11-26-2020

Developing Physical Exam Skills in Residency: Comparing the Perspectives of Residents and Faculty about Values, Barriers, and Teaching Methods

John W. Ragsdale
University of Kentucky, john.ragsdale@uky.edu

Catherine Habashy
University of North Carolina, Chapel Hill

Sarita Warrier
Brown University

Developing Physical Exam Skills in Residency: Comparing the Perspectives of Residents and Faculty about Values, Barriers, and Teaching Methods

Digital Object Identifier (DOI)
https://doi.org/10.1177/2382120520972675

Notes/Citation Information
Published in *Journal of Medical Education and Curricular Development*, v. 7.

Developing Physical Exam Skills in Residency: Comparing the Perspectives of Residents and Faculty About Values, Barriers, and Teaching Methods

Journal of Medical Education and Curricular Development
Volume 7: 1–6

DOI: 10.1177/2382120520972675
SAGE

John W. Ragsdale[1], Catherine Habashy[2] and Sarita Warrier[3]

[1]University of Kentucky College of Medicine, Lexington, KY, USA. [2]University of North Carolina, Chapel Hill, NC, USA. [3]Warren Alpert Medical School of Brown University, Providence, RI, USA.

ABSTRACT

BACKGROUND: The physical examination (PE) skills of residents are often not improved since medical school. Unfortunately, how residents learn PE is not well understood. There is a paucity of research on the factors involved and the differences between resident and faculty perspectives. The authors sought to determine resident and faculty perceptions about the value of PE, the major barriers to learning PE, and the most effective teaching methods.

METHODS: Based on a rigorous process of literature review and semi-structured interviews, the authors developed an online survey which was sent to 406 internal medicine residents and 93 faculty at 3 institutions. Residents and faculty answered questions about both their own opinions and about their perception of the other group's opinions.

RESULTS: About 283 residents (70%) and 61 faculty (66%) completed the survey. Both residents and faculty rated the importance of PE similarly. Residents rated being too busy, followed by a lack of feedback, as the most significant barriers to learning PE. Faculty rated a lack of feedback, followed by a lack of resident accountability, as the most significant barriers. Both groups rated the availability of abnormal findings as the least significant barrier. Both groups agreed that faculty demonstration at the bedside was the most effective teaching method.

CONCLUSION: This survey can serve as a needs assessment for educational interventions to improve the PE skills of residents by focusing on areas of agreement between residents and faculty, specifically faculty demonstration at the bedside combined with feedback about residents' skills.

KEYWORDS: Physical examination, clinical skills, curriculum development, graduate medical education, residency

RECEIVED: October 6, 2020. **ACCEPTED:** October 15, 2020.

TYPE: Original Research

FUNDING: The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was funded by a grant from the Thomas H Nimick, Jr Competitive Research Fund.

DECLARATION OF CONFLICTING INTERESTS: The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

CORRESPONDING AUTHOR: John W. Ragsdale, Assistant Dean for Clinical Education, University of Kentucky College of Medicine, 800 Rose St., MN 109, Lexington, KY 40536, USA. Email: john.ragsdale@uky.edu

Introduction

Physical examination (PE) skills are first learned in medical school with dedicated courses or course elements.[1] Assessment is used to ensure skill acquisition.[2] It is expected that learners will continue to improve their skills during residency training, yet, formal programs to teach PE are uncommon in residency training programs,[3-6] as is bedside teaching of PE.[7-10] The prevailing belief that PE skills will continue to develop in the course of routine clinical work, is not substantiated. When formally assessed, residents' skills are typically below expected competency levels.[5,11-32] In fact, residents often perform no better than medical students.[33-38] Even when observed in routine patient care, residents make multiple errors involving PE.[39-42]

There is a paucity of research examining how PE is learned during residency. Various factors have been hypothesized to explain the lack of skill development, including residents being uninterested or too busy,[7,43-45] faculty lacking skills or confidence in their skills,[8,28,46-53] faculty not observing residents,[41,44,54,55] lack of patients with advanced findings,[37,56] and overreliance on technology.[7,33,37,43,44,47,56,57] In many cases, these are cited without supporting data, and the relative importance of each is not well understood.

