Student Perception of Case-based Teaching by Near-Peers and Faculty during the Internal Medicine Clerkship: A Noninferiority Study

Journal of Medical Education and Curricular Development
Volume 8: 1–6

DOI: 10.1177/23821205211020762
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ABSTRACT

INTRODUCTION: Third-year medical students traditionally receive their didactic or small group teaching sessions from clinical faculty during clerkship rotations. Near-peer teaching is increasingly recognized as an acceptable method for teaching, however most near-peer teaching takes place during the pre-clinical curriculum. We sought to determine if fourth year medical students were noninferior to faculty in facilitating small group discussions during clerkship rotations.

METHODS: Seventy-five third-year medical students participated in a small group session focused on rheumatologic diseases during their internal medicine clerkship rotation. Students were taught by fourth-year medical students who self-selected to participate as near-peer teachers at 1 clinical site (near-peers, N = 36) and by clinical faculty at another site (N = 39). At the end of the session, third-year medical students completed a survey evaluating teacher performance and effectiveness.

RESULTS: There was no significant difference between the 2 groups on each of the 17 survey items assessing teacher performance, the total teaching performance score, and the teaching effectiveness rating (all *P*-values >.05). A mean between-group difference of 2% in favor of the near-peers indicated noninferiority of the near-peer teachers compared with faculty teachers on the total teaching performance score. An absolute difference of 14% in favor of the near-peers indicated noninferiority of the near-peer teachers compared with faculty teachers on the teaching effectiveness score. Near-peer teachers reported several benefits, including improving their own medical knowledge and skills as a future educator.

DISCUSSION: Our data supports the noninferiority of the perceived performance and effectiveness of near-peer teachers compared to faculty teachers in the clerkship setting. Adding near-peer teachers to the clerkship setting is feasible and can be beneficial to all stakeholders.

KEYWORDS: Near-peer teaching, undergraduate medical education, clinical clerkship, noninferiority study

RECEIVED: February 25, 2021. **ACCEPTED:** May 10, 2021.

TYPE: Original Research

FUNDING: The author(s) received no financial support for the research, authorship, and/or publication of this article.

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.

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Introduction

In the traditional model of medical education, basic science and clinical faculty serve as the primary source of disseminating information to medical students through didactic lectures or small group facilitation. The implementation of Resident as Teacher[1] and Medical Student as Teacher programs[2,3] has allowed for more flexibility in how knowledge and skills are taught to medical students. Near-peer teaching, where the near-peer teacher is on the same level of medical training but 1 or more years senior,[4] is starting to gain momentum in medical education.[5] Near-peer teaching is based on the theories of cognitive and social congruence, suggesting that near-peer teachers create a learning environment that is less intimidating for the learner due to the proximity in training.[6-8] This teaching format allows senior students to test out their own teaching styles while they are still in training[9] and may improve their confidence in their ability to teach.[2,10] Incorporating near-peer teachers also alleviates faculty burden.[11]

Near-peer teaching frequently occurs during the preclinical years. Senior medical students facilitate small group work,[2,12] anatomy lab sessions,[13] clinical and procedural skills,[14,15] or written and oral communication skills.[16,17] Students are often satisfied with the level of preclinical teaching that their near-peers provide.[12-14,16] Although student satisfaction does not consistently translate into better performance on assessments,[18] satisfaction is a positive indicator of student engagement, well-being, and a supportive learning environment.[19,20]

There are some studies which show that students are satisfied with the quality of teaching by near-peers during clerkship rotations,[21-23] but it is unclear how they view near-peer teachers relative to faculty. At least 1 study showed that students were more satisfied with near-peer teachers than faculty[24] and another

showed no significant difference in student satisfaction with near-peer or faculty teaching.[25] There are a couple of reports showing that objective measures, such as scores on written or OSCE exams, are comparable regardless if students are exposed to near-peer or faculty teachers.[26,27] Relying on near-peer teachers seems to be a practical alternative to utilizing faculty teachers, however the ability of near-peer teachers to teach in a clerkship setting has not been rigorously evaluated.[28]

We sought to determine if fourth-year medical students (MS4s) could perform as well as clinical faculty as near-peer teachers during clerkship rotations. We created a case-based small group session for third-year medical students (MS3) on their internal medicine (IM) clerkship rotation. At 1 clinical site, a MS4 served as the facilitator and at another site a faculty member served as the facilitator. In this study we compared faculty to MS4 sub-interns using items from a validated tool,[29] to measure student's perception of clinical teaching. We hypothesized that near-peer teaching is noninferior to faculty teaching in a clerkship rotation. We also report near-peer teacher reflections on their experience as a teacher.

