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Students Teaching Students:

Evaluation of a “Near-Peer” Teaching Experience

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Rationale and Objectives: Teaching is an important skill. Academic physicians teach on a daily basis, and nearly all physicians occasionally teach colleagues and patients. There are generally few opportunities for medical students to learn teaching skills. We developed a novel “near-peer” teaching program in which fourth-year students cotaught first-year students.

Materials and Methods: Eighteen fourth-year students enrolled in our institution’s primary senior radiology elective learned the basics of ultrasound through a series of lectures and hands-on scanning sessions. Each fourth-year student, paired with a radiology resident or attending, then cotaught a first-year anatomy small group session. After instruction, voluntary surveys were administered to assess the perceived value of the “near-peer” teaching experience.

Results: Seventeen of 18 (94%) and 104 of 120 (87%) administered surveys were returned by fourth- and first-year students, respectively. Sixteen (94%) and 99 (95%) of the fourth- and first-year students reported they “enjoyed” or “really enjoyed” the near-peer teaching experience. Fourteen (82%) of the fourth years perceived improvement in their teaching skills and an increase in their knowledge. Only 8 (47%) of the fourth years thought they were “helpful” or “very helpful,” though 92 (88%) of the first years identified their fourth-year co-instructors as “helpful” or “very helpful.”

Conclusions: We piloted a novel “near-peer” program. Both senior and freshman students enjoyed the experience, and fourth years thought the session was educational for them as well. Although most fourth years did not judge themselves as helpful, first-year students overwhelmingly considered them a useful addition to the session.

Key Words: Medical students; education; near-peer teaching; evaluations.

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Physicians almost universally benefit from being able to teach; some physicians directly teach as part of their regular duties and nearly all physicians have occasion to teach colleagues and patients. Although teaching skills are important, formal education on how to teach is generally lacking throughout medical school and postgraduate training (1,2).

Students teaching other students is termed “peer” or “near-peer” education (3). These terms are often applied to structured group teaching sessions, as opposed to the more common and informal one-on-one teaching that occurs on the clinical wards. Near-peer teaching can be beneficial for both the junior and senior learners alike: the more junior learners benefit from having a teacher who is sensitive to their position and knowledge level. The more senior learners benefit by solidifying their knowledge on a topic and from the opportunity to improve their teaching skills. Indeed, some research suggests that teaching can help students become more effective learners themselves (4,5).

Currently, the near-peer teaching experiences offered in medical schools are often limited and only available to those actively seeking them out. Therefore, many senior learners do not benefit, particularly students who are uncomfortable teaching or reluctant to volunteer. Required teaching overcomes this barrier, though can be intimidating without sufficient support (6).

Herein, we describe a novel “near-peer” teaching program built into a fourth-year radiology medical student elective. Students were trained in the basic use of ultrasound including how to perform a targeted ultrasound examination to guide minor bedside interventions, a skill useful for future interns/residents in many disciplines. After the training, the fourth-year students co-instructed a 1.5-hour session for first-year students. The sessions focused on the most basic aspects of ultrasound and the use of ultrasound to identify superficial arm vasculature. We conducted a voluntary survey to assess the students’ experiences. We hypothesized that the senior and junior learners both would perceive these sessions as valuable, and that the senior students would perceive the sessions as helpful to their own learning and teaching skills.

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MATERIALS AND METHODS

“Near-Peer” Teaching: Preparing the Fourth-Year Students

Eighteen fourth-year (senior) medical students enrolled in the main senior radiology elective participated in this pilot

near-peer teaching program. Of the 18, one indicated an intention to enter radiology; the remainder planned to enter a variety of fields, as is common for our elective.

