

Teaching Evidence-Based Physical Diagnosis: A Workshop for Hospitalists

Zahir Kanjee, MD, MPH*, Anjala V. Tess, MD

*Corresponding Author: zkanjee@bidmc.harvard.edu

Abstract

Introduction: Teaching on physical examination, especially evidence-based physical diagnosis, is at times lacking on general medicine rounds. We created a hospitalist faculty workshop on teaching evidence-based physical diagnosis. **Methods:** The workshop included a systematic approach to teaching evidence-based physical diagnosis, multiple teaching resources, and observed peer teaching. A long-term follow-up session was offered several months after the workshop. Participants completed questionnaires before and after the workshop as well as after the long-term follow-up session. **Results:** Four workshops were conducted and attended by 28 unique participants. Five hospitalists attended long-term follow-up sessions. Due to the COVID-19 pandemic, repeat sessions and long-term follow-up were limited. In paired analyses compared to preworkshop, respondents after the workshop reported a higher rate of prioritizing ($p = .008$), having a systematic approach to ($p < .001$), and confidence in ($p = .001$) teaching evidence-based physical diagnosis. Compared to before the workshop, participants after the workshop were able to name more resources to inform teaching of evidence-based physical diagnosis ($p < .001$). Informal feedback was positive. Respondents noted that the workshop could be improved by allowing more practice of the actual physical exam maneuvers and more observed teaching. **Discussion:** We created and implemented a workshop to train hospitalists in teaching evidence-based physical diagnosis. This workshop led to improvements in faculty attitudes and teaching skills. Long-term outcomes were limited by low participation due in part to the COVID-19 pandemic.

Keywords

Clinical Reasoning/Diagnostic Reasoning, Clinical Teaching/Bedside Teaching, Evidence-Based Medicine/Knowledge Translation, Faculty Development, Hospital Medicine, Physical Examination

Educational Objectives

By the end of this activity, learners will be able to:

1. Incorporate evidence-based physical diagnosis into regular teaching at the bedside.
2. Apply a simplified approach to understand statistics related to diagnostic utility—in particular, pretest and posttest probabilities and the likelihood ratio—and employ these statistics to teaching of evidence-based physical diagnosis.
3. Implement a novel systematic teaching approach to create personal evidence-based physical diagnosis teaching scripts around examining common clinical conditions.

Introduction

Physical examination is an essential diagnostic tool^{1,2} whose supportive evidence continues to grow.^{3,4} Evidence-based physical diagnosis is defined as the “application of an evidence-based approach [that] quickly identifies the relatively few [physical exam] findings that predict” a diagnostic gold standard (such as a biopsy or imaging result).³ Though trainees agree on the need for greater emphasis on physical diagnosis teaching,⁵ such teaching occurs relatively rarely during general medicine rounds.^{6,7} Declining faculty bedside-teaching skills are at least partially to blame.⁸

Published curricula on teaching physical examination exist, though relatively little of this scholarship focuses on the intersection of teaching evidence-based physical diagnosis and faculty development. Approaches to teaching physical examination at both the undergraduate⁹ and graduate¹⁰ levels are nonstandardized. Educators have written about innovations using lay teachers,^{11,12} simulation,¹³ near-peer teachers,¹⁴ objective structured clinical examinations,¹⁵ and novel teaching structures at the bedside.^{16,17} Though curricula exist on teaching

Citation:

Kanjee Z, Tess AV. Teaching evidence-based physical diagnosis: a workshop for hospitalists. *MedEdPORTAL*. 2022;18:11243. https://doi.org/10.15766/mep_2374-8265.11243

necessary psychomotor skills,¹⁸ head-to-toe examination,¹⁹ hypothesis-driven examination,¹⁹⁻²¹ and evidence-based medicine,^{22,23} there is not a great deal of literature devoted to teaching evidence-based physical diagnosis. A brief report of a faculty program has described some helpful principles,²⁴ but there is much room for faculty development curricula in this space. We therefore created a workshop for inpatient clinician-educators on how to teach evidence-based physical diagnosis.

Methods

Setting

We conducted this workshop at Beth Israel Deaconess Medical Center, a 673-bed teaching hospital of Harvard Medical School, in Boston, Massachusetts. Since hospitalists make up a plurality of teachers of medical students and internal medicine residents on the internal medicine wards, this workshop targeted attending physicians in the hospital medicine program.