Methods

Participants

Seventy-five MS3 students at the Donald and Barbara Zucker School of Medicine (ZSOM) at Hofstra University/Northwell were invited to participate in the study. All 75 students were enrolled in the IM clerkship at 1 of 2 tertiary care centers in the Northwell System (Northshore University Hospital [NSUH] and Long Island Jewish Medical Center [LIJ]). Students who enrolled in the IM clerkship at other Northwell sites were not included in this study. Data from this study was collected from February 2018 to July 2019. This study was approved by Hofstra University's Institutional Review Board through expedited review.

Curricular context

The IM clerkship consists of 6 weeks of general inpatient unit training and 2 weeks of specialty-specific training (eg, cardiology). During the 6 weeks of general IM training, medical students are provided with a weekly 1-hour session on topics that are relevant to IM. These sessions are case-based and highly interactive. There are approximately 6 to 10 medical students per clerkship site who participate in these sessions. For the purposes of this study, near-peer teachers presented case content for the rheumatology session at 1 site (LIJ) and faculty presented the identical case at another (NSUH). The rheumatology session was created for this study and was chosen because students historically scored low on this topic on their NBME Clinical Subject Exam for internal medicine.

Procedure

Near-peer and faculty teachers. Twenty MS4 students who were enrolled in their IM sub-internship at the LIJ site were recruited during their orientation training to participate in the study as near-peer teachers. Nine students expressed an interest to participate as near-peer teachers. Of those 9, 4 were available to teach during the allotted time that the session was run. Three IM clinical faculty members at the NSUH site agreed to participate as faculty teachers based on their interest and availability to run the session.

A faculty guide was created based on a rheumatology case with inclusion of clinical questions aimed to encourage clinical reasoning. Both faculty and student teachers were given the faculty guide with a detailed description of the case topic, clinical reasoning questions to use during the presentation, and ideal answers to those questions. One of the authors (SEA) made himself available to the near-peer teacher and the faculty as a resource content expert. Both the faculty and the students could perform their own research on the topic although the faculty guide was comprehensive. Of the 4 near-peer teachers, 3 reached out with clarifying questions regarding the content. None of the 3 faculty who participated in this study reached out regarding content.

Rheumatology session. In the rheumatology session, a patient case narrative was handed out to students. One student read the case out loud. Students were asked to come up with a list of differential diagnoses based on this initial information. The facilitator then guided students through the case, prompting them with specific questions as the patient's story unfolded, including having the students determine what information to gather from the patient (history and systems), choose a diagnostic work up, review the lab results, and make changes to the differential diagnosis based on the development of new symptoms throughout the course of the hospital visit. At the end, the diagnosis was revealed, and students were expected to discuss what they knew about the disorder. The facilitator also went through several teaching points that were provided in the faculty guide. The session ended with a discussion of the appropriate post-discharge plan and follow-up for the patient.

Evaluation

Immediately following the rheumatology session, MS3 students were invited to complete a paper survey to evaluate the effectiveness of the case-based teaching by either the faculty or the MS4. Participation was voluntary and surveys were completed anonymously. The survey consisted of 18 items from the Stanford Faculty Development Program (SFDP-26) form[29] that were relevant to our session. The SFDP-26 is a 26-item validated survey to evaluate clinical teaching. In the validated survey, there are 7 domains scores (made up of 3-4 items per domain) which are created by taking the mean score of each domain. Although most of the items in the SFDP-26 were applicable to the case-based session, there were several questions related to application of knowledge to clinical care (2 items, eg, "evaluated learners' ability to apply medical knowledge to specific patients"),

providing feedback (3 items, eg, "gave feedback frequently"), logistical considerations (2 items, eg, "used blackboard or other visual aids"), or motivation (1 item, eg, "motivated learners to learn on their own"), which were beyond the scope of our intervention. Ultimately, we used 17 of the 25 individual statements regarding the performance of the clinical teacher that participants are asked to rate on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree). Removing 8 items would have a significant impact in creating domain scores as traditionally intended; therefore, we opted to calculate a total survey score by summing the individual items and computing a total teaching performance percentage score.

There was an additional item asking participants to rate teaching effectiveness on a 5-point Likert scale from 1 (very poor) to 5 (excellent). MS4 near-peer teachers provided a brief self-reflection about their experience immediately after their teaching session. It is important to note that this survey did not measure other skills that are required of faculty during small group facilitation, such as reflection, role modeling, and mentoring.