The elective runs repeatedly over the course of the year; however, a single elective month was selected for this pilot. Along with the standard elective lectures and activities, students received 2 hours of lecture regarding how to perform basic, targeted ultrasounds and then participated in a 2-hour hands-on scanning session. During these sessions, the use of ultrasound was specifically discussed in the context of performing thoracenteses, paracenteses, and placing central lines. This focus was selected based on a needs assessment of procedural skills required during medical and surgical internships at our institution (and many others). Ultrasound-guided bedside interventions are increasingly being performed by medicine and emergency medicine teams, yet a formal program of instruction is lacking at our institution. This pilot program was initiated by an interventional radiologist (M.C.) to overall increase the role of interventional radiology in the training of medical students and to specifically address this educational void. The hands-on sessions were directed by an interventional radiologist, who supervised groups of four to five senior medical students.

Before co-instructing the first-year students, the fourth years received all materials provided to the first years and were coached by faculty for approximately 15 minutes regarding the mechanics of the session. This coaching session reviewed basic tips for engaging students. Each fourth-year student was paired with a radiology resident or attending co-instructor. They were encouraged to view this arrangement as a supportive environment in which they could “take the lead with backup,” rather than feeling secondary to the more senior instructor.

“Near-Peer” Teaching: Co-instructing the First-Year Students

The near-peer teaching sessions aimed to orient first-year students to the basic principles of ultrasound and to use the modality to reinforce information taught in the core anatomy course. Specifically, the session reviewed the basic superficial vasculature of the arm and the relationship of arm vessels to muscles and tendons. The emphasis on basic arm anatomy did differ from the emphasis of the fourth years’ instruction (performing basic procedures); reinforcing arm anatomy was selected to supplement the instruction that was concurrently being offered in the core anatomy course at the time of the pilot, whereas using ultrasound for bedside interventions was thought most appropriate for fourth years. Despite the differing emphases for each group’s sessions, the value of ultrasound as a tool was highlighted for both sets of students and the fourth years were sufficiently knowledgeable to assist in the basic forearm anatomy ultrasound session.

Each fourth-year student and senior instructor team was assigned a group of five or six first-year students and was provided a portable ultrasound machine (SonoSite, Bothell, WA). Written learning objectives were provided, including review-

ing the basic features of the machine, reinforcing the ultrasound appearance of various tissues, and identifying key arm vessels. The learning objectives were created jointly by the anatomy course directors and the interventional radiologist leading the sessions (M.C.). From the perspective of the curricular committee, the intent of the session was to familiarize students with ultrasound (and more globally, to increase the radiology content in the first 2 years of the curriculum) and to reinforce anatomy learned through cadaver dissection (a global initiative which included introducing more educational supplements to traditional cadaver dissections).

Survey Design and Administration

Two surveys were designed to assess the perceived value of the near-peer teaching experience, each comprised a small number of questions with standard 5-point Likert scale answer choices. Numbers and neutrally worded answer choices were selected, and each survey provided a space for handwritten comments at the end. The exact wording of the questions and answers are included as part of [Tables 1](#) and [2](#). The survey was edited, approved by all authors, and reviewed by our institutional review board (which often provided comments regarding survey design). The surveys were also reviewed by students uninvolved in the sessions.

At the completion of the near-peer sessions, surveys were administered to all participating first and fourth-year students. The surveys were approved by our institutional review board and were anonymous and voluntary.

The survey questions given to fourth-year students and to first-year students are listed in [Tables 1](#) and [2](#), respectively. Survey question responses were either on a 5-point Likert scale or were yes/no.

Statistical Analysis

Data were summarized with the absolute number and percentage of students answering each answer choice. Likert scale answers were also summarized by a mean value with a standard deviation.

RESULTS

Seventeen of the 18 fourth-year students and 104 of 119 first-year students completed the surveys (94% and 87% response rate, respectively). The participating faculty included two senior assistant professors and one junior associate professor from interventional radiology, abdominal imaging, and thoracic imaging sections. Radiology residents included three postgraduate year 3 and three postgraduate year 4 level residents, approximately half of whom had an interest in interventional radiology. The summary responses to each question are reported in [Tables 1](#) and [2](#).