Prerequisite Knowledge

No prerequisite knowledge was required by hospitalist participants. The facilitator (Zahir Kanjee) was familiar with the material in the slides, including the steps of the SAID-LR (state, ask, identify, demonstrate, look, and reinforce) model (see below), and had read the papers discussed in great detail in the presentation. The facilitator was also able to perform and demonstrate the signs/maneuvers they asked the faculty participants to teach, namely, fluid wave, jugular venous pressure, and abdominal jugular reflux. Ideally, the facilitator delivering the workshop would be a hospitalist so they would be able to relate to the skills and challenges of the participants in their own teaching.

Educational Approach

We conducted key stakeholder interviews with internal medicine residents and hospital medicine faculty that identified gaps in teaching related to the instruction of evidence-based physical diagnosis. This informed the design of the clinical teaching intervention.

The ultimate goal of the workshop was to increase the use and teaching of evidence-based physical diagnosis to residents and students by inspiring and training the hospitalist faculty. In line with adult learning theory,²⁵ we postulated that faculty teaching evidence-based physical diagnosis would need to appreciate its importance and utility, be aware of the evidence, become facile in its interpretation, and have an effective educational approach, ideally with practice teaching at the bedside. Our approach was informed in part by Kolb's experiential learning cycle²⁶ in that it

included abstract conceptualization through lecture/discussion, active experimentation with bedside-teaching practice, concrete experience in terms of allowing participants time to subsequently implement the lessons learned in their own teaching practice, and reflective observation in the long-term follow-up session discussing their own interim successes and challenges in using the new evidence-based physical diagnosis teaching approach.

The workshop covered the importance of physical diagnosis, simplified statistics and clinical epidemiology (in particular, a focus on the use of pretest and posttest probabilities and likelihood ratios²²), and sources of data on evidence-based physical diagnosis. In addition, we created a novel systematic approach to teaching evidence-based physical diagnosis (see Figure 1) by adapting existing approaches on teaching physical diagnosis¹⁶ and procedures.²⁷ For ease of recollection, the novel teaching approach used a simple mnemonic for steps the hospitalist could follow at the bedside. This mnemonic was

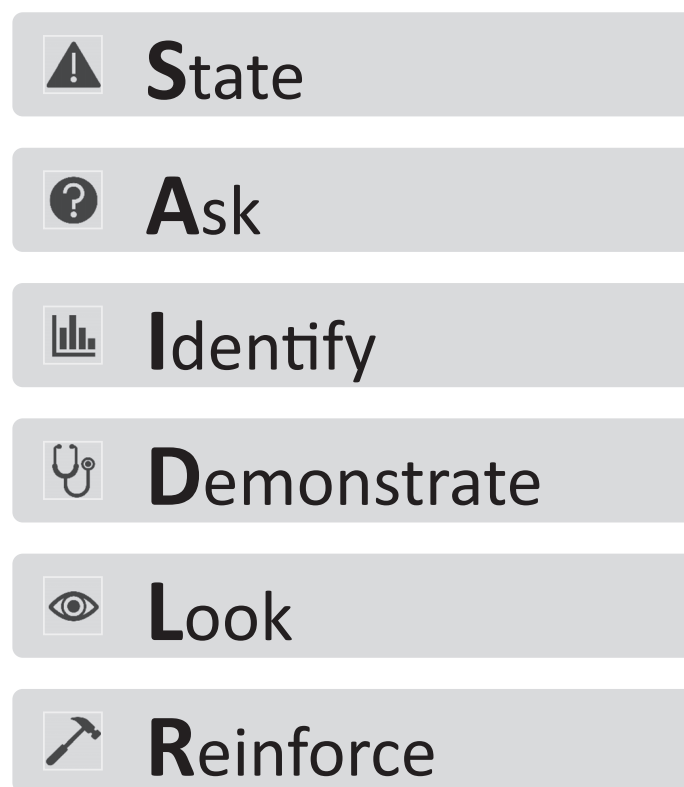


Figure 1. Structured approach for teaching evidence-based physical diagnosis: SAID-LR (State, Ask, Identify, Demonstrate, Look, Reinforce). *State* represents stating the problem, ideally in a case-based manner emphasizing the benefit of the exam. *Ask* represents assessing learner prior knowledge and eliciting misconceptions. *Identify* represents highlighting exam maneuvers with good evidence. *Demonstrate* represents performing and narrating the exam. *Look* represents watching learners attempt the exam. *Reinforce* represents repeating the exam on other patients and/or sharing papers/reviews on the topic.

