



# Leveraging the COVID-19 Research Spike to Provide Medical Students with Practical Experience in Data Appraisal and Grant Review

Lainey Bukowiec<sup>1</sup> · Zhiyong Han<sup>2</sup> · Stanley R. Terlecky<sup>2</sup> · Kristen Grotheer<sup>1</sup> · Tanner Corse<sup>1</sup> · Vicki Coffin<sup>2</sup> · Linda D. Siracusa<sup>2</sup>

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## Abstract

In April and May 2020, a group of students and professors from the Hackensack Meridian School of Medicine (HMSOM) created an elective to review pre-selected, de-identified COVID-19-related research proposals by physicians and researchers within the Hackensack Meridian Health (HMH) network. Students discussed and rated each proposal's significance, innovation, and approach using grading criteria that paralleled the National Institute of Health's (NIH) study section-based grant review process. In discussing these topics under the guidance of faculty with experience in writing and reviewing research grants, students gained a better understanding of what constitutes a quality research study and a compelling grant proposal.

**Keywords** Medical education · Grant review process · Interprofessional skills · COVID-19 research · Pedagogy

## Background

Physician-scientists are vital to the advancement of medicine, particularly in the translation of basic research into clinically relevant modalities that impact patient outcomes [1]. Concerns about declining physician participation in medical research were identified as early as 1979 by former NIH Director James Wyngaarden, M.D. [2, 3]. Despite corrective efforts attempted by the Institute of Medicine, the NIH, the Association of American Medical Colleges, and private foundations, data from the 1990s showed that medical students' intentions to pursue research careers continued to decline and the number of first-time grant applications by M.D.s remained stagnant [4, 5]. After NIH funding increased in the late 1990s, institutions expanded their research capacities and training programs and conditions improved until the NIH budget came to a halt in 2004. These gains in physician involvement were lost after the curtail in

funding: the number of physicians receiving first-time NIH R01 grants had not changed from 1984 to 2014 [6]. The 2014 NIH Physician-Scientist Workforce Working group and a 2018 systematic review of physician-scientist programs further identified a leaky trainee pipeline, a steady decline in M.D. representation in research, and a shortage of faculty mentors to medical students in training as barriers to physician participation in research [3, 7, 8].

Exposure to research and mentorship play critical roles in shaping medical student career paths. Medical students with influential mentorship spend more time conducting research, producing quality publications, and are more likely to be principal investigators on grants [9]. Professional development and exposure to research are also linked to greater career satisfaction and an enhanced medical school experience [10]. Finally, involvement in research during medical school increases the likelihood of successfully securing future research funding and obtaining research-oriented faculty positions [11].

During their education, Ph.D. students are mentored by their advisors to develop the capabilities and skills required to write and critically appraise grant proposals. This is essential to prepare the students as independent principal investigators. In contrast, most medical students are not exposed to grant proposals in their curriculum. Physicians without these skills are undoubtedly disadvantaged in developing competitive grant proposals and are therefore less inclined to

✉ Vicki Coffin  
Vicki.Coffin@hmhn.org

✉ Linda D. Siracusa  
Linda.Siracusa@hmhn.org

<sup>1</sup> Hackensack Meridian School of Medicine, Nutley, NJ 07110, USA

<sup>2</sup> Department of Medical Sciences, Hackensack Meridian School of Medicine, Nutley, NJ 07110, USA

enter the physician-scientist career pathway. To address the shortage of physician-scientist participation in research, the Hackensack Meridian School of Medicine (HMSOM) developed a research mentorship program for medical students early in their training. One of the program's aims was to provide students with skills to critically evaluate the quality of research grants and thus have a better understanding of what constitutes a quality research proposal. The program was made possible through structured and close mentorship by faculty members with experience in writing and reviewing grants as well as performing high-quality scientific research.

## Activity

This educational experience was open to all first and second year medical students at the HMSOM, and six students chose this elective. Model grant proposals were selected by medical school faculty from research applications written by investigators within the HMM network in response to a call for COVID-19 research [12]. All proposals were de-identified, with writers' names and departmental affiliations removed. In this elective, under careful faculty supervision, students established NIH-style "study sections" for the critical review of grant proposal quality and project feasibility.

The online booklet entitled *NIH Peer Review: Grants and Cooperative Agreements* was used as a blueprint by faculty in structuring and teaching the peer review process to medical students (<https://grants.nih.gov/grants/peerreview22713webv2.pdf>). Although NIH criteria for research grants (R# series) covers five main areas (significance, investigator, innovation, approach, and environment), our review criteria did not account for

investigator (since proposals were de-identified) or environment (since all were within the HMM network).