Statistical analysis

Data was statistically evaluated using IBM SPSS Statistics (SPSS Inc., Chicago, Illinois, USA, Version 24.0). A Mann Whitney *U* test was used to compare individual SFDP-26 survey items between the clinical faculty teacher group and the near-peer teacher group. In order to correct for multiple comparisons a Bonferroni correction was applied, and adjusted *P*-values are presented. A percentage score was calculated for the total teaching performance score by adding up the scores for each of the 17 individual items and dividing by the maximum total score possible. A 2-sided student's *t*-test was used to determine the between-group differences. For the teaching effectiveness scale (5-point Likert scale) students only selected a score of 4 or 5 (excellent), therefore this outcome was treated as binary. A 2×2 chi square test was used to compare the score frequencies between the 2 groups. For all tests, a P value $\leq .05$ was considered statistically significant.

In order to determine noninferiority for the total teaching performance score we calculated the mean difference (and 95% CI). For the teaching effectiveness item, the absolute difference score (and 95% CI) was calculated by subtracting the % of students who rated the faculty teacher a 5 (excellent) from the % of students who rated the near-peer teacher a 5.

We calculated the noninferiority margin using analogous noninferiority studies comparing the effectiveness of peer and faculty teachers. Margins in the peer teaching literature included 3,[30] 5,[31] and 20.[32] For the current study, we set the noninferiority margin at 5, which we felt was appropriately conservative. Noninferiority is demonstrated if the lower limit of the 95% CI is greater than the noninferiority margin. A power analysis revealed that a sample size of 30 participants per group was sufficient using the following specifications: a noninferiority margin of 5, a group difference of 0, estimated standard deviation of 6, power ($\beta - 1$) of 90%, and a 1-sided alpha of .025.[33]

The 4 near-peer teachers were asked to provide a brief written reflection on their experience teaching. Although this sample was too small for formal thematic analysis, representative comments are included.

Results

Seventy-five MS3 students participated in the sessions and 100% completed the survey (36 in the near-peer group and 39 in the faculty group). Figure 1 shows the percent of students who agreed/strongly agreed to each of the individual survey items for the near-peer teachers and faculty teachers. There was no significant difference between the 2 groups on each of the 17-items after correcting for multiple comparisons (all adjusted *P*-values $>.51$). There was also no significant difference in the total teaching performance score comparing the near-peer ($95.9\% \pm 6.3\%$) and faculty group ($93.9\% \pm 6.6\%$; $t(73) = 1.35$, $P = .18$). A mean between-group difference of 2% in favor of the near-peer group indicated noninferiority of the near-peer teachers compared with faculty teachers on the total teaching performance score (Figure 2; 95% CI, −0.97% to 4.99%).

For the teaching effectiveness rating, 1 student did not respond to this item therefore data is available for only 74 students. There was a trend toward more students in the near-peer group selecting 5 (Excellent; 94%) compared to students in the faculty group (80%; $\chi^2(1) = 3.13$, $P = .08$). The absolute difference of 14% in favor of the near-peer group indicated noninferiority of the near-peer teachers compared with faculty teachers on the teaching effectiveness rating (Figure 3; 95% CI, −0.59% to 28.8%).

Three of the 4 near-peer teachers provided reflective comments about their experience teaching. In the near-peer self-reflections, students considered their skills as a teacher. One student wrote, "*I enjoyed practicing peer-teaching and really tried to prepare the case beforehand with small learning points throughout. . . They asked me several questions throughout the session, and I felt prepared to answer most of them!*" Another student recounted the amount of preparation that was required to adequately prepare for teaching, "*To be able to teach topics one must be able to recognize potential questions that come about, so I felt a greater pressure to understand the reasoning behind the work up and the treatment so I would be able to explain it better. I was able to learn both before and even during the session*."

They also provided their impression of how the MS3 students received them as teachers "*I think the students were engaged throughout and enjoyed it – one student told me she enjoyed being taught by a 4th year because we understand what level they are at and can teach tidbits which are relevant to both exams and floors*." Two near-peer teachers noted that MS3s felt comfortable participating "*despite the fact that they thought that some of the content of the case was challenging*."