SAID-LR: State, Ask, Identify, Demonstrate, Look, and Reinforce. *State* represented stating the problem, ideally in a case-based manner emphasizing the benefit of the exam. *Ask* represented assessing learner prior knowledge and eliciting misconceptions. *Identify* represented highlighting exam maneuvers with the best evidence. *Demonstrate* represented performing and narrating the exam. *Look* represented watching learners attempt the exam. *Reinforce* represented repeating the exam on other patients and/or sharing papers/reviews on the topic.

The lecture/discussion portion of the workshop was geared primarily towards creating and/or reinforcing positive attitudes about the benefits of physical diagnosis while also familiarizing hospitalists with resources to support its teaching. The lecture/discussion portion was purposely designed to be low stakes by involving a small group of participants, including food and drink, occurring in a familiar environment (hospitalist office lunch space), and implementing confidential questionnaires.

Immediately after introducing a systematic teaching approach in the lecture/discussion portion of the workshop, participants conducted small-group bedside-teaching role-playing practice with actual patients who had relevant physical findings while their hospitalist colleagues acted as their learners. This served to create a high-fidelity teaching simulation with immediate and repetitive practice of learned teaching skills, supplemented by immediate peer feedback in a safe environment.

We designed a pocket card to be carried by hospitalists in their white coats to serve as both a reminder and quick reference regarding key resources and the teaching approach going forward (Appendix A).

We arranged a long-term follow-up seminar as a semistructured forum to discuss successes and challenges, as well as to facilitate the creation of a long-lasting community of educators particularly interested in this topic.

All sessions were delivered by Zahir Kanjee.

Setup

On the day prior to each workshop, the facilitator recruited volunteer patients with findings of volume overload (in particular, elevated jugular venous pressure and abdominal jugular reflux) and ascites (in particular, fluid wave) from the inpatient cardiology and hepatology services, respectively, by asking residents on these teams about any patients with these findings. Patients with these findings were selected because their pathologies were common in the hospital and their findings important and relatively simple to understand and teach (though other types of

patients could be selected if desired). One patient was recruited per approximately four to five expected faculty participants to permit adequate small-group teaching practice. Patients were given an information sheet (Appendix B) and informed that the activity was for about 15 minutes the following day. They were informed that their participation would allow faculty to practice teaching to each other so they could deliver better teaching to the hospital's trainees, ultimately developing a better health care workforce.

The didactic portion of the workshop occurred in a hospitalist shared meeting and eating space over a lunch period. This permitted attendance and a relatively private area for faculty to learn in a casual and friendly environment without their trainees around. This space had a computer with projected screen to display slides as well as a table upon which to place optional books (see below). This teaching space was also near to the wards of the selected patient volunteers to facilitate a quick transition to the bedside-practice portion of the workshop. We made each participant a laminated pocket card (Appendix A) and sample teaching scripts (Appendix C). We also brought to the session an attendance sheet as well as QR codes that participants could scan to access the questionnaires (Appendix D).

Several days prior to each workshop, the facilitator recruited hospitalists via group email to the faculty practice and invited them to attend.

Workshop

The facilitator delivered a 60-minute workshop using slides and a facilitator guide (Appendices E and F). The workshop included a 40-minute lecture/discussion and 20 minutes of teaching practice at the bedside. (Note that in response to participant feedback, we now suggest that the workshop be lengthened to 90 minutes to prolong the teaching practice at the bedside from 20 minutes to 50 minutes; see the Discussion, below.) Copies of some of the books mentioned in the slides were available on hand to briefly show during the presentation. These books were not essential but served as an easy way to allow participants to see the resources, start to become familiar with them, recognize their value, and imagine how they might be useful to their teaching in the future. At the end of the lecture/discussion portion, the facilitator handed out the pocket cards (Appendix A) and sample teaching scripts (Appendix C) as a reference and resource. With these in hand, hospitalist participants then formed small groups of four to five, and each group went to the bedside of one of the recruited patients to role-play observed teaching on patients with actual physical examination findings. The participants

observed each other and gave each other feedback based on the teachings provided in the workshop. The facilitator circulated to each group to answer any questions and ensure the role-playing teaching practice was occurring.

Refreshments were provided to encourage participation in the workshop. No other compensation was offered to participants or patients. An attendance sheet was filled out to facilitate subsequent invitations to the long-term follow-up seminar. This attendance sheet was not linked to any survey results.