In order to improve the PE skills of residents and future practitioners, we need to better understand the barriers that hinder skill development and the teaching methods that promote it. By understanding these issues from the perspectives of both the learner (resident) and the teacher (faculty), we can design curriculum interventions which better address the concerns of both groups and promote wider support. We conducted a multi-institutional, cross-sectional survey of residents and faculty to determine (1) how much each group values PE and how each perceives the other, (2) what each group perceives as the major barriers to learning PE skills, and (3) what teaching methods each group believes are most effective.

Methods

Study design

We surveyed internal medicine residents and faculty at 3 institutions (Brown University, University of Kentucky, and University of Pittsburgh) between December 2011 and May 2012 (2 faculty surveys were completed in June and August 2012). Residents were defined as categorical internal medicine or internal medicine-pediatrics residents. Faculty were defined

as general internal medicine faculty with clinical and teaching responsibilities on an inpatient medicine service. Institutional review board approval was obtained at all institutions.

Survey instrument development

We began by conducting a literature review of physical exam teaching in residency, including research studies of specific interventions to teach PE components, surveys of perceptions about the utility of the PE, and editorials and letters about how it should be taught. This literature review was used to develop a semi-structured interview guide to further explore the identified themes. One author (JR) conducted the semi-structured interviews using a convenience sample of 3 residents and 3 faculty, which were audio recorded and transcribed. We then developed a survey instrument based on the data from the literature review and semi-structured interviews. We pilot-tested this instrument on faculty and recently-graduated residents, prompting further revisions.

Survey instrument

The final survey included 61 questions in 3 domains: (1) perceived value of PE skills, (2) barriers to learning PE skills, and (3) effective teaching methods of PE skills (see Supplemental Appendix). We asked participants about their own opinions and their perception of the other group's opinions (ie, residents were asked about faculty opinions and faculty were asked about resident opinions). For this reason, we created 2 versions of the survey with parallel questions (eg, "resident" in the faculty version was changed to "you" in the resident version). We instructed participants to focus on experiences on the inpatient general medicine service. Demographic questions were also included.

Data collection

We distributed the survey to a total of 406 residents and 93 faculty at 3 institutions via an online survey tool (SurveyMonkey, San Mateo, CA). Participation was voluntary and anonymous. We sent 2 reminder emails and encouraged participation through an optional gift card drawing conducted by the survey company. Contact information for the drawing was not paired with survey responses.

Analysis

We used descriptive statistics to characterize demographic information. For items asking about agreement, we compared the proportion of strongly agree/agree to the proportion of neutral/disagree/strongly disagree using a chi-squared test. For qualitative frequency items, we compared the proportion of always/often to the proportion of sometimes/rarely/never using a chi-squared test. For all other items, we compared the mean response of residents to faculty using a *t*-test. For items in which the respondent rated both their own opinion and their perception of the other group's opinion, we compared means using a paired *t*-test. For all tests, significance was set at $P < .05$. Data were analyzed using SAS 9.4 (Cary, NC).

Table 1. Demographic characteristics of survey participants.

	RESIDENTS N (%)	FACULTY N (%)
Total (n)	282	58
Female[a]	149 (54%)	27 (49%)
Institution		
Brown University	86 (30%)	17 (29%)
University of Kentucky	56 (20%)	16 (28%)
University of Pittsburgh	140 (50%)	25 (43%)
Post-graduate year[b]		
PGY-1	102 (37%)	—
PGY-2	79 (29%)	
PGY-3	83 (30%)	
PGY-4	10 (4%)	
Years in practice[c]		
0-5 years	—	14 (25%)
6-10 years		16 (29%)
11-15 years		10 (18%)
16-20 years		6 (11%)
21+ years		10 (18%)
Weeks per year on an inpatient teaching service[c]		
1-8 weeks	—	28 (50%)
9-16 weeks		23 (41%)
17-24 weeks		5 (9%)
Medical school location[d]		
United States	240 (88%)	53 (95%)
Other	33 (12%)	3 (5%)

[a]7 residents and 3 faculty did not answer.
[b]8 residents did not answer.
[c]2 faculty did not answer.
[d]9 residents and 2 faculty did not answer.