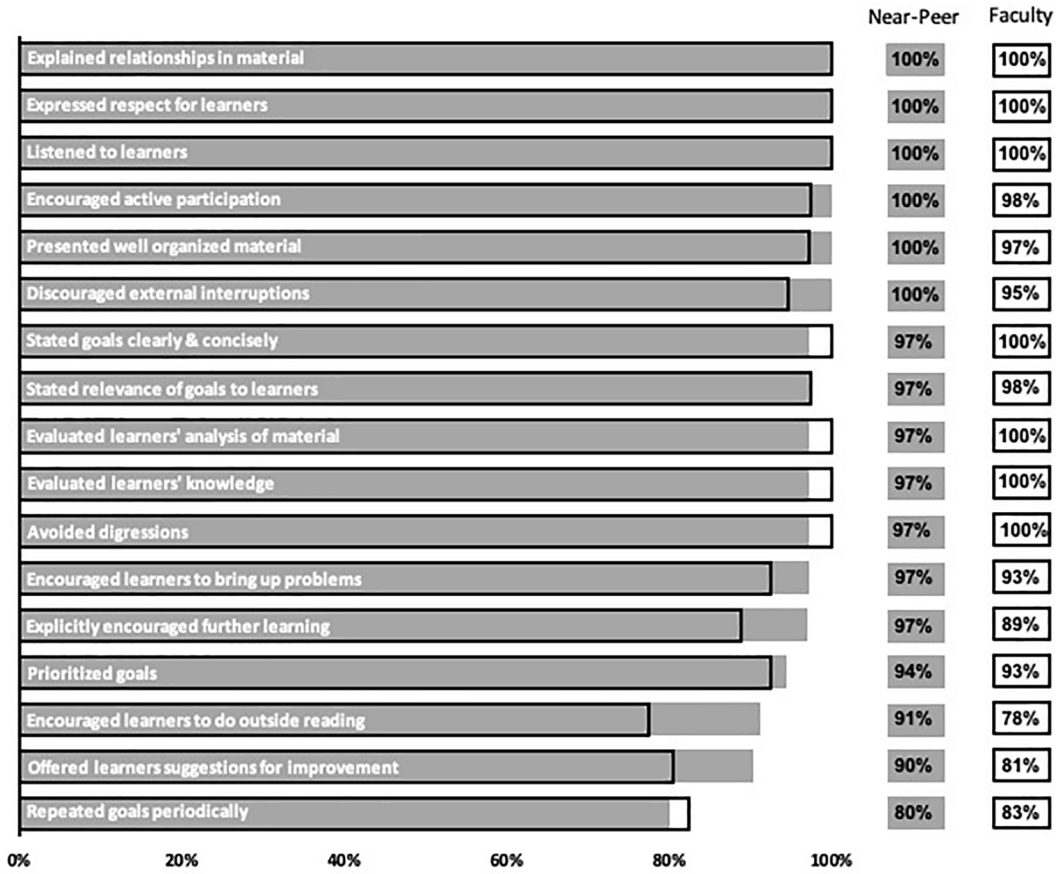

Figure 1. Percent of students who strongly agreed/agreed with each of the 17 items from the SFDP-26 survey evaluating the near-peer teachers (N = 36; gray shading) and faculty teachers (N = 39; white box with black outline).

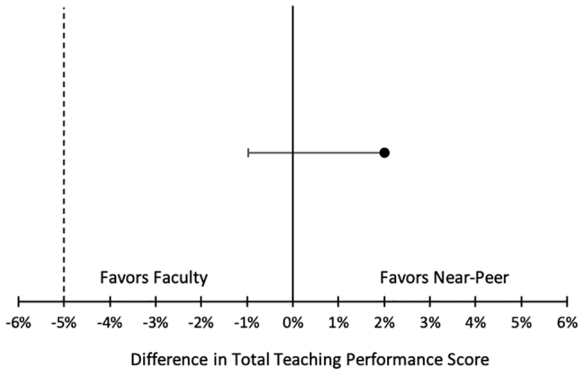

Figure 2. The mean difference between faculty and near-peer teachers on the total teaching performance score is presented. The error bar represents the 1-sided 95% CI. The dashed line indicates the noninferiority margin determined a priori (Δ = 5), with the region to the right of representing the zone of noninferiority. The lower limit of the CI lies to the right of the noninferiority margin, demonstrating noninferiority of near-peer teachers relative to faculty.

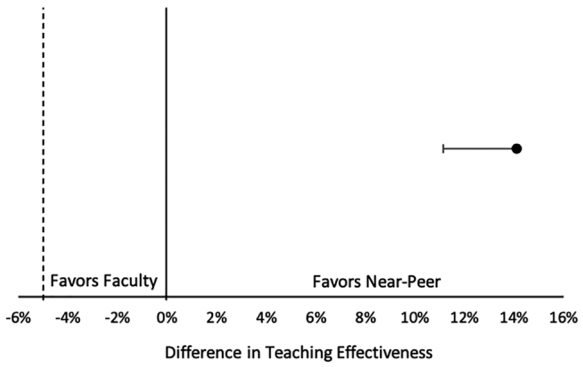

Figure 3. The absolute difference score between faculty and near-peer teachers on overall teaching effectiveness is presented. The error bar represents the 1-sided 95% CI. The dashed line indicates the noninferiority margin determined a priori (Δ = 5), with the region to the right of representing the zone of noninferiority. The lower limit of the CI lies to the right of the noninferiority margin, demonstrating noninferiority of near-peer teachers relative to faculty.