Long-term Follow-up Seminar

Approximately 3-6 months after the workshop, participants were invited to attend a long-term follow-up seminar. The facilitator conducted this session using slides and a facilitator guide (Appendices G and H). Topics covered included a review of key teaching points and techniques from the workshop, as well as a moderated discussion about successes and challenges in teaching evidence-based physical diagnosis in the preceding few months. This session was designed to facilitate reflective practice and also to strengthen the community of medical educators teaching these topics. This 30-minute session occurred during a lunch hour in a hospitalist space away from trainees where faculty participants would feel comfortable discussing these topics. The room had a screen to show slides. Laminated pocket cards were reprinted and offered in case any participant had misplaced theirs in the interim.

Assessment

Prior to and just after the workshop, as well as after the long-term follow-up session, hospitalists completed surveys to self-assess their motivation and perceived skill related to teaching evidence-based physical diagnosis. These surveys were based on process outcomes that we felt were likely to reflect our workshop's ultimate objectives. Respondents were also asked to select a condition for which they would like to create an evidence-based physical diagnosis teaching script in the future. Similar questionnaires were completed after the long-term follow-up session. Questionnaires (Appendix D) were conducted on Qualtrics. All surveys included a confidential identity linkage (hospitalist's mother's maiden name) known only to the respondents.

Analysis

We reverse-coded Likert scores, with higher scores indicating greater levels of agreement (0 to 4, from *strongly disagree* to *strongly agree*) for ease of interpretation. We calculated descriptive statistics for unpaired and paired (linking the same hospitalist by confidential identity linkage) survey data. We

compared paired hospitalist responses at baseline preworkshop and after the workshop. We also compared paired hospitalist responses at baseline preworkshop and after the long-term follow-up seminar. Given the small sample sizes, we analyzed all data using nonparametric signed rank tests. We independently scored the survey item asking respondents to list resources to inform evidence-based physical diagnosis teaching (confirming whether the resources listed existed and were good potential resources for this task), with scoring disagreements resolved by consensus. We calculated interrater reliability with a kappa statistic.

We hypothesized that all markers of information, motivation, and perceived skill would increase after this workshop. All tests were two-sided, and $p < .05$ was deemed statistically significant. No adjustments were made for multiple comparisons. We used Stata 13.1 (StataCorp) to conduct all analyses.

Ethical Approval

Patients and hospitalists provided assent to participate in this workshop. The study of the workshop was deemed exempt from human subjects review by the Committee for Clinical Investigation at Beth Israel Deaconess Medical Center.

Results

Between May 30 and December 12, 2019, we conducted four workshops. Respondents completed 30 preworkshop and 18 postworkshop surveys. After removal of duplicate surveys (two hospitalists attended the workshop twice and completed the baseline [but not postworkshop] surveys twice, so we removed the results of their duplicate baseline surveys), this included 28 unique hospitalist participants, 18 of whom completed both preworkshop and postworkshop surveys. This last group comprises the subjects of the paired preworkshop and postworkshop analyses below. Between October 30 and November 11, 2019, five hospitalists attended the lone long-term follow-up session and completed long-term surveys. Each of these hospitalists had completed both a preworkshop and a postworkshop survey; these five individuals are included in the paired preworkshop and long-term analyses below.

Due to restrictions imposed by the COVID-19 pandemic, repeat sessions (i.e., additional opportunities for other faculty to attend if they were unavailable during the four scheduled workshops) and long-term follow-up sessions were limited.

Agreement between the two authors on resource counts was excellent ($\kappa = .92$).

See the [Table](#) for unpaired differences in median responses to survey items. This table lists faculty responses to survey items regarding prioritization of, having a systematic approach to, and confidence in teaching about evidence-based physical diagnosis. In unpaired analysis, participants named a median of 1.5 resources from which to find data to inform teaching of evidence-based physical diagnosis before the workshop compared to three resources after the workshop.

See [Figure 2](#) for paired analyses comparing preworkshop and postworkshop responses. After the workshop, respondents reported a higher rate of prioritizing (*Mdn*: 3.0 vs. 2.0 on a 0-4 scale, $p = .002$), having a systematic approach to (*Mdn*: 3.0 vs. 1.0 on a 0-4 scale, $p = .0003$), and confidence in (*Mdn*: 2.5 vs. 1.0 on a 0-4 scale, $p = .004$) teaching evidence-based physical diagnosis. When asked to name up to three resources from which to find data to inform teaching of evidence-based physical diagnosis, participants named more after the session than before (*Mdn*: three resources vs. two, $p = .002$).