Of note, 16 of 17 (94%) of the responding fourth year students “enjoyed” or “really enjoyed” teaching first years, 15 (88%) felt sufficiently knowledgeable, 14 (82%) felt they

TABLE 1. Survey Questions, Answer Choices, and Responses From Fourth-Year Medical Students (The Near-Peer Teachers)

Question	Answer Choices	Number of Responses (%)	Mean Response (SD)
Overall, did you enjoy teaching first-year students in this setting?	5 really enjoyed 4 enjoyed 3 neutral 2 did not enjoy 1 really did not enjoy	9 (52.9) 7 (41.2) 1 (5.9) 0 (0) 0 (0)	4.5 (0.62)
Overall, did you feel helpful/useful as a co-instructor?	5 very helpful 4 helpful 3 neutral 2 not helpful 1 very not helpful	2 (11.8) 6 (35.3) 8 (47.1) 1 (5.9) 0 (0%)	3.5 (0.80)
Did you feel sufficiently knowledgeable to be teaching this topic to this audience?	5 very much sufficiently knowledgeable 4 sufficiently knowledgeable 3 neutral 2 not sufficiently knowledgeable 1 very not sufficiently knowledgeable	1 (5.9) 14 (82.4) 1 (5.9) 1 (5.9) 0 (0)	3.9 (0.57)
Did you learn more about the topic by participating as a co-instructor?	Yes No	14 (82.4) 3 (17.6)	
Do you feel this helped you improve your teaching skills?	Yes No	14 (82.4%) 3 (17.6)	

Boldface indicates positive/favorable responses.

TABLE 2. Survey Questions, Answer Choices, and Responses From First-Year Medical Students (The Near-Peer Learners)

Question	Answer Choices	Number of Responses (%)	Mean Response (SD)
Overall, did you enjoy having fourth-year students as co-instructors?	5 really enjoyed 4 enjoyed 3 neutral 2 did not enjoy 1 really did not enjoy	57 (54.8) 42 (40.4) 5 (4.8) 0 (0) 0 (0)	4.5 (0.59)
Overall, did you feel the fourth-year students were helpful/useful as co-instructors?	5 very helpful 4 helpful 3 neutral 2 not helpful 1 very not helpful	53 (51.0) 39 (37.5) 10 (9.6) 2 (1.9) 0 (0)	4.4 (0.73)
Do you feel that the fourth-year students were sufficiently knowledgeable to be teaching this topic as co-instructors?	5 very much sufficiently knowledgeable 4 sufficiently knowledgeable 3 neutral 2 not sufficiently knowledgeable 1 very not sufficiently knowledgeable	44 (42.3) 49 (47.1) 9 (8.7) 2 (1.9) 0 (0)	4.3 (0.71)
How large of a role did the fourth-year students have in teaching the sessions	5 very large role 4 large role 3 neutral 2 small role 1 very small role	23 (22.1) 47 (45.2) 21 (20.2) 11 (10.6) 2 (1.9)	3.8 (0.958)

Boldface indicates positive/favorable responses.

improved on their teaching skills, and 14 (82%) felt they learned more about the topic they were teaching. Only eight (47%) of the fourth-year students, however, reported that they overall felt “helpful” or “very helpful.”

The returned surveys from 104 first-year students revealed that 99 (95%) “enjoyed” or “really enjoyed” having fourth-year students as co-instructors, and 93 (89%) found the senior students to be sufficiently knowledgeable. Divergent from the

surveys of the senior students, 92 (88%) of the first-year students rated fourth years as “helpful” or “very helpful.”

Handwritten comments were provided on eight of the 17 fourth-year student surveys and 39 of the 104 first-year surveys. All free text-written comments are included in the [Appendix](#). Of note, a number of the fourth-year students’ comments suggested a more targeted, specific role for the fourth-year students: “Have a small portion of session dedicated to MS4 to teach a concept.” “Would have been helpful to have ... a specific role for MS4s.” Comments from the first-year students were generally positive, though some commented that the radiology resident or attending did more of the teaching in their session: “I liked the student we had and I think that they can teach us a lot, but in this case the resident did almost all of the teaching.” “I enjoyed having the fourth year although the radiologist had a much bigger teaching role.”