These study sections consisted of six students appraising ten total grant proposals with three faculty facilitators and one faculty member as chair. Each proposal was assigned to three student reviewers for the formal review process conducted within large group sessions. Prior to the first study section, faculty members briefed students on the NIH grant review process as well as subject matter related to the proposal under consideration. Three pre-meetings were held, each involving one faculty member and two students who together discussed assigned applications in-depth (Table 1). Students were instructed on how to perform literature reviews to understand the background of each proposal as well as to gain up-to-date knowledge about the COVID-19 pandemic. Pairs of students met with a different faculty member for each of the "pre-meetings" to gain a breadth and depth of perspectives and approaches to the peer review process.

Students and faculty met once per week in large group sessions and once per week in small group sessions over the course of 5 weeks (Table 1). The mock study section aimed to examine projects with the potential to have an immediate and significant impact on the COVID-19 pandemic. Proposals with a high likelihood to exert a sustained, powerful influence on research were prioritized during the review process.

As part of the critical appraisal of research proposals, students discussed and rated each proposal's overall significance, innovation, and approach (Fig. 1). The numerical grading criteria and format of discussions paralleled that of the NIH in their peer review process for research grants (R# series). This educational opportunity served as a platform

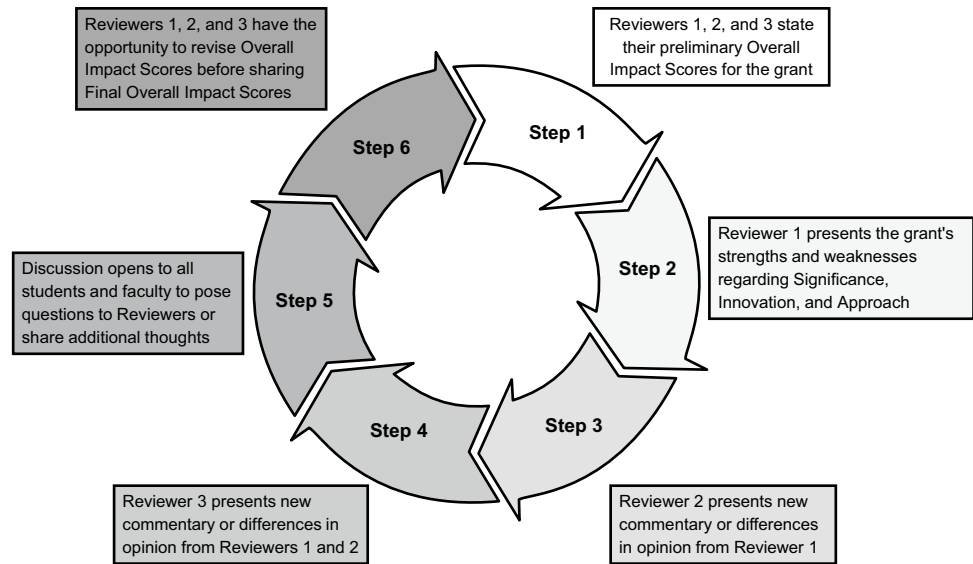
**Table 1** Training session and study section agendas

Training	Study sections #1 and #2	Final study section
<i>Lecture</i> Overview of COVID-19 pandemic—state of diagnostics, therapeutics	<i>Small group meetings</i> Students met with faculty mentor (two students per mentor) to discuss grants #1 and #2 <sup>a</sup>	<i>Small group meetings</i> Students met with faculty mentor (two students per mentor) to discuss grants #5 through #10
<i>Lecture</i> Overview of the NIH grant review process Educational material provided for further reading	<i>Large group session</i> <ul style="list-style-type: none"> <li>• Three students served as reviewers 1, 2, or 3 for grant #1</li> <li>• The three remaining students served as reviewers 1, 2, or 3 for grant #2<sup>b</sup></li> <li>• After formal discussion with the entire large group, reviewers assigned to each grant provided final scores</li> </ul>	<i>Large group session</i> <ul style="list-style-type: none"> <li>• Three students served as reviewers 1, 2, or 3 for each of the six grants discussed</li> <li>• Each student had the opportunity to be the first, second, and third reviewer on three separate grants</li> <li>• After formal discussion with the entire large group, reviewers assigned to each grant provided final scores</li> </ul>

<sup>a</sup>For study section #2, grants #3 and #4 were discussed

<sup>b</sup>For each study section, student roles were distributed such that each student had the opportunity to serve as reviewers 1, 2, and 3 for different grants

**Fig. 1** The sequence of teaching elements for training medical students in the grant review process



**Table 2** Student comments including positive takeaways and suggestions for improvement

**Student 1**

“This experience was a great introduction to the grant review process. Faculty mentors provided helpful suggestions during small group meetings and facilitated interesting and informative conversations during large group meetings. The presentations at the beginning were appropriate in introducing the material and allowing us to become familiar/comfortable with the grant review process. Overall, a great experience.”