There were no statistically significant differences between long-term follow-up and preworkshop in terms of perceived priority of (*Mdn*: 3.0 vs. 2.5 on a 0-4 scale, $p = .32$), systematic approach to (*Mdn*: 1.5 vs. 2.0 on a 0-4 scale, $p = .84$), and confidence in (*Mdn*: 2.5 vs. 2.0 on a 0-4 scale, $p = .16$) teaching evidence-based physical diagnosis. Out of the five participants completing long-term follow-up surveys, one (20%) reported that they had not had a teaching block since completing the workshop. Among the remaining four hospitalists, two (50%) reported that they had somewhat increased their rate of evidence-based physical diagnosis teaching due to the workshop, and two (50%) reported no change. One participant of the five (20%) reported having created a teaching script on the condition they chose during the workshop.

Discussion

We created and implemented a hospitalist workshop to improve evidence-based physical diagnosis teaching at a major academic medical center. We found that this workshop was associated with short-term increases in prioritization of, systematic approaches

to, confidence in, and familiarity with useful resources for teaching evidence-based physical diagnosis. These findings are supportive of, but not definitively proof of, our workshop learning objectives. Among those who had completed a teaching block in the interim, half reported that the workshop led to an increase in their evidence-based physical diagnosis teaching. The inability of the workshop to demonstrate long-term effects related to our outcomes likely has several causes, including small number of participants, lack of spaced learning through reminders, opportunities to practice, and competing priorities. Each of these is a potentially addressable limitation.

We have several observations from reflecting on the work and from feedback we received from participants. First, faculty wanted more time to reinforce their content expertise around actually performing the physical examination. Several did not feel facile with even some of the relatively basic maneuvers discussed in the workshop, consistent with literature showing deficiency in performing (and therefore teaching) the exam.^{8,28} Though some innovative approaches exist,²⁹ relatively little continuing medical education focuses on physical examination, particularly that which incorporates in-person demonstration and hands-on practice. More time for faculty demonstration and participant practice (e.g., on each other before going to the bedside) could be helpful in future iterations of this training.

Faculty also appreciated the chance to role-play teaching at the bedside and asked for more time for this step. While peer-teaching feedback in bedside small groups is useful,^{30,31} faculty would likely have appreciated more observation from the facilitator as well. Employing more than one faculty facilitator knowledgeable in the teaching approach would likely help, particularly if paired with an objective structured teaching encounter.³² As above, for several reasons we suggest lengthening the bedside portion from 20 minutes to 50 minutes to permit this extra focus on bedside-teaching practice and feedback.

Consistent with Kolb's experiential learning cycle,²⁶ this workshop aimed not only to provide participants with abstract

Table. Unpaired Analysis Comparing Pre- and Postworkshop Prioritization of Having a Systematic Approach to and Confidence in Teaching Evidence-Based Physical Diagnosis

Survey Item	Median Score Among All Participants ^a	
	Preworkshop	Postworkshop
I make it a TOP PRIORITY to teach evidence-based physical diagnosis to my learners.	2.0	3.0
I have a SYSTEMATIC APPROACH to teaching evidence-based physical diagnosis.	1.0	3.0
I am VERY CONFIDENT in my ability to teach evidence-based physical diagnosis.	1.0	2.5

^aRated on a Likert scale from 0 = *strongly disagree* to 4 = *strongly agree*.