Results

Participants

About 283 residents and 61 faculty completed the survey, for response rates of 70% and 66%, respectively. Upon review of the data, 1 resident was excluded because they self-identified as a faculty physician in the comments. Three faculty were excluded because they reported no time spent on an inpatient teaching service and were ineligible. This left 282 residents and 58 faculty (Table 1).

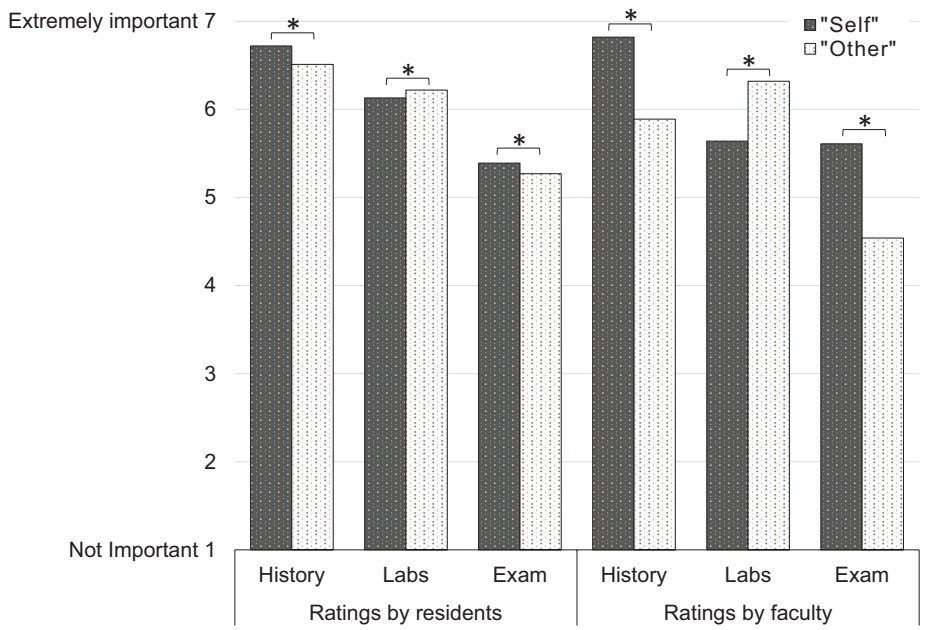

Figure 1. Ratings on a multi-institutional survey of residents and faculty of the importance of different factors in making patient care decisions. Residents were asked to rate the importance in their own decisions ("self") and how they perceived the importance in faculty decisions ("other"). Faculty were asked to rate the importance in their own decisions ("self") and how they perceived the importance in resident decisions ("other").
*$P < .05$.

Perceived value of PE skills

A majority of both residents (R) and faculty (F) agreed that physicians should be skilled at PE (R: 96.5%, F: 94.8%, $P = .56$). A majority of both groups reported that the PE often/always influences the tests they order (R: 50.7%, F: 64.9%, $P = .0502$) and often/always contributes to their differential diagnoses (R: 72.5%, F: 77.2%, $P = .47$). A majority of residents (55.7%) but a minority of faculty (38.6%, $P = .02$) perceived that faculty are often/always interested in a patient's PE findings. A minority of both groups perceived that the other group often/always used PE findings to explain their clinical reasoning (R: 44.3%, F: 31.6%, $P = .08$). Residents approximated the percentage of other residents and the percentage of faculty who value PE. Both ratings were between "41%-60%" and "61%-80%," though faculty were rated slightly higher ($P < .001$). Faculty approximated other faculty and residents within the same range, with faculty slightly higher ($P < .001$).

When asked to rate the importance of different elements in making patient care decisions, both groups rated history highest, followed by laboratory tests (displayed as "self" ratings in Figure 1). The PE was rated similarly by both groups ($P = .55$). When asked to rate the "other" group, residents rated faculty slightly lower than themselves for history, slightly higher for laboratory tests, and slightly lower for PE ($P = .03$). In contrast, faculty rated residents much lower than themselves for history, much higher for laboratory tests, and much lower for PE ($P < .001$).

Barriers to learning PE Skills

Residents rated being too busy as the most significant barrier, followed by lack of feedback (Figure 2). Faculty rated lack of feedback highest, followed by residents not being held accountable for their findings. Both groups rated availability of abnormal findings as the least significant barrier. In the 3 barriers with a significant difference in ratings, faculty ratings were higher for all 3.

