A structured mentored review program improves the quality of peer review: a pre-post intervention study

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Abstract

**Background:** Peer review is essential to the advancement of knowledge. However, training on how to conduct peer review is limited, unorganized, and not well studied. Thus, we sought to determine if a structured mentored peer-review program improves the quality of peer review as measured by quantitative assessment of peer review of a standardized manuscript.

**Methods:** This pre-post intervention study enrolled 55 mentees across 5 cohorts from 2020 to 2023. Each cohort completed pre-program evaluations, participated in two mentored reviews, and completed post-program evaluations over 6 months. The primary outcome measured was total score on the modified Review Quality Index (RQI). Secondary outcomes included participant-reported comfort with and understanding of the review process as well RQI subscores. Pre- and post-program measures were compared using the Wilcoxon test. The a priori hypothesis was that mentored review would improve peer review quality.

**Results:** 42 mentees completed both pre- and post-program reviews of a standardized manuscript. For these participants, post-program total modified RQI score (median (IQR) = 31 (26.25-35.75)) was significantly higher than pre-program total scores (26.59 (19.67-29.46)). 53 mentees completed both pre- and post-program surveys which showed improved participant perceptions of the review (median (IQR) scores pre = 4 (3-4), post =5 (4-5)) and editorial processes (pre = 3 (2-4), post = 4 (4-5)). In addition, confidence in completing an independent review of both scientific (median (IQR) scores pre = 2 (2-3), post = 4 (4-4)) and non-scientific (pre = 3 (2-4), post = 4 (4-5)) manuscripts significantly increased following program participation. p < 0.0001 for all scores noted above.

**Conclusions:** A six-month structured mentored-review program including 2 mentored reviews improves peer review quality as measured by the modified RQI as well as participant understanding of publication science.

**Background**

Peer review is an essential part of the scientific publishing process to ensure high quality, methodologically rigorous, peer-vetted work moves the field forward. During review, an author’s scientific, research, or scholarly ideas are subjected to the scrutiny of others who are experts in the same field. [1] This process serves as a filter to improve the quality of scientific literature while maintaining the integrity and authenticity of research. Despite the existence of peer review for the sciences since the 18th century, there is no standard program, structure, or onboarding process that has been consistently implemented or reliably validated to develop a trained reviewer pool. [2] Now more than ever, integrity and authenticity in scientific publication is critical. Rapid publication models, pre-print servers, and expedited review have been critical for informing the public of major advances and health concerns in crises such as the COVID-19 pandemic. [3, 4] However, rapid dissemination of information and open artificial intelligence platforms have also highlighted issues with misinformation, lack of reproducibility, and duplication of studies. [5]
High quality peer review is one way to ensure integrity but requires that reviewers have (1) sufficient content knowledge, (2) the ability to critically appraise scientific study, (3) effective written communication skills, and (4) an understanding of the editorial process and purpose. [6–8]

Despite its importance, the process of learning how to review a manuscript is largely informal and is not required in medical training. [9] Journals often call upon reviewers based on their content expertise; however, there are limited resources to train reviewers in critical appraisal, effective communication, and journalology. Further, one study suggested 20% of potential reviewers completed up to 94% of reviews, suggesting a shortage of engaged reviewers. [10–13] This limited pool increases the existing burden on reviewers to review more papers, on journals to ensure timeliness of editorial decisions, on editors to detect errors or study flaws, and on authors to allow for fairness and transparency. Thus, there is a need for programs to prepare early career physicians and scientists to participate in peer review. [9, 14]

A scalable, sustainable, effective program to teach physicians and scientists-in-training to conduct quality review would address these important gaps. In a prior randomized study, we developed an unstructured peer review training program and evaluated the impact of mentoring on peer review quality and knowledge of research methodology. [15] While this mentored review program showed the ability to increase the pool of available, qualified peer reviewers, it did not demonstrate improvements in review quality, error identification, or knowledge. Two potential explanations included the lack of a structured curriculum to guide mentors and the high frequency of external mentors for mentees in the control (i.e., “non-mentored”) cohort. To address these limitations and determine whether a structured, mentored peer review program could improve the quality of capable peer reviewers, the Resident and Fellow Section (RFS) of Neurology launched a Mentored Peer Review Training Program in 2010. Between 2010–2019, the program structure was piloted, a formal curriculum was developed for mentors, and written materials were generated to guide novice peer reviewers. [16] In 2020, we set out to formally evaluate the effectiveness of this program. The study was not pre-registered. Here, we aim to show that participation in a mentored peer review program improves (1) review quality as measured by a modified version of the Review Quality Index (RQI), (2) critical appraisal skills and (3) self-perceived understanding of the review process.