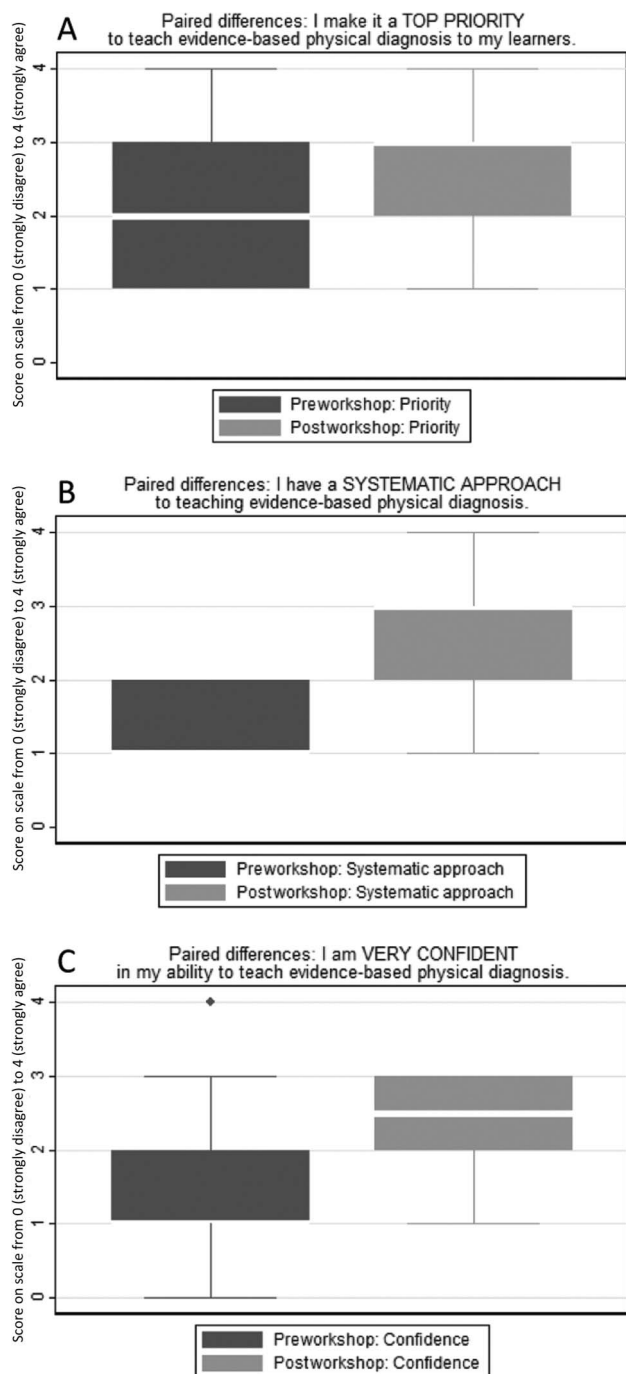


Figure 2. Paired analysis box plots of preworkshop and postworkshop results. A: Comparison of agreement to the prompt “I make it a TOP PRIORITY to teach evidence-based physical diagnosis to my learners.” B: Comparison of agreement to the prompt “I have a SYSTEMATIC APPROACH to teaching evidence-based physical diagnosis.” C: Comparison of agreement to the prompt “I am VERY CONFIDENT in my ability to teach evidence-based physical diagnosis.” Responses were scored on a scale of 0 = *strongly disagree*, 1 = *disagree*, 2 = *neither agree nor disagree*, 3 = *agree*, and 4 = *strongly agree*. The vertical dark line represents the median, boxes represent upper and lower quartiles, whiskers represent variability outside of the quartiles, and, in panel C, the diamond represents an outlier. All differences are statistically significant.

conceptualization (during the lecture/discussion session) but also to allow for active experimentation (in the bedside-teaching practice), concrete experience (in participants’ own subsequent teaching on the wards after the workshop), and reflective observation (especially during the long-term follow-up session). The experiential learning cycle suggests ways to improve our workshop. Better opportunities for bedside-teaching practice (as suggested above) can increase self-efficacy, which will permit and encourage more frequent use of these techniques during subsequent participant teaching on the wards. Improved attendance at the long-term follow-up session (or other ways of encouraging reflective observation, such as asynchronous email communication on the topic for those interested) would also be beneficial.

Our study of this workshop has several limitations. First, participants were a small sample of hospitalists at a single academic medical center, limiting potential generalizability of markers of efficacy to other groups. Second, primarily due to scheduling challenges and the COVID-19 pandemic, long-term follow-up was limited, so outcomes were primarily short term, though it is encouraging that reported long-term evidence-based physical diagnosis teaching was nominally increased. Finally, results were self-reported and self-assessed by participants rather than based on observation of their teaching processes or the learning of their trainees. Despite these limitations, we believe our approach has the potential to motivate and train educators how to teach their learners about an important subject. Our workshop was designed with hospitalists in mind, but based on positive feedback from our participants, we are expanding to include residents, nonhospitalist internists, and noninternists.

In conclusion, we created and implemented a workshop to train hospitalists in teaching evidence-based physical diagnosis. This workshop was associated with short-term improvements in hospitalists’ prioritization of, systematic approaches to, confidence in, and familiarity with relevant resources for teaching this essential topic.