Individual barriers were further explored with targeted questions. Regarding being busy, both groups agreed that residents perform less detailed exams when their clinical workload is high (R: 83.6%, F: 91.2%, $P = .14$). Regarding feedback, only about half of each group agreed that residents' skills have improved from feedback (R: 42.1%, F: 50.9%, $P = .23$). When asked to approximate the percentage of new admissions for which residents receive PE feedback, resident and faculty ratings both approximated "21%-40%" ($P = .06$). Residents and faculty both approximated the percentage of faculty competent in PE as between "41%-60%" and "61%-80%" ($P = .60$). Despite this, residents and faculty approximated the percentage of faculty who teach PE as between "21%-40%" and "41%-60%" ($P = .64$). Regarding equipment, both groups reported that residents often forgo some exams when equipment is not readily available: fundoscopic (R: 68.2%, F: 76.8%, $P = .20$), otoscopic (R: 62.4%, F: 77.2%, $P = .03$), pelvic (R: 40.4%, F: 61.4%, $P = .004$). Regarding residents being held accountable, both groups agreed that PE findings presented on rounds influence clinical decisions (R: 80.5%, F: 93.1%, $P = .02$). However, both groups reported that faculty do not often comment on residents' PE findings (R: 21.4%, F: 36.8%, $P = .01$). Residents and faculty reported similar rates of direct observation by faculty, with residents approximating "<1 time/week," and faculty approximating "1-3 times/week" ($P = .63$). Direct observation by other residents approximated "1-3 times/week" for both

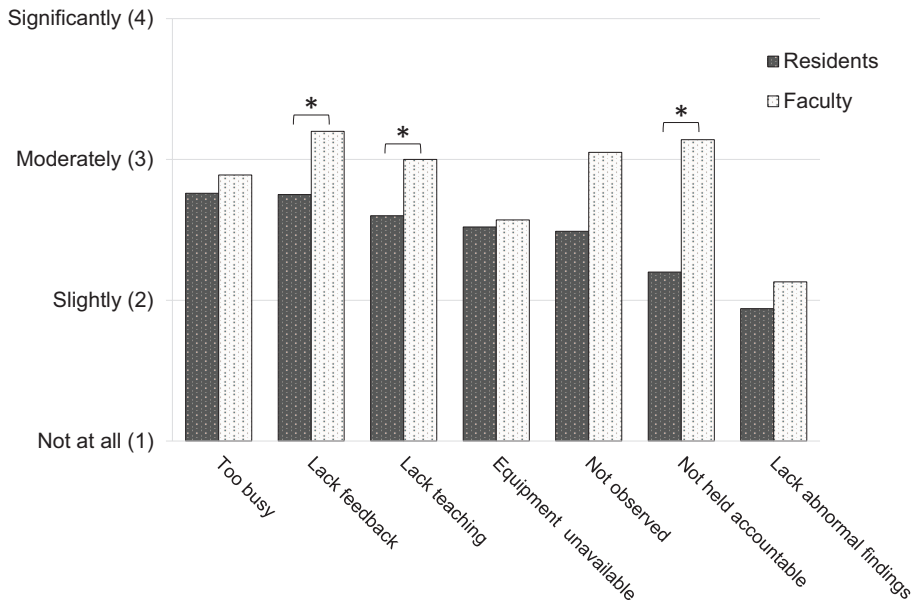

Figure 2. Ratings on a multi-institutional survey of residents and faculty of the degree to which different barriers hinder the development of physical examination skills in residency.
*$P < .05$.