**Methods**

*Study Design*

Beginning in September 2020, mentees and mentors were enrolled in the Mentored Peer Review Training Program across five cohorts with each cohort taking approximately 6 months to complete the program (Fig. 1). At the start of the program, each mentor-mentee pair received a welcome packet including a pre-program survey and resources on how to review a manuscript (supplement) and a description of the program timeline (Fig. 1A). For cohorts two through five, mentees were asked to complete an independent review of a standardized manuscript. They were not told the review would be quantitatively scored. The standardized manuscript, taken from Biorxiv, described a prospective study of stroke incidence before
and after the arrival of COVID-19 in a hospital in Bangladesh. This pre-print was subsequently published in *PLoS One.* [17]

Mentors and mentees were required to sign up as reviewers for *Neurology.* Case-based manuscripts submitted to the RFS considered appropriate for review by an editor were assigned to the mentor-mentee pairs on a rolling basis. A shared Google spreadsheet was used to track manuscript assignment, review request date, and review receipt date. Assigned manuscripts were sent to the mentor and mentee separately who began with an independent review and later met to discuss their findings. The mentor-mentee meetings were self-coordinated by the pair. Once the mentor felt the review was ready, the mentee submitted the joint review through the reviewer portal. (Fig. 1B) Mentored reviews were not quantitatively scored.

Once all mentor-mentee pairs within each cohort had completed their first mentored review, a survey was sent to mentees (supplement) and then the process was repeated for a second mentored review. After all pairs had completed their second review, mentors and mentees completed post-program assessments (supplement). For cohorts two through five, mentees submitted an independent review of the same standardized manuscript they had reviewed as part of the pre-assessment.

**Participants**

Mentees were all neurology residents or fellows at the time of acceptance to the program. Three cohorts were comprised of individuals who had applied for a position on the *Neurology* Resident and Fellow Editorial Board. For these cohorts, applicants accepted to the board were enrolled in the program to support them in their new editorial role. Additional applicants considered strong editorial board candidates but not accepted to the board were sent an e-mail invitation to participate in the program. All mentees accepted participation. The other two cohorts were recruited via an open call for applications announced on a *Neurology* blog and publicized over social media. [18] For these cohorts, applicants submitted their name, preferred e-mail address, current institution, year in training, number of manuscripts reviewed (for *Neurology* and for other journals), two to three sentences on why they were interested in this program, and a statement that they had the support of their residency/fellowship director and/or chair to commit ~3 hours/month to this program. ALW reviewed all applications and selected candidates based on high interest but limited access to mentorship in this area. Selected candidates were offered a spot in the program via e-mail.

Mentors were recruited from known adult and child neurology academicians with a track record of well written reviews for the *Neurology* journal or experience in neurology education. Mentors responded to a blog post [18] via e-mail or were approached directly by e-mail from ALW. Nine mentors participated twice and four mentors participated three times across the five cohorts. Mentors and mentees were matched based on neurology areas of interest.

**Measurement Tools**
Four assessments were used in this study as follows. First, prior to being matched with their mentor, mentors and mentees completed a pre-assessment developed by the authors for this study (supplement) which asked them to report their demographic information (name, age, gender, advanced degrees, years since medical school graduation, current level of training), review experience (frequency of reading scientific journals, participation in scientific research, number of published articles, amount of peer review experience, and access to a mentor), and three goals related to participation in the program. The mentee version of this survey also included four questions about comfortability with the review and editorial process. These questions were administered both pre and post program participation. Responses were on a 5-point Likert scale in which higher numbers indicated greater understanding.