**Student 2**

“The Grant Review experience was very beneficial to me in my medical education. I was able to work with faculty and classmates to hone my analytical skills and my ability to think critically in considering multiple aspects of each proposal. This helped me to build on my past research experience and will undoubtedly help me be more successful in future research endeavors. By communication with my professors and peers, I also was able to expand my mindset and learn how others approached the material.

I envision this will be beneficial to my career in many ways. I have long been interested in incorporating research into my practice of medicine. I recommend that this training process continue for students as I believe many students would derive great benefit from it.”

**Student 3:**

“Overall, I found the study section helpful and a great learning experience. I enjoyed the discussion between peers and advisors in dissecting each of the various proposals. This has helped me become more critical of medical publications and a more discerning reader. The experience has shed light on the research approval process for me. This will be useful in the future for planning research projects by allowing me to think from the reviewer’s perspective and ensure proposal quality. I greatly enjoyed the experience.”

**Student 4**

“I found learning about the grant review process to be very enriching in my ability to look at research critically. This will benefit my career as a physician in the future because it will give me a greater ability to identify what new research is more applicable to my own practice, instead of having to rely on other outlets to analyze new research for me. Additionally, if I participate in research in the future, this will help me write my own grants, having seen what is and is not successful from looking over these submissions.”

**Student 5**

“It was very helpful to look at things from a peer-review point of view. I enjoyed the fostering of critical thinking that was inherent to the review process. It is something that I’ve felt is an important component of medical education. Understanding studies and really breaking them down and dissecting them is crucial in order to accurately interpret data and results. I think this is an invaluable skill as a physician and one that I am grateful to have had an opportunity to work on during these grant reviews.

One way I think this would have been even more beneficial would have been to have fewer grants and a more thorough and systematic critique of each grant. A deeper level analysis – including more detailed grant breakdown with careful discussion of pros, cons, and applicability would have helped.”

**Student 6**

“After participating in the Study Section Training, I am now able to participate in conversations centered on the strengths and weaknesses of potentially groundbreaking findings. Learning what leading national researchers use to critique and evaluate major worldwide studies and being able to walk through and develop interpretations was incredibly rewarding and being able to practice articulating my thoughts with fellow students and distinguished faculty has been an incredible strength.”

to discuss novel COVID-19 therapies and drug repurposing. The process also facilitated detailed discussions of relevant biochemistry of SARS-CoV-2 and pharmacology of its potential treatment modalities. For each grant, students described the strengths and weaknesses of each criteria (significance, innovation, approach). In addition, students wrote an overall impact paragraph explaining the score-driving factors for each grant, deciding on an overall impact score to summate these critiques.

## Results and Discussion

Each of the six students was asked to write a reflection statement about their experiences after completion of this educational initiative. The reflection statements were kept anonymous and collected by a third party. Table 2 shows excerpts from student comments including positive takeaways and suggestions for improvement. Overall, this elective was successful in providing students with training about the mechanics of the grant review process. Students found that learning the procedures for peer review also provided them with insights about how best to prepare research proposals. This first execution of this elective provided faculty with an appreciation for the value of training medical students to critically assess research proposals. Faculty were encouraged to make this elective available again as part of research training opportunities and to include grant applications covering a broader scope of fields.

The COVID-19 pandemic provided a unique academic climate for an educational initiative focused on the grant review process and the formulation of high-quality research proposals. With the dramatic increase in pandemic-related scholarly activity amongst researchers in the HMH network, students had ample material for informative discussions. Educational institutions, particularly medical schools, should take advantage of climates that encourage research by looping students into the grant review process. By exposing medical students to this process early in their training, medical schools may improve career satisfaction of medical professionals, address the lack of physician-scientist participation in biomedical research, and enhance health outcomes.

## Disclaimer

The opinions expressed in this article are the author's own and do not reflect the view of the National Institutes of Health, the Department of Health and Human Services, or the US government.

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## Declarations

**Ethics Approval** NA

**Informed Consent** NA

**Conflict of Interest** The authors declare no competing interests.

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