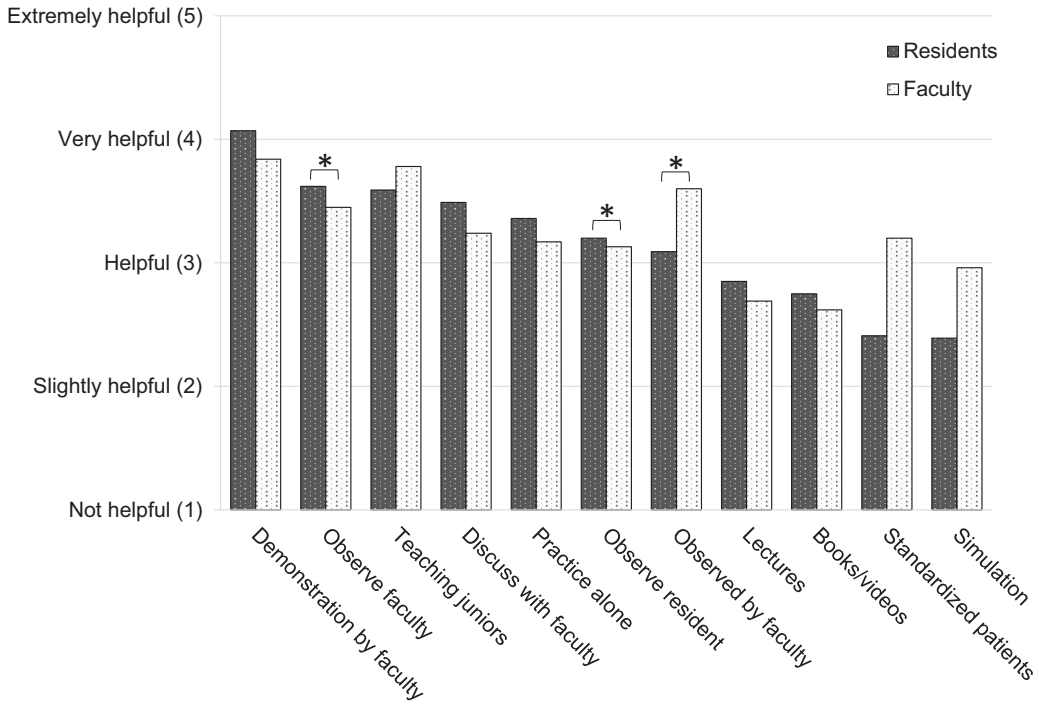

Figure 3. Ratings on a multi-institutional survey of residents and faculty of how helpful different methods are for learning physical examination skills in residency.
*$P < .01$.

($P = .39$). Regarding technology, faculty had higher agreement that residents perform a more thorough PE without imaging immediately available (R: 57.7%, F: 72.4%, $P = .04$).

Effective teaching methods of PE skills

Both residents and faculty rated faculty demonstration of specific PE maneuvers as the most effective teaching method (Figure 3). Residents rated 2 methods slightly higher than faculty: observing a faculty doing his/her own PE and observing another resident performing his/her own PE. Faculty rated one method higher: faculty observing a resident performing a PE.

Discussion

Regarding our first question of how much each group values PE, both residents and faculty appear to highly value PE. Regarding how each perceives the other, both groups perceive that the other group values it less than they themselves do,

though this discrepancy was more pronounced in the faculty responses. This perception may negatively impact the teaching process if faculty are reluctant to teach something they think residents do not want to learn. However, our data should reassure faculty that residents do, in fact, value the PE and is corroborated by other studies showing residents value these skills and want to learn them.[7,49]

Regarding our second question of what each group perceives as the major barriers to learning PE skills, both groups rated a lack of feedback as 1 of the top 2 barriers. Both groups similarly rated the impact of being too busy and agreed that resident workload impacts practicing PE, which is not surprising but has not been previously supported by data. We must find ways to prioritize learning PE despite the many competing demands of residency. Lack of teaching was an important barrier for both, and both groups perceived a greater percentage of faculty were competent in PE than teach it. This indicates that other factors, such as a lack of confidence, may be affecting whether a faculty member teaches PE, as other studies have reported.[8,46,49] Neither group perceives that a lack of abnormal findings is limiting PE learning, which counters the argument that PE is harder to learn in the modern era with earlier, more effective treatments.[37,56] The largest discrepancy in barriers was in residents viewing accountability as less important compared to faculty. One explanation may be that faculty perceive more of a link between accountability and skill development than residents do. Overall, faculty and residents tended to agree about systems barriers (workload, equipment, availability of findings), but faculty rated educational barriers higher (feedback, teaching, accountability).