DISCUSSION

We developed a novel “near-peer” teaching experience that was well received by senior and junior students alike. The program included all of the fourth-year students enrolled in our senior radiology elective. After receiving a training program in ultrasound, developed almost exclusively with their learning needs in mind, the fourth-year students co-instructed a hands-on small group session for first-year students. The goal of the near-peer session was appropriately basic and was targeted to a set of learning objectives designed for first-year students. Specifically, the session helped reinforce anatomy being concurrently taught in the anatomy course. Additionally, the introduction to ultrasound was considered preparatory for subsequent lectures teaching the strengths and weakness of the modality and the appropriate use of imaging. In this way, each group was provided level-appropriate instruction (fourth years learned ultrasound guidance for bedside interventions and first years learned anatomy), while also providing the senior students the skills needed to teach more junior students.

Students on both sides of the interaction enjoyed the experience with 94–95% of them rating the experience as something they “enjoyed” or “really enjoyed.” The possible benefits to participating in near-peer teaching for the more senior student include solidifying ones own knowledge and improving teaching skills; our senior students reported both. Teaching resulting in improved personal learning has been documented elsewhere. Gregory et al (2011) rigorously tracked learning before and after a teaching experience and found that the preparation for teaching does indeed enhance learning, likely because of stress surrounding the heightened level of knowledge perceived to be required (7).

The potential benefits for the more junior learner in a near-peer arrangement are well-documented. A major benefit is the “cognitive congruence” resulting from near-peer teachers using language and explaining concepts at an appropriate level (6). As one first year in our study commented, the fourth year “provided great context of which info is pertinent to school

and future years.” Senior students, who have recently mastered the material, may excel at helping junior students traverse their obstacles to understanding difficult concepts. Also, it has been suggested that students are more comfortable asking questions of their peers than of faculty (8). Although less discussed in the literature, there are likely social benefits to interclass interactions including enhance motivation and inspiration that can result from seeing knowledgeable, competent senior students who have weathered the intervening years of medical school. One first year in our study wrote, “It was inspiring to see where I will be.” In our study, the first-year students almost universally rated the fourth years as “helpful” or “very helpful.”

Interestingly, the first years’ assessment of the near-peer teachers’ helpfulness was much higher than the fourth-year student’s self-assessment. We presume this discrepancy is due in part to 1) insecurity on the part of the senior students given they were paired with knowledgeable radiology residents and faculty as co-instructors and 2) the lack of a defined role which differed from their co-instructor. We provided the co-instructors a set of shared teaching objectives rather than assigning specific teaching tasks. As suggested by a number of comments reported in the [Appendix](#), defining a specific role or topic to teach could have been helpful.

Very little has been written about “near-peer” or “peer” medical student teaching in the radiology literature. Most learners-teaching-learners articles have focused on programs in which residents teach other residents (9,10) or residents teach medical students (11). Most articles on this topic cite a general lack of teaching education. For example, Donovan et al found only one-third of radiology programs provided teacher skills training (9). The majority of residents in that study felt the need to start training in teaching early in residency. One could extrapolate that perhaps a teacher-training program could be beneficial even earlier, for example, in medical school. We suspect the paucity of radiology literature on student-to-student “near-peer” teaching is mostly from a lack of substantial radiology content in the preclinical years of many medical school curricula.

“Near-peer” teaching has been evaluated more extensively in the nonradiology literature (3,5,8,12–16), though again, the primary focus of many learners-teaching-learners studies has been on residents teaching students or each other (17–23). In the near-peer teaching program studied by Evans et al (16), senior medical students taught thoracic anatomy to first-year students; the authors reported that senior students believed the program facilitated the development of effective teaching skills and oral communication skills as well as enhancing their knowledge of anatomy. This finding is consistent with our results and supports the belief that senior students teaching more junior students can be a valuable learning experience for both sets of learners (5,12–14,24).