The second assessment was a modified version of the Review Quality Index (mRQI) used to evaluate quality of the independent (non-mentored) pre and post program review of a standardized manuscript. The Review Quality Instrument (RQI) is a validated tool that examines the extent to which a review comments on five aspects of a manuscript (i.e., importance of the research question, originality of the paper, strengths and weaknesses of the method, presentation, interpretation of results) and two aspects of the review (i.e., constructiveness and substantiation of comments). \[19\] It has been used previously to study the quality of peer review and impact of training interventions. \[15\] Importantly, the RQI measures only if a domain is present in the review, not if the reviewers assessment of that domain is an accurate reflection of the manuscript. Although researchers have raised concern that the RQI is not an optimal measuring tool \[20\], our goal was to determine whether reviewers addressed these domains, not just the accuracy of comments. The mRQI differs from the original review quality index because it also assesses organizational components of a review and measures reviewer appraisal of references. The mRQI has 14 questions. Questions 1–4 (supplement) were scored 0 (absent) or 1 (present), and questions 5–14 were scored on a 5-point Likert scale with higher scores indicating better evaluation of a given review element. The additional questions (Q1-4 and Q12) added to the RQI were developed by the authors. One participant did not complete the pre-program independent review and two participants did not return the post-program independent review, and therefore were excluded from the quantitative analysis.

The third assessment was a brief questionnaire developed by the authors to measure quantitative and qualitative metrics of the mentored review experience (supplement). It was administered to each mentee twice, once after each completed mentored review (Fig. 1a). It included two open-ended questions: “What is one thing you learned from this mentored review” and “How will this experience change your approach to reviewing a manuscript.” The fourth assessment was a 5 question post-program mentor survey (supplement) in which they were asked to rate their enjoyment of the program and willingness to participate again on a 5-point Likert scale, with 5 indicating strong agreement. They were also asked to provide free text comments on program barriers and benefits. The two most common themes were identified from each open-ended question.

Variables
The primary outcome of the study was change in total mRQI score as a metric of improvement in review quality. Secondary outcomes included change in participant understanding and confidence in the review process as a metric of knowledge of publication science, mRQI subscores as metrics of scholarly communication and content expertise, qualitative analysis of participant comments to determine what they learned, and mentor satisfaction to assess sustainability.

Statistical Methods

Three unblinded independent reviewers (ALW, WWA, RES) scored pre- and post-program independent reviews using the mRQI. Individual and total question scores from each independent reviewer were averaged to obtain final scores. Wilcoxon tests were used to compare scores for the 42 participants who completed both pre- and post-program independent reviews. By using pre- and post-program evaluations, each participant served as their own internal control. To assess within-rater reliability, we calculated an $R^2$ correlation for total score on mRQI obtained by summing the responses to all questions of the mRQI with the mean score for question 14, “What is the overall quality of the review”. Wilcoxon tests were used to evaluate pre- vs post-program responses to the four questions on assessment of understanding and comfortability with the review process. Open-ended survey responses were coded by author WA and reported by frequency according to major theme. Statistical tests were performed in Prism (RRID:SCR_002798).

The full dataset including statistical output scripts were shared with the journal during external review. De-identified data is available upon request but was not deposited in a public repository given that mentor names are publicly available, making it difficult to ensure anonymity amongst the small group.

This study was evaluated by the institutional review board at Wake Forest University and determined to be exempt from requirement for individual authorization as all information was de-identified. Exempt protocol #IRB00097410. Participants were aware that the program was being evaluated but the specific study goals were not shared, and all data were de-identified prior to analysis. Neither patients nor the public participated in method development, data collection nor data analysis.

Results

Participants

From September 2020 through March 2023, 55 mentees (31 (56%) female, median age 31 years, 8 (14.5%) international) and 38 unique mentors (13 (34%) female, median age 38.5 years) were enrolled in the Mentored Peer Review Training Program across five cohorts with each cohort taking approximately 6 months to complete the program (Fig. 1, table 1). 30 mentors returned their pre-program demographic survey.

Participants included residents and fellows with a mix of exposure to peer review prior to participation (table 2) divided into five cohorts ranging from 9–14 participants (table 1). While distribution of
advanced degrees was similar between groups (table 1), mentors read journals more frequently and had more experience reviewing manuscripts than mentees (table 2).

Improvement in mRQI

42 participants completed both pre- and post- program independent reviews. Total mRQI score was highly correlated ($R^2 = 0.902$) with the mean score for question 14, “What is the overall quality of the review” (Fig. 2A), suggesting total mRQI captured the overall quality of the review.

Total mRQI score pre- and post-program participation (Fig. 2B) showed significant improvement (pre-program median score 26.6 (19.7–29.5), post-program median score 31 (26.3–35.8), N = 42, Wilcoxon test $p < 0.0001$). Considering the structural elements of the review, we saw a significant increase in the likelihood of including a summary of the study at the beginning of the review, structuring the review with separate comments for authors and editors, using an organizational system such as providing comments by manuscript section, and including a formal recommendation (Wilcoxon tests: $p = 0.0003$, $p < 0.0001$, $p = 0.0135$, $p < 0.0001$; Fig. 2C). These findings also corresponded with our qualitative analysis. When asked to describe one skill they learned during the program, 19/42 (45.2%) mentees reported overall improvement in their ability to structure and organize comments to editors and authors.