Regarding our third question of what teaching methods each group believes are most effective, both groups rated demonstration of specific PE maneuvers as the most effective teaching method. Faculty rated learning through being observed higher than residents. Possible explanations for this include residents not realizing when they have been observed or not appreciating the link between observation and feedback. Simulation and standardized patients were the 2 lowest-rated methods for residents and in the bottom half for faculty. Therefore, these do not appear to be viewed by either group as highly effective methods, which is supported by a systematic review of interventions.[58] Both groups agreed that lectures and books/videos were less effective, which is not surprising given that these primarily address knowledge rather than skill objectives.

One strength of this study is incorporating both resident and faculty perspectives. This helps ensure that any curriculum intervention is grounded in the both teacher and learner perspectives. Despite the length, the survey had a high response rate which suggests these data are representative of residents and faculty at those institutions. By involving multiple institutions in different geographic areas, the results are less likely affected by local teaching practices and health system factors and are more generalizable to other academic medical centers.

One limitation of this study is that we only surveyed internal medicine residents and faculty so the results may not be generalizable to other specialties. Our study focused on learning PE in the inpatient setting, so results might be different in an ambulatory setting. Our survey was conducted at academic residency programs, and the results may be different in community programs. Finally, this survey was completed approximately 8 years ago. While the results may have changed during this time, the literature about PE performance by residents and the perceived factors has remained stable for decades. Further verification of our results in more recent samples could be useful in further supporting curriculum development initiatives.

Conclusion

This is the first study we are aware of to evaluate opinions about learning PE from both resident and faculty perspectives at multiple institutions. By focusing on areas of agreement and exploring areas of disagreement, we believe that any resulting intervention will be stronger. We hope our findings will reassure faculty that residents value learning PE and also provide an evidence basis for educational interventions that focus on high-priority barriers and teaching methods. Based on these data, we believe that the most important intervention is faculty development to promote demonstrating PE skills at the bedside and providing feedback to residents about their skills. Future studies should explore how this can be most effectively accomplished and the effects of these interventions on skill development.

Acknowledgements

Mentorship of the following people was invaluable in completing this project: Kevin Kraemer, MD MSc and Melissa McNeil, MD, MPH at the University of Pittsburgh and Dario Torre, MD, MPH, PhD at the Uniformed Services University. We would also like to thank Kristen McQuerry, PhD for her help with the statistical analysis.

Author Contributions

Each author was involved in the data collection, writing and revision of the manuscript, and approval of the final version.

ORCID iDs

John Ragsdale https://orcid.org/0000-0002-9942-1192
Sarita Warrier https://orcid.org/0000-0002-1685-4719

Supplemental Material

Supplemental material for this article is available online.

REFERENCES

1. Number of Medical Schools Including Topic an an Independent Course or Part of an Integrated Course. Association of American Medical Colleges Curriculum Reports; 2019. Accessed March 1, 2019. https://www.aamc.org/initiatives/cir/406466/06b.html
2. Functions and Structure of a Medical School. *Structure of a Medical School: Standards for Accreditation of Medical Education Programs Leading to the MD Degree*. Liason Committee on Medical Education; 2017.