Appendices

- A. Pocket Card.docx
- B. Patient Prospective Agreement.docx
- C. Sample Teaching Scripts.docx
- D. Questionnaires.docx
- E. First Session Slides.pptx
- F. First Session Facilitator Guide.docx

G. Follow-up Session Slides.pptx

H. Follow-up Session Facilitator Guide.docx

All appendices are peer reviewed as integral parts of the Original Publication.

Zahir Kanjee, MD, MPH: Hospitalist, Department of Medicine, Beth Israel Deaconess Medical Center; Assistant Professor of Medicine, Harvard Medical School; ORCID: <https://orcid.org/0000-0001-9287-4503>

Anjala V. Tess, MD: Hospitalist and Associate Vice Chair for Education, Department of Medicine, Beth Israel Deaconess Medical Center; Associate Professor of Medicine, Harvard Medical School

Acknowledgments

We are grateful for educational insights from Drs. K. Meredith Atkins, Neal Biddick, Grace Huang, Andrew Junkin, Susan McGirr, Vilas Padwardhan, Anita Vanka, and Katherine Wrenn, as well as statistical assistance from Drs. Shani Herzog and Devraj Sukul.

Disclosures

None to report.

Funding/Support

This work was funded by the Core Faculty Education program at Beth Israel Deaconess Medical Center.

Ethical Approval

The Beth Israel Deaconess Medical Center Committee for Clinical Investigation deemed further review of this project not necessary.

References

1. Verghese A, Charlton B, Kassirer JP, Ramsey M, Ioannidis JPA. Inadequacies of physical examination as a cause of medical errors and adverse events: a collection of vignettes. *Am J Med.* 2015;128(12):1322-1324.E3. <https://doi.org/10.1016/j.amjmed.2015.06.004>
2. Reilly BM. Physical examination in the care of medical inpatients: an observational study. *Lancet.* 2003;362(9390):1100-1105. [https://doi.org/10.1016/S0140-6736\(03\)14464-9](https://doi.org/10.1016/S0140-6736(03)14464-9)
3. McGee S. *Evidence-Based Physical Diagnosis*. 4th ed. Elsevier; 2018.
4. Simel DL, Rennie D, eds. *The Rational Clinical Examination: Evidence-Based Clinical Diagnosis*. McGraw Hill; 2009.
5. McMahon GT, Marina O, Kritek PA, Katz JT. Effect of a physical examination teaching program on the behavior of medical residents. *J Gen Intern Med.* 2005;20(8):710-714. <https://doi.org/10.1111/j.1525-1497.2005.0159.x>
6. Stickrath C, Noble M, Prochazka A, et al. Attending rounds in the current era: what is and is not happening. *JAMA Intern Med.* 2013;173(12):1084-1089. <https://doi.org/10.1001/jamainternmed.2013.6041>
7. Crumlish CM, Yialamas MA, McMahon GT. Quantification of bedside teaching by an academic hospitalist group. *J Hosp Med.* 2009;4(5):304-307.
8. Ramani S, Orlander JD, Strunin L, Barber TW. Whither bedside teaching? A focus-group study of clinical teachers. *Acad Med.* 2003;78(4):384-390. <https://doi.org/10.1097/00001888-200304000-00014>
9. Uchida T, Park YS, Ovitsh RK, et al. Approaches to teaching the physical exam to preclerkship medical students: results of a national survey. *Acad Med.* 2019;94(1):129-134. <https://doi.org/10.1097/ACM.0000000000002433>
10. Mookherjee S, Pheatt L, Ranji SR, Chou CL. Physical examination education in graduate medical education—a systematic review of the literature. *J Gen Intern Med.* 2013;28(8):1090-1099. <https://doi.org/10.1007/s11606-013-2380-x>
11. Zabel J, Sterz J, Hoefler SH, et al. The use of teaching associates for knee and shoulder examination: a comparative effectiveness analysis. *J Surg Educ.* 2019;76(5):1440-1449. <https://doi.org/10.1016/j.jsurg.2019.03.006>
12. Barley GE, Fisher J, Dwinell B, White K. Teaching foundational physical examination skills: study results comparing lay teaching associates and physician instructors. *Acad Med.* 2006;81(10)(suppl):S95-S97. <https://doi.org/10.1097/00001888-200610001-00024>
13. Okuda Y, Bryson EO, DeMaria S Jr, et al. The utility of simulation in medical education: what is the evidence? *Mt Sinai J Med.* 2009;76(4):330-343. <https://doi.org/10.1002/msj.20127>
14. Blank WA, Blankenfeld H, Vogelmann R, Linde K, Schneider A. Can near-peer medical students effectively teach a new curriculum in physical examination? *BMC Med Educ.* 2013;13:165. <https://doi.org/10.1186/1472-6920-13-165>
15. Siddharthan T, Soares S, Wang HH, Holt SR. Objective structured clinical examination–based teaching of the musculoskeletal examination. *South Med J.* 2017;110(12):761-764. <https://doi.org/10.14423/SMJ.0000000000000739>
16. Chi J, Artandi M, Kugler J, et al. The five-minute moment. *Am J Med.* 2016;129(8):792-795. <https://doi.org/10.1016/j.amjmed.2016.02.020>
17. Goyal A, Garibaldi B, Liu G, Desai S, Manesh R. Morning report innovation: Case Oriented Report and Exam Skills. *Diagnosis (Berl).* 2019;6(2):79-83. <https://doi.org/10.1515/dx-2018-0086>
18. Damp J, Morrison T, Dewey C, Mendes L. Teaching the physical exam and psychomotor skills in the clinical setting. *MedEdPORTAL.* 2015;11:10136. https://doi.org/10.15766/mep_2374-8265.10136