Similarly, we found that comments were more constructive (mRQI Q9, $p = 0.0008$). We also saw a significant improvement in discussion of essential components including strengths and weaknesses of the method (mRQI Q7, $p = 0.0003$), author interpretation of results (mRQI Q11, $p < 0.0001$), and originality of the paper (mRQI Q6, $p = 0.0040$). In contrast, post-program reviews did not improve in their discussion of the research question (mRQI Q5, $p = 0.1765$), use of specific examples to substantiate comments (mRQI Q10, $p = 0.1114$), or discussion of appropriateness of references (mRQI Q12, $p = 0.6313$). Finally, we did not see any improvement in the likelihood of including specific, useful comments on writing, organization, tables, and figures (mRQI Q8, $p = 0.2695$) or the overall tone of the comments (mRQI Q13, $p = 0.3547$) likely related to the high pre-program scores in these areas (Fig. 2D).

Improvement in understanding of publication science

Next, we assessed impact on participant understanding of the review and editorial process. 53 mentees completed both pre- and post-program survey questions (supplement). Participant perception of understanding the review (median (IQR) scores pre = 4 (3–4), post = 5 (4–5)) and editorial processes (pre = 3 (2–4), post = 4 (4–5)) significantly increased. In addition, confidence in completing an independent review of both scientific (median (IQR) scores pre = 2 (2–3), post = 4 (4–4)) and non-scientific (pre = 3 (2–4), post = 4 (4–5)) manuscripts significantly increased following program participation (Wilcoxon tests, all $p < 0.0001$) (Fig. 3).

Improvement in critical appraisal skills
42/44 mentees from cohorts one through four provided answers to post-review survey questions. We reviewed their qualitative comments and identified the two most common themes for each question. When asked to describe one skill they learned after completing the first mentored review, 13/42 (31.0%) mentees learned to provide more constructive feedback to authors, and 6/42 (14.3%) reported improvement in determining a manuscript’s suitability for the target audience. After completing their second review, 16/42 (38.1%) mentees again reported improvement in their ability to provide constructive feedback to authors, especially in a more targeted, concise manner with proper tone, while 8/42 (19.1%) mentees reported improvement in review structure. When asked to discuss how they will change their approach to future manuscripts after the first mentored review, 4/42 (9.5%) mentees planned to be more mindful of the target audience, and 4/42 (9.5%) mentees commented on the importance of considering a manuscript’s novelty and contribution to the broader literature. After the second mentored review, 7/42 (16.7%) planned to improve the quality of feedback to authors, while 4/42 (9.5%) also commented on a manuscript’s overall value. One mentee wrote:

Look at the big picture: consider the value of the manuscript, what it’s supposed to teach us, and whether it is accomplishing that goal. Is the manuscript even necessary or is it teaching us something we already know? Do not ignore the references.

**Program Sustainability**

Finally, 23/38 (60.5%) mentors completed a post-program assessment (supplement). median (range) scores for enjoyment and repeat participation were 5/5 (3–5) and 5/5 (2–5), respectively, indicating high levels of satisfaction. When asked to describe benefits to participation, 13/23 (56.5%) felt the program made them stronger peer reviewers and 5/23 (21.7%) felt their involvement developed their skills as mentors and educators. One mentor wrote:

Mostly that I enjoyed it! But I also think it helps me become a better reviewer, too, to review the process and the specifics with a mentee.

For 13/23 (56.5%) mentors, the main barrier to participation was time with few other reported barriers. Lastly, when asked to identify an area of program improvement, both mentees (2/43; 4.7%) and mentors (6/23; 26.1%) asked to review scientific manuscripts rather than solely critique case reports, as scientific manuscripts are more complex and ubiquitous in academic medicine.