3. Mangione S. The teaching of cardiac auscultation during internal medicine and family medicine training—a nationwide comparison. *Acad Med*. 1998;73:S10-S12.
4. Mangione S. The teaching of chest auscultation in US internal medicine and family practice medicine residencies. *Acad Med*. 1999;74:S90-S92.
5. Chalabian J, Formenti S, Russell C, Pearce J, Dunnington G. Comprehensive needs assessment of clinical breast evaluation skills of primary care residents. *Ann Surg Oncol*. 1998;5:166-172.
6. Herrle SR, Corbett EC Jr., Fagan MJ, Moore CG, Elnicki DM. Bayes' theorem and the physical examination: probability assessment and diagnostic decision making. *Acad Med*. 2011;86:618-627.
7. 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;20:710-714.
8. Crumlish CM, Yialamas MA, McMahon GT. Quantification of bedside teaching by an academic hospitalist group. *J Hosp Med*. 2009;4:304-307.
9. Aldeen AZ, Gisondi MA. Bedside teaching in the emergency department. *Acad Emerg Med*. 2006;13:860-866.
10. Stickrath C, Noble M, Prochazka A, et al. Attending rounds in the current era: what is and is not happening. *JAMA Intern Med*. 2013;173:1084-1089.
11. Willett LL, Estrada CA, Castiglioni A, et al. Does residency training improve performance of physical examination skills? *Am J Med Sci*. 2007;333:74-77.
12. Dupras DM, Li JT. Use of an objective structured clinical examination to determine clinical competence. *Acad Med*. 1995;70:1029-1034.
13. Hatala R, Cole G, Kassen BO, Bacchus CM, Issenberg SB. Does physical examination competence correlate with bedside diagnostic acumen? An observational study. *Med Teach*. 2007;29:199-203.
14. Chalabian J, Dunnington G. Do our current assessments assure competency in clinical breast evaluation skills? *Am J Surg*. 1998;175:497-502.
15. Norcini JJ, Blank LL, Duffy FD, Fortna GS. The mini-CEX: a method for assessing clinical skills. *Ann Intern Med*. 2003;138:476-481.
16. Li JT. Assessment of basic physical examination skills of internal medicine residents. *Acad Med*. 1994;69:296-299.
17. Dugoff L, Everett MR, Vontver L, Barley GE. Evaluation of pelvic and breast examination skills of interns in obstetrics and gynecology and internal medicine. *Am J Obstet Gynecol*. 2003;189:655-658.
18. Steiner E, Austin DF, Prouser NC. Detection and description of small breast masses by residents trained using a standardized clinical breast exam curriculum. *J Gen Intern Med*. 2008;23:129-134.
19. Criley JM, Keiner J, Boker JR, Criley SR, Warde CM. Innovative web-based multimedia curriculum improves cardiac examination competency of residents. *J Hosp Med*. 2008;3:124-133.
20. Yudkowsky R, Bordage G, Lowenstein T, Riddle J. Residents anticipating, eliciting and interpreting physical findings. *Med Educ*. 2006;40:1141-1142.
21. Wilcox T, Oyler J, Harada C, Utset T. Musculoskeletal exam and joint injection training for internal medicine residents. *J Gen Intern Med*. 2006;21:521-523.
22. Houck WA, Soares-Welch CV, Montori VM, Li JT. Learning the thyroid examination—a multimodality intervention for internal medicine residents. *Teach Learn Med*. 2002;14:24-28.
23. Smith CA, Hart AS, Sadowski LS, et al. Teaching cardiac examination skills. A controlled trial of two methods. *J Gen Intern Med*. 2006;21:7-12.
24. Oddone EZ, Waugh RA, Samsa G, Corey R, Feussner JR. Teaching cardiovascular examination skills: results from a randomized controlled trial. *Am J Med*. 1993;95:389-396.
25. Sachdeva AK, Loiacono LA, Amiel GE, Blair PG, Friedman M, Roslyn JJ. Variability in the clinical skills of residents entering training programs in surgery. *Surgery*. 1995;118:300-308; discussion 308-309.
26. St Clair EW, Oddone EZ, Waugh RA, Corey GR, Feussner JR. Assessing housestaff diagnostic skills using a cardiology patient simulator. *Ann Intern Med*. 1992;117:751-756.
27. Marcus GM, Vessey J, Jordan MV, et al. Relationship between accurate auscultation of a clinically useful third heart sound and level of experience. *Arch Intern Med*. 2006;166:617-622.
28. Jones JS, Hunt SJ, Carlson SA, Seamon JP. Assessing bedside cardiologic examination skills using "Harvey," a cardiology patient simulator. *Acad Emerg Med*. 1997;4:980-985.
29. Endean ED, Sloan DA, Veldenz HC, Donnelly MB, Schwarcz TH. Performance of the vascular physical examination by residents and medical students. *J Vasc Surg*. 1994;19:149-154; discussion 155-146.
