± 1.4 ($p = 0.17$). In PT-2, LGs had a lower number of prompts with 1 ± 0.6 versus 1.7 ± 0.9 ($p = 0.023$). The odds of identifying the correct PT-1 diagnosis were 17.1 times greater in LGs than NLGs, with 14/15 LGs and 9/20 NLGs respectively. [OR 17.1, CI 1.87-156.26 ($p = 0.0119^*$)].

Table 2: Independent 2-tailed T-test comparing groups that identified a team leader to those that did not.

PT-1				
	Team Leader	Total Points Scored	95% CI	P-value
Total (51)	Yes (n=15)	21.53 (4.55) 42.2%	19.23-23.84	0.141
	No (n=20)	19.25 (4.36) 37.7%	17.34-21.16	
PT-2				
Total (30)	Yes	22.53 (2.33) 75.1%	21.36-23.71	*<0.00001
	No	16.75 (2.95) 55.8%	15.46-18.04	
Pt. 1 + Pt. 2				
Total (81)	Yes	44.07 (5.76) 54.4%	41.15-46.98	*0.00002
	No	36.00 (3.93) 44.4%	34.28-37.72	
Pt. 1 Correct diagnosis				
Total	Yes (15)	14 OR=17.1	1.87-156.26	*0.0119
	No (20)	9		

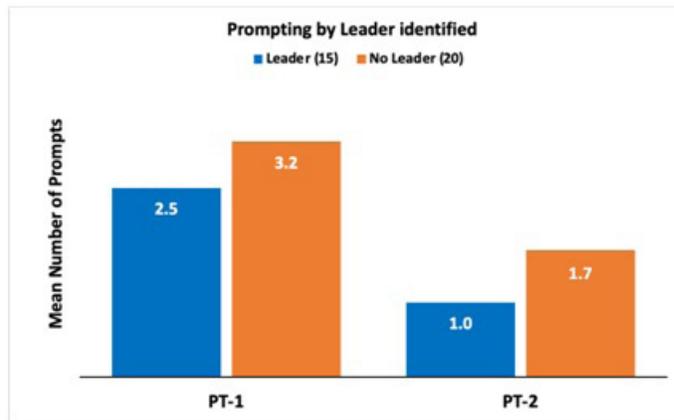


Figure 1: (A) Performance scores in PT-1 and PT-2 comparing groups with and without a leader identified during PT-2. (B) Number of prompts comparing groups with and without a leader identified in PT-2.

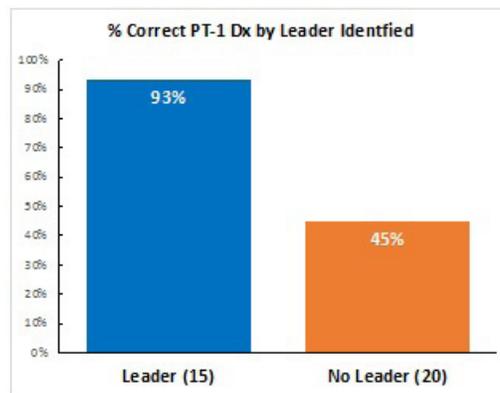


Figure 2: The percent of groups obtaining the correct diagnosis of PT-1 comparing groups with and without a leader identified in PT-2.

5. Discussion

Teams that identified a leader in PT-2 had higher average performance scores and less prompting. In PT-2, LGs scored 75% vs 56% in NLGs ($p < 0.05$). Interestingly, LGs which were identified in PT-2 also performed better in PT-1, with average performance score of 42% vs. 38%. When combining the PT-1 and PT-2 scores, LGs had significantly higher average scores obtaining 54.4% of the total points versus 44.4% in NLGs ($p < 0.05$). LGs also had a significantly higher diagnostic accuracy in PT-1, with 93% correctly identifying the diagnosis vs. 45% for NLGs ($p < 0.05$). These results suggest that the presence of a leader facilitates improved performance in team-based clinical simulations, independent of

whether leaders are clearly identified during simulation exercises. Despite extensive studies demonstrating improved outcomes among medical students and residents with leadership skills, many medical schools do not provide such training [10,11,16]. Vroom et al. defined leadership as a process of motivating people to work together collaboratively to achieve a common goal [27]. Medical students can acquire leadership attributes through experience working as a team with qualified supervision and guidance from training staff [28]. Richard et al. demonstrated this using Kirkpatrick’s modified framework, in which medical students that participated in an interactive leadership training advanced leadership skills [16]. Thus evidence suggests that a directed effort from med-