**Discussion**

We have demonstrated that medical trainees with variable review experience can improve their understanding of publication science, critical appraisal skills, and scholarly communication leading to objectively higher quality reviews following participation in a structured mentor review program. Further, this program was easily integrated into an existing journal infrastructure, suggesting a small change in editorial infrastructure could broadly impact how we train reviewers, creating a pipeline to increase the pool of available, qualified peer reviewers.
Our results build on important prior work in the area of peer review. At baseline, peer review is difficult to perform as it is not an innate skill and approaches to reviewing an article are not systematically taught nor are they included in accreditation standards for biomedical training. Prior approaches to training peer reviewers can be divided into mentored vs. non-mentored training programs, single vs. longitudinal peer review workshops, and self-taught vs. guided instruction. [21] To date, few programs have proven to meaningfully improve the quality of peer review. [21, 22]

What defines a “good” review is also difficult to standardize or even articulate and can vary depending on the type of manuscript, goals of the review, and audience of the journal. [23] Several methods have been explored to improve the quality of reviews, such as a checklist, open peer review, group review, and blinded review. Yet very few of these methods have been proven to enhance the value of a review. [24, 25]

To effectively evaluate a manuscript, we propose that the reviewer must have (1) content expertise, (2) critical appraisal skills, (3) effective written communication skills, and (4) understanding of publication science. We found that our mentored review program improved reviews on measures of publication science, critical appraisal, and structure but not areas related to content knowledge. This distinction represents an important nuance of peer review that merits further investigation. To have content expertise, a reviewer needs to fully understand the science, have clinical or research experience providing appropriate perspective as well as intellectual humility to recognize gaps in their knowledge. Our data suggest that these skills cannot be directly taught but are learned over time. However, this leads to the provocative question: do individuals with training in the general review process develop critical thinking in their content area sooner, or more effectively communicate constructive criticism once they have gained sufficient content knowledge? If so, training in “basic” review structure could be added to all medical school curricula. If not, journals should prioritize developing review resources for content experts.

In contrast, our data suggest that skills required for critical appraisal of a manuscript, including critical thinking, curiosity, and experience with evaluation can be taught. The themes identified by our residents in their post-review surveys articulate these skills which were developed from conversations around a mentored review rather than specifically articulated through program resources. The greatest areas of improvement in our cohorts were the development of scholarly communication skills and understanding of publication science. Notably, our participants gained these skills following only two mentored reviews, suggesting these foundational skills could be easily incorporated into training programs. These improvements were seen across participants with a wide variety of editorial experience and backgrounds ranging from editorial board members to an intern.

**Study Strengths**

The strengths of this study include the time (over a decade) invested in developing the program, cohort size, use of a standardized metric for evaluating review quality, and variable pre-program skill level of mentees which likely reflects the overall reviewer population. Further, a major strength of this program was integration with a journal’s established peer review system demonstrating a process by which peer review training can be implemented without excessive burden on journal staff, editors, or mentors. While
we only report 2.5 years of pre-post program data here, our program is ongoing and proves that mentored peer review programs built into existing journal infrastructure are sustainable, similar to non-mentored learning repositories.

Study Limitations

This study also had three main limitations. Most importantly, the mRQI only assesses the presence of absence of domains within the review, not if the reviewer's comments are accurate. Future studies could improve upon this analysis by creating a list of expected crucial point an experienced reviewer would identify or comparing participant reviews to real-life peer reviews, both of which would allow more sensitive and specific evaluation of review quality. Similarly, we did not evaluate intermediate mentored reviews because the final review received by the journal was the result of multiple rounds of input from the mentor and it was therefore impossible to know which components came directly from the mentee. In the future, we could ask the mentee to submit their first version of the review and the mentor to submit the final version and compare the two. Second, we did not formally screen mentor review ability or style resulting in significant variability across mentors without the ability to quantify the relationship between mentor experience and mentee improvement. Finally, the RFS only publishes case-based articles, yet our pre- and post-program metric was based on a research article. Thus, lack of improvement in some areas might reflect lack of opportunity to discuss research methodology with the mentor. It is possible that a mentored review program incorporating manuscripts of different types might be more impactful than the structure reported here. Similarly, improvement might be due to participants re-reading the same article a second time.

Conclusions

We show that a two-review, integrated mentorship program helps increase confidence in reviewing, likely due to increases in understanding the publication process and purpose of a review. Further, this program improved the structure of submitted reviews which reflects new skills related to writing as a reviewer. However, this program is not a panacea. We still need reviewers with content knowledge and methods to teach critical appraisal. While there are indications that mentored review can support this process, developing these skills requires additional training and investment in physicians as reviewers and scientists.