30. Hergenroeder AC, Chorley JN, Laufman L, Fetterhoff AC. Pediatric residents' performance of ankle and knee examinations after an educational intervention. *Pediatrics*. 2001;107:E52.
31. Kumar K, Thompson WR. Evaluation of cardiac auscultation skills in pediatric residents. *Clin Pediatr (Phila)*. 2013;52:66-73.
32. Beran MC, Awan H, Rowley D, Samora JB, Griesser MJ, Bishop JY. Assessment of musculoskeletal physical examination skills and attitudes of orthopaedic residents. *J Bone Joint Surg Am*. 2012;94:e36.
33. Mangione S, Burdick WP, Peitzman SJ. Physical diagnosis skills of physicians in training: a focused assessment. *Acad Emerg Med*. 1995;2:622-629.
34. Mangione S, Nieman LZ. Cardiac auscultatory skills of internal medicine and family practice trainees. A comparison of diagnostic proficiency. *JAMA*. 1997;278:717-722.
35. Mangione S, Peitzman SJ, Gracely E, Nieman LZ. Creation and assessment of a structured review course in physical diagnosis for medical residents. *J Gen Intern Med*. 1994;9:213-218.
36. Petrusa ER, Blackwell TA, Ainsworth MA. Reliability and validity of an objective structured clinical examination for assessing the clinical performance of residents. *Arch Intern Med*. 1990;150:573-577.
37. Vukanovic-Criley JM, Criley S, Warde CM, et al. Competency in cardiac examination skills in medical students, trainees, physicians, and faculty: a multicenter study. *Arch Intern Med*. 2006;166:610-616.
38. Mangione S, Nieman LZ, Gracely E, Kaye D. The teaching and practice of cardiac auscultation during internal medicine and cardiology training. A nationwide survey. *Ann Intern Med*. 1993;119:47-54.
39. Aloia JF, Jonas E. Skills in history-taking and physical examination. *J Med Educ*. 1976;51:410-415.
40. Wray NP, Friedland JA. Detection and correction of house staff error in physical diagnosis. *JAMA*. 1983;249:1035-1037.
41. Johnson JE, Carpenter JL. Medical house staff performance in physical examination. *Arch Intern Med*. 1986;146:937-941.
42. Lillicrap MS, Byrne E, Speed CA. Musculoskeletal assessment of general medical in-patients—joints still crying out for attention. *Rheumatology (Oxford)*. 2003;42:951-954.
43. Simel DL. Time, now, to recover the fun in the physical examination rather than abandon it. *Arch Intern Med*. 2006;166:603-604.
44. Elder A, Chi J, Ozdalga E, Kugler J, Verghese A. A piece of my mind. The road back to the bedside. *JAMA*. 2013;310:799-800.
45. Hirschtick RE. The quick physical exam. *JAMA*. 2016;316:1363-1364.
46. Ramani S, Orlander JD, Strunin L, Barber TW. Whither bedside teaching? A focus-group study of clinical teachers. *Acad Med*. 2003;78:384-390.
47. Ramani S. Twelve tips for excellent physical examination teaching. *Med Teach*. 2008;30:851-856.
48. LaCombe MA. On bedside teaching. *Ann Intern Med*. 1997;126:217-220.
49. Wu EH, Fagan MJ, Reinert SE, Diaz JA. Self-confidence in and perceived utility of the physical examination: a comparison of medical students, residents, and faculty internists. *J Gen Intern Med*. 2007;22:1725-1730.
50. Wiener S, Nathanson M. Physical examination. Frequently observed errors. *JAMA*. 1976;236:852-855.
51. Chan-Yan C, Gillies JH, Ruedy J, Montaner JS, Marshall SA. Clinical skills of medical residents: a review of physical examination. *CMAJ*. 1988;139:629-632.
52. Mangione S, Peitzman SJ. Revisiting physical diagnosis during the medical residency: it is time for a logbook—and more. *Acad Med*. 1999;74:467-469.
53. Mookherjee S, Hunt S, Chou CL. Twelve tips for teaching evidence-based physical examination. *Med Teach*. 2015;37:543-550.
54. Holmboe ES, Fiebach NH, Galaty LA, Huot S. Effectiveness of a focused educational intervention on resident evaluations from faculty a randomized controlled trial. *J Gen Intern Med*. 2001;16:427-434.
55. Wiener SL. Ward rounds revisited—the validity of the data base. *J Med Educ*. 1974;49:351-356.
56. Fletcher RH, Fletcher SW. Has medicine outgrown physical diagnosis? *Ann Intern Med*. 1992;117:786-787.
57. Smith MA, Gertler T, Freeman K. Medical students' perceptions of their housestaffs' ability to teach physical examination skills. *Acad Med*. 2003;78:80-83.
58. 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;28:1090-1099.