One student reflected on this experience as is related to their future role in medical education, "*I think fourth years can certainly benefit from honing their teaching skills early on (as we will be expected to be teachers throughout residency and fellowship) and third-years can benefit from tailored, peer-taught sessions which encourage clinical reasoning, data gathering, and fine-tuning specific content areas like rheumatology.*"

Discussion

We were able to show the noninferiority of the perceived performance and effectiveness of near-peer teachers compared to faculty teachers in the clerkship setting. Total teaching performance scores were high for both the near-peer and faculty teachers (96% and 94%, respectively), as well as perceived teaching effectiveness (94% and 80%, respectively). Near-peer

teachers reported several positive outcomes related to their experience teaching, including gaining a deeper understanding of the material they had to teach, providing a comfortable and engaging environment for their MS3 student learners and developing skills as a future educator.

Our findings are consistent with what has been reported in the literature. Students are satisfied with the quality of teaching done by their near-peers during clinical clerkships[21-23] and perhaps are even more confident in their near-peers than the near-peers are of themselves.[34] When comparing near-peer teachers to faculty teachers, students are either more satisfied with near-peers or the satisfaction levels are no different.[24,25] Further, objective indicators of student performance on exams are not impacted by having a near-peer teacher.[26,27]

Cognitive and social congruence theories can be used to explain why near-peer teaching may be so effective.[6-8] Cognitively, MS4s do have more knowledge than MS3s but the gap is much narrower when compared to attending physicians. In our study, 1 near-pear teacher noted that they were able to teach at a level that was relatable for MS3s. Socially, the learning environment is more relaxed when the teacher is a near-peer.[35] Our qualitative data confirms that students appeared more comfortable as they were readily participating in the session. Also, MS3s and MS4s are close enough on the hierarchy to be able to connect through shared experiences.[8] In our study, a near-peer teacher described their ability to teach what was relevant for exams as well as for patient care. This shared understanding that students need to perform well on exams allows the near-peer tutors to effectively communicate what material is most relevant for exam preparation and balancing that with material is pertinent for patient care.

Less than half of all medical schools offer a formal near-peer teaching program to prepare senior medical students to teach.[5] These programs are typically offered in the MS4 year and few schools require participation by all students.[5,36] However, all medical students need meaningful opportunities to practice teaching because they will be teaching as residents. In our study, MS4 students required little training or preparation to teach the rheumatology session because they had already participated in the session as students the prior year. Therefore, it is feasible to find myriad ways to provide teaching experience to all students with little formal training.

Limitations

There are some limitations to this study that are important to note. First, this study was limited to only 2 clinical sites across our health system. Faculty teachers were at 1 site and near-peer teachers another, therefore it is possible that differences inherent in each learning environment may have confounded the results. Another limitation is that the near-peer teachers self-selected to participate. These students may inherently be more interested and skilled in teaching; therefore, it is possible that their performance does not reflect how medical students, in general, would have fared as near-peer teachers. This limits the generalizability of the findings to students with an interest in teaching medicine. Our near-peer teachers did not undergo any formal training in delivering the material other than the faculty guide and optional meetings with the PI, but if this model was applied to the broader medical student community it is possible that further teacher training would be needed. Finally, 1 strength of our study was that we used a validated tool to assess teaching performance, but we did not use the complete scale as several items were not relevant to the session (eg, applying knowledge to a specific patient, using visual aids). It is unclear how not using the complete scale would impact its validity.

Conclusion

Our findings demonstrate that near-peer teachers are noninferior to faculty teachers when considering students' perception of teaching performance and effectiveness in the clerkship setting. Incorporating near-peer teachers in the clinical learning environment is feasible and can be well accepted by MS3 students. Furthermore, it provides senior students with the opportunity to practice teaching, which is a necessarily skill to have for their residency training. Although our study comprised a small sample at 1 medical school, the results are promising and suggest that building a broader near-peer program that could provide all medical students with teaching experience may be a valuable as part of their overall medical education.

Author Contributions

Study concept and design: SA, GAF, AF, REP, KF. Designed the sessions: SA, GAF. Acquired the data: SA. Analysis and interpretation of data: SA, DMO. Drafting of the manuscript: SA, DMO. Critical revision of the manuscript: SA, GAF, AF, REP, KF, DMO.

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