Abbreviations

RFS: Resident and Fellow Section
RQI: Review Quality Index
mRQI: modified Review Quality Index

Declarations
**Ethics approval statement**

This study was evaluated by the institutional review board at Wake Forest University and determined to be exempt from requirement for individual authorization as all information was de-identified. Exempt protocol #IRB00097410.

**Consent for publication:** Not applicable

**Availability of data and materials**

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

**Competing interests**

All authors are affiliated with the journal *Neurology* and receive financial compensation for their work with the journal. However, the mentored-review program here does not receive financial support nor do any of the authors receive compensation for additional time spent analyzing the effectiveness of the program. Thus, all researchers are independent of the journal.

**Funding**

This study did not receive any targeted funding.

**Authors’ contributions**

ALW developed the program, collected, analyzed, and interpreted the data and wrote the first draft of the manuscript. WA helps run the program, analyzed and interpreted data and contributed significantly to the writing of the manuscript. KP helps run the program, interpreted the data and contributed significantly to editing the manuscript. RS analyzed and interpreted the data and contributed significantly to the writing of the manuscript. All authors read and approved the final manuscript.

**Acknowledgements**

We wish to thank the mentors who generously contributed their time to provide training and mentorship to build the pool of available, trained reviewers. We would also like to acknowledge *Neurology* staff who assisted in sending and tracking reviews: Kade Halvorson, Seth Retzlaff, and Anne Salmi.

**References**


Tables

Table 1: Participant demographics
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<thead>
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<th>Mentees (n = 55)</th>
<th>Mentors (n = 38)*</th>
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<tr>
<td>Female, n (%)</td>
<td>31 (56%)</td>
<td>11 (33%)</td>
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<td>Age, median (interquartile range) years</td>
<td>31 (29-33)</td>
<td>38.5 (34.25-42)</td>
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<td>Resident &amp; Fellow Section (RFS) board, n (%)</td>
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<td>1 (3%)</td>
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<td>Years post residency, mean +/- std</td>
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<td>6.03 +/- 4.1</td>
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* Sex and RFS board status were known for all mentees and mentors. N = 30 for mentor age.
Table 2: Mentors read journals and review manuscripts more frequently than mentees

<table>
<thead>
<tr>
<th>How often read journals</th>
<th>Mentees (n = 55)</th>
<th>Mentors (n = 29)</th>
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<tr>
<td>Daily, n (%)</td>
<td>9 (16%)</td>
<td>13 (46%)</td>
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<td>Weekly, n (%)</td>
<td>28 (51%)</td>
<td>15 (54%)</td>
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<tr>
<td>Monthly, n (%)</td>
<td>15 (27%)</td>
<td>1 (&lt;1%)</td>
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<td>Less than once a month, n (%)</td>
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<th>Number of manuscripts reviewed in the last year</th>
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<th>Mentors (n = 29)</th>
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<td>2-5, n (%)</td>
<td>15 (27%)</td>
<td>7 (24%)</td>
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<td>6-10, n (%)</td>
<td>2 (4%)</td>
<td>8 (28%)</td>
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<tr>
<td>&gt;10, n (%)</td>
<td>9 (16%)</td>
<td>14 (48%)</td>
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Figures
Figure 1: Schematic of Program Structure

(A) Timeline in months for each cohort of participants from recruitment through post-program assessments.
(B) Flowchart illustrating mentor-mentee workflow after manuscripts are assigned.

Figure 1

See image above for figure legend.
Figure 2: Quantitative assessment of review quality using the modified RQI

Scatter plot (A) comparing mean total score and mean score for question 14 (overall quality of the review) for both pre (white dots) and post (gray dots) program reviews demonstrating high correlation. Average total (scores on the modified RQI (B), for questions 1-4 (C) and questions 5-14 (D) on the modified RQI for pre (white bar) and post (gray bar) program reviews. Questions 1-4 were scored Yes = 1 or No = 0 based on presence of absence of each structural component. Questions 5-14 were scored 1-5 with 1 being not at all and 5 being extensive/comprehensive discussion of that feature.

Figure 2

See image above for figure legend
Figure 3: Participant’s reported subjective improvement in reviewing skills
Pre (white bars) and post (gray bars) average response to each of 4 questions posed to
each participant before and after program participation. Responses options were 1
(strongly disagree) through 5 (strongly agree).

Figure 3

See image above for figure legend

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- JoinedSupplementwithindex.docx
- PrismOutput.pdf
- Infographic.jpeg