Our study has a number of limitations. There were no objective measures of learning, for either fourth- or first-year students, nor was there an objective measure of the fourth years’ improved teaching skills. We hope in the future to

obtain pre- and posttesting of the fourth years' bedside procedure ultrasound knowledge and skills, and then after, hope to test the first years' mastery of the material after near-peer teaching sessions. An experimental design could have been employed in which only a subset of the students participated in "near-peer" teaching; however, we had a limited number of senior students enrolled and we wanted them all to participate. Our results may not extrapolate to other institutions or other cohorts of students. Last, we understand radiology near-peer instruction may not be possible at all institutions: many curricula do not include radiology content during the first and second year, and therefore this type of near-peer teaching would not be possible.

We believe "near-peer" teaching could be a valuable activity to introduce into senior medical student radiology electives, including both classroom-based and reading room-based electives. To ensure success, we recommend 1) selecting topics that are relevant to both senior and junior learners, 2) providing adequate preparatory instruction for the more senior students, 3) having sufficient "backup" for the senior students during the teaching, and 4) defining specific roles or teaching objectives for the senior students.

CONCLUSION

We developed a novel program of fourth-year medical students co-instructing first-year medical students in a radiology-focused, hands-on teaching session. This "near-peer" teaching was universally liked. The more junior students (the learners) found the senior students to be quite helpful and knowledgeable as co-instructors. The senior students (the teachers) found the sessions helped develop their teaching skills and solidify their knowledge of the topic. Senior students would likely benefit most from near-peer teaching by having very well-defined roles and specified teaching objectives.

REFERENCES

1. Andreatta PB, Hillard ML, Murphy MA, et al. Short-term outcomes and long-term impact of a programme in medical education for medical students. *Med Educ* 2009; 43:260-267.
2. Pasquale SJ, Pugnaire MP. Preparing medical students to teach. *Acad Med* 2002; 77:1175-1176.
3. Ten Cate O, Durning S. Peer teaching in medical education: twelve reasons to move from theory to practice. *Med Teacher* 2007; 29:591-599.
4. Dandavino M, Snell L, Wiseman J. Why medical students should learn how to teach. *Med Teacher* 2007; 29:558-565.
5. Peets AD, Coderre S, Wright B, et al. Involvement in teaching improves learning in medical students: a randomized cross-over study. *BMC Med Educ* 2009; 9:55.
6. Lockspeiser TM, O'Sullivan P, Teherani A, et al. Understanding the experience of being taught by peers: the value of social and cognitive congruence. *Adv Health Sci Educ Theory Pract* 2008; 13:361-372.
7. Gregory A, Walker I, McLaughlin K, et al. Both preparing to teach and teaching positively impact learning outcomes for peer teachers. *Med Teacher* 2011; 33:e417-e422.
8. Bulte C, Betts A, Garner K, et al. Student teaching: views of student near-peer teachers and learners. *Med Teacher* 2007; 29:583-590.
9. Donovan A. Radiology residents as teachers: current status of teaching skills training in United States residency programs. *Acad Radiol* 2010; 17:928-933.
10. Naeger DM, Phelps A, Shah V, et al. Clinician-educator pathway for radiology residents. *Acad Radiol* 2011; 18:640-644.
11. Scheiner JD, Mainiero MB. Effectiveness and student perceptions of standardized radiology clerkship lectures: a comparison between resident and attending radiologist performances. *Acad Radiol* 2003; 10: 87-90.
12. Nelson AJ, Nelson SV, Linn AM, et al. Tomorrow's educators... today? Implementing near-peer teaching for medical students. *Med Teacher* 2013; 35:156-159.
13. Sobral DT. Cross-year peer tutoring experience in a medical school: conditions and outcomes for student tutors. *Med Educ* 2002; 36: 1064-1070.
14. Colaco SM, Chou CL, Hauer KE. Near-peer teaching in a formative clinical skills examination. *Med Educ* 2006; 40:1129-1130.
15. Nestel D, Kidd J. Peer tutoring in patient-centered interviewing skills: experience of a project for first-year students. *Med Teacher* 2003; 25: 398-403.
16. Evans DJ, Cuffe T. Near-peer teaching in anatomy: an approach for deeper learning. *Anatomic Sci Educ* 2009; 2:227-233.
17. Hill AG, Yu TC, Barrow M, et al. A systematic review of resident-as-teacher programmes. *Med Educ* 2009; 43:1129-1140.
18. Mann KV, Sutton E, Frank B. Twelve tips for preparing residents as teachers. *Med Teacher* 2007; 29:301-306.
19. Morrison EH, Rucker L, Boker JR, et al. The effect of a 13-hour curriculum to improve residents' teaching skills: a randomized trial. *Ann Intern Med* 2004; 141:257-263.
20. Morrison EH, Rucker L, Boker JR, et al. A pilot randomized, controlled trial of a longitudinal residents-as-teachers curriculum. *Acad Med* 2003; 78: 722-729.
21. Post RE, Quattlebaum RG, Benich JJ, 3rd. Residents-as-teachers curriculum: a critical review. *Acad Med* 2009; 84:374-380.
22. Ricciotti HA, Dodge LE, Head J, et al. A novel resident-as-teacher training program to improve and evaluate obstetrics and gynecology resident teaching skills. *Med Teacher* 2012; 34:e52-e57.
23. Yu TC, Md AG. Implementing an institution-wide resident-as-teacher program: successes and challenges. *J Grad Med Educ* 2011; 3:438-439.
24. Jackson TA, Evans DJ. Can medical students teach? A near-peer-led teaching program for year 1 students. *Adv Physiol Educ* 2012; 36: 192-196.