19. Daniel M, Rougas S, Warriier S, Tabaddor R, Bray K, Taylor J. Teaching physical exam skills to novices: developing all the tools in the clinician toolbox. *MedEdPORTAL*. 2015;11:10057. https://doi.org/10.15766/mep_2374-8265.10057
20. Yudkowsky R, Otaki J, Bordage G, Lowenstein T, Riddle J, Nishigori H. Hypothesis-driven physical examination student handbook. *MedEdPORTAL*. 2011;7:8294. https://doi.org/10.15766/mep_2374-8265.8294
21. Garibaldi BT, Olson APJ. The hypothesis-driven physical examination. *Med Clin North Am*. 2018;102(3):433-442. <https://doi.org/10.1016/j.mcna.2017.12.005>
22. McGee S. Simplifying likelihood ratios. *J Gen Intern Med*. 2002;17(8):647-650. <https://doi.org/10.1046/j.1525-1497.2002.10750.x>
23. Mojica M. The Making Evidence-Based Medicine Simple Series—Diagnostic Testing Module. *MedEdPORTAL*. 2013;9:9475. https://doi.org/10.15766/mep_2374-8265.9475
24. Huggett KN, Warriier R, O'Neill S, Maio A. Back to school for the teachers: improving teaching of physical diagnosis. *J Contin Educ Health Prof*. 2009;29(1):77-78. <https://doi.org/10.1002/chp.20012>
25. Knowles MS. *The Modern Practice of Adult Education: From Pedagogy to Andragogy*. Rev ed. Association Press/Follett Publishing; 1980.
26. Kolb DA. *Experiential Learning: Experience as the Source of Learning and Development*. 2nd ed. Pearson Education; 2015.
27. Peyton JWR, ed. *Teaching and Learning in Medical Practice*. Manticore Publishers; 1998.
28. Rousseau M, Könings KD, Touchie C. Overcoming the barriers of teaching physical examination at the bedside: more than just curriculum design. *BMC Med Educ*. 2018;18:302. <https://doi.org/10.1186/s12909-018-1403-z>
29. Janjigian MP, Charap M, Kalet A. Development of a hospitalist-led-and-directed physical examination curriculum. *J Hosp Med*. 2012;7(8):640-643.
30. Regan-Smith M, Hirschmann K, lobst W. Direct observation of faculty with feedback: an effective means of improving patient-centered and learner-centered teaching skills. *Teach Learn Med*. 2007;19(3):278-286. <https://doi.org/10.1080/10401330701366739>
31. Pazo VC, Frankl S, Ramani S, Katz J. Peer teaching of the physical exam: a pilot study. *Clin Teach*. 2018;15(5):393-397. <https://doi.org/10.1111/tct.12708>
32. Osman C, Dembitzer A, Zabar S, Tewksbury L. Using objective structured teaching exercises for faculty development. *MedEdPORTAL*. 2015;11:10258. https://doi.org/10.15766/mep_2374-8265.10258

Received: July 29, 2021

Accepted: January 24, 2022

Published: April 7, 2022