ical school programs is necessary to bridge the learning gap in medical student leadership training. Our study used a single method to evaluate the presence of leaders which showed a quantitative improvement on performance outcomes in simulation training. Leadership had a variable impact based on the checklist scoring items. There was a more profound impact of leader's presence on identifying the correct diagnosis and higher accuracy in performing clinical interventions, with a lesser impact on history-taking and patient interviewing. This is evidenced by statistically significant higher performance scores in PT-2 which was focused on performing actions, but an insignificant impact on performance scores in PT-1 which was primarily history taking and physical exam.

The results from this study suggest medical school programs should develop and implement of leadership training as it affects student performance in clinical scenarios. Prior studies suggest that aligning leadership curricula with competency models could help standardize the evaluation of outcomes and, therefore, lead to better measure of student competency [18]. Hunziker et al performed a prospective randomized controlled trial which demonstrated leadership instruction was superior to knowledge-based education when assessing medical student performance scores in a high-fidelity simulation [29]. Our findings support this finding as groups with leaders performed better, even without specific leadership instruction. To confirm leadership training improves student performance in simulation greater than knowledge-based instruction; future studies are needed using high-quality methodological design and reporting [17]. This prospective study reports the quantitative outcomes assessing the impact of leaders on performance scores in simulation training. The sample included a cohort of second-year medical students at a single institution. The study design yielded level 4b evidence according to Kirkpatrick's modified framework for evaluating medical education programs, with the assessment of correct diagnosis and accuracy of interventions [30]. There are several limitations to this study. Leaders were identified by the research team, which holds an element of subjectivity and bias. Studies on medical student leadership are difficult to evaluate due to significant heterogeneity in assessment methods [3,7,17]. There was no screening assessment for individual student's baseline leadership skills which may have provided insight as to which groups had leaders present. Furthermore, the performance scores were assessed by a group's performance, rather than individual actions. Additionally, this study did not include a qualitative assessment of whether students believed that a leader was present within the group or their perceptions from the experience. Our results demonstrated groups with team leaders had higher average performance scores with less prompting in both PT-1 and PT-2 compared to those without a leader. Identification of a leader also led to higher diagnostic accuracy. These findings call for action of medical school programs to integrate leadership training as part of the medical education curriculum, to teach students the importance

of leadership in medical school and guide those skills to clinical practice. Further studies are needed to assess the impact of leadership training on medical student performance in simulation experiences and the clinical setting.

References

1. McKimm J, Lieff SJ, Harden RM, Hunt D, Medical education leadership. A practical guide for medical teachers. In: Dent J, ed. A practical guide for medical teachers. Churchill Livingstone-Elsevier. 2013; 343-351.
2. Paniagua M, Salt J, Swygert K, Barone MA. Perceived Utility of the USMLE Step 2 Clinical Skills Examination from a GME Perspective Research Article. *Journal of Medical Regulation*. July. 2018; 104(2): 51-57.
3. Varkey P, Peloquin J, Reed D, Lindor K, Harris I. Leadership curriculum in undergraduate medical education: a study of student and faculty perspectives. *Med Teach*. Mar. 2009; 31(3): 244-50.
4. Warren OJ, Carnall R. Medical leadership: why it's important, what is required, and how we develop it. *Postgrad Med J*. 2011; 87(1023): 27-32.
5. Chen TY. Medical leadership: An important and required competency for medical students. *Ci Ji Yi Xue Za Zhi*. 2018; 30(2): 66-70.
6. Geerts JM, Goodall AH, Agius S. Evidence-based leadership development for physicians: A systematic literature review. *Soc Sci Med*. 2020; 246: 112709.
7. Mokshagundam S, Pitkin J, Dekhtyar M, Santen S, Hammoud M, Skochelak SE. Engaging Medical Students in Leadership Development. *Med Sci Educ*. 2019; 29(3): 849-853.
8. Rosenman ED, Shandro JR, Ilgen JS, Harper AL, Fernandez R. Leadership training in health care action teams: a systematic review. *Acad Med*. 2014; 89(9): 1295-306.
9. Harries AJ, Lee C, Jones L. Effects of the COVID-19 pandemic on medical students: a multicenter quantitative study. *BMC Med Educ*. 2021; 21(1): 14.
10. Schmidt-Huber M, Netzel J, Kiesewetter J. On the road to becoming a responsible leader: A simulation-based training approach for final year medical students. *GMS J Med Educ*. 2017; 34(3): Doc34.
11. Neeley SM, Clyne B, Resnick-Ault D. The state of leadership education in US medical schools: results of a national survey. *Med Educ Online*. 2017; 22(1): 1301697.
12. Clyne B, Rapoza B, George P. Leadership in Undergraduate Medical Education: Training Future Physician Leaders. *R I Med J*. 2013; 98(9): 36-40.
13. Diec S, Patel PH, Samuel NG, Hernandez-Munoz JJ. Student perceptions of non-technical skills development during advanced pharmacy practice experiences. *Curr Pharm Teach Learn*. 2021; 13(11): 1510-1516.
14. Cha JS, Anton NE, Mizota T. Use of non-technical skills can predict medical student performance in acute care simulated scenarios. *Am J Surg*. 2019; 217(2): 323-328.