APPENDIX

Handwritten Comments From Administered Surveys

Comments from fourth-year student surveys (8 of 17 surveys contained written comments).

- Have a small portion of session dedicated to MS4 to teach a concept
- Teaching first years was very enjoyable and helped to solidify knowledge as well as our confidence in our knowledge. Thanks for the opportunities.
- My role was not vital to the student nor my experience, especially right before an exam.
- Would have been helpful to have better orientation and then a specific role for MS4s. Not necessary to have both attending and MS4s at each table.
- [Recommend] Two fourth-year students per group with residents walking around.
- It was fun.
- Lots of fun and was useful to be teaching with attending and residents.
- Imaging the forearm has very specific anatomy. It was hard to teach “specifics” to the MS1s besides “vessel, muscle, fat, etc.”

Comments from first-year student surveys (39 of 104 surveys contained written comments).

- Both the instructors and fourth-year students were extremely helpful—supportive and knowledgeable.
- I really enjoyed the ultrasound workshop but didn't feel like our student did much compared to the resident.
- Interesting course.
- The professors and radiologists were most helpful and enjoyable part of the learning experience.
- This was a great experience.
- Cool activity—thanks!
- Would be better with fewer people and/or ultrasound setups.
- I liked the student we had and I think that they can teach us a lot, but in this case the resident did almost all of the teaching.
- A little more information preparation for fourth-year student would make a big improvement. But overall he was good.

- Really like ultrasound and want more opportunities to learn and practice with them.
- Really helpful and fun!
- It was inspiring to see where I will be.
- Great introduction to ultrasound!
- They could be a little more active. This was great! Do it again!
- Would not really be able to judge fourth year, received a lot of help from faculty.
- Helpful to have accessible teachers (fourth years).
- I really liked it!
- Awesome session!
- I enjoyed having the fourth year although the radiologist had a much bigger teaching role.
- Awesome.
- I loved the opportunity, thanks!
- Mostly the radiology docs, not the fourth years.
- Fourth-year student was awesome!
- Shadowing.
- Mostly worked with MDs.
- Led mostly my resident.
- This was an awesome experience. Thank you!
- Fourth-year student was helpful in identifying structures and working the ultrasound machine. Resident physicians very helpful in explaining how to find structures.
- Fun!
- Great experience!
- It was a great idea to have fourth year and they had helpful tips!
- Provided great context of which info is pertinent to school and future years.
- This was a great session!
- Very friendly, good implementation of fourth years.
- This was a well-organized session and helped put the things we are learning in anatomy into perspective.
- Perhaps faculty should not micromanage as much, unless they are thoroughly concerned that the MS4 is not prepared enough.
- Great session!
- We had a guided tour to ultrasound!
- I enjoyed having them!