15. Aggarwal R, Swanwick T. Clinical leadership development in post-graduate medical education and training: policy, strategy, and delivery in the UK National Health Service. *J Healthc Leadersh.* 2015; 7: 109-122.
16. Richard K, Noujaim M, Thorndyke LE, Fischer MA. Preparing Medical Students to Be Physician Leaders: A Leadership Training Program for Students Designed and Led by Students. *MedEdPORTAL.* 2019; 15: 10863.
17. Shubeck SP, Kanters AE, Dimick JB. Surgeon leadership style and risk-adjusted patient outcomes. *Surg Endosc.* 2019; 33(2): 471-474.
18. Webb AM, Tsipis NE, McClellan TR. A first step toward understanding best practices in leadership training in undergraduate medical education: a systematic review. *Acad Med.* 2014; 89(11): 1563-70.
19. Wenrich M, Jackson MB, Scherpbier AJ, Wolfhagen IH, Ramsey PG, Goldstein EA. Ready or not? Expectations of faculty and medical students for clinical skills preparation for clerkships. *Med Educ Online.* 2010; 17(1): 35-40.
20. Okuda Y, Bryson EO, DeMaria S Jr. The utility of simulation in medical education: what is the evidence? *Mt Sinai J Med.* 2009; 76(4): 330-43.
21. James E, Evans M, Mi M. Leadership Training and Undergraduate Medical Education: a Scoping Review. *Med Sci Educ.* 2021; 31(4): 1501-1509.
22. Alexander EK. Perspective: moving students beyond an organ-based approach when teaching medical interviewing and physical examination skills. *Acad Med.* 2008; 83(10): 906-9.
23. Windish DM, Paulman PM, Goroll AH, Bass EB. Do clerkship directors think medical students are prepared for the clerkship years? *Acad Med.* 2004; 79(1): 56-61.
24. Lyons O, Su'a B, Locke M, Hill A. A systematic review of leadership training for medical students. *N Z Med J.* 2018; 131(1468): 75-84.
25. Sadowski B, Cantrell S, Barelski A, O'Malley PG, Hartzell JD. Leadership Training in Graduate Medical Education: A Systematic Review. *J Grad Med Educ.* 2018; 10(2): 134-148.
26. Vroom VH, Jago AG. The role of the situation in leadership. *Am Psychol.* 2007; 62(1): 17-24.
27. Jorge ML, Coelho IC, Paraizo MM, Paciornik EF. Leadership, management and teamwork learning through an extra-curricular project for medical students: descriptive study. *Sao Paulo Med J.* 2014; 132(5): 303-6.
28. Hunziker S, Buhlmann C, Tschan F. Brief leadership instructions improve cardiopulmonary resuscitation in a high-fidelity simulation: a randomized controlled trial. *Crit Care Med.* 2010; 38(4): 1086-91.
29. Frich JC, Brewster AL, Cherlin EJ, Bradley EH. Leadership development programs for physicians: a systematic review. *J Gen Intern Med.* 2015; 30(5): 656-74.