

Promoting Medical Student Research Productivity: The Student Perspective

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ABSTRACT

One-third of medical students complete medical school without significant exposure to research. This gap in their medical education is significant: research not only exposes medical students to scientific methodology and academic writing, but also encourages them to multi-task, communicate, and critically analyze the scientific literature – valuable skills that will serve them well in their future medical careers. We report herein the proceedings from a student-led symposium that aimed to promote student involvement in research at the Alpert Medical School of Brown University by providing practical information on how to successfully complete a research project.

KEYWORDS: medical student, research, publication

INTRODUCTION

Due to the declining numbers of physician scientists, there is a recent push to expose medical students to research.¹ Medical students who acquire research experience are more likely to choose academic careers²⁻⁴ and are better prepared for residency training.⁵ Moreover, research teaches students how to ask scientific questions and critically review literature – valuable skills for future physicians irrespective of their career choices.⁶

The primary barriers to student involvement in research include time constraints, difficulty finding mentors, and absence of training in research methodology.⁷ To begin addressing these barriers, we presented a symposium titled, “Publications and Pitfalls: Our Tips as Medical Students,” at the Alpert Medical School (AMS) in January 2014. Supported by two faculty members and led by a panel of five AMS students with experience in scientific research, the symposium sought to share the successes and failures of the student panelists and encourage first- and second-year medical students to become involved in research. This paper synthesizes the proceedings of the symposium.

Picking a Faculty Mentor

Identifying a committed mentor is vital to a successful research experience. Students should begin by determining if they wish to do basic science or clinical research. Compared

to laboratory-based projects, clinical science often lends itself to smaller projects, which are more amenable to beginning researcher and student schedules. Students should then find an area of interest and arrange to meet with faculty members who have experience in that subject. If a student cannot decide on a specific field, it is helpful to speak to peers about possible interests and good mentor experiences.

The initial face-to-face meeting with the faculty member will allow students to assess the potential mentor’s interest in working with them. Good mentors will be enthusiastic, have multiple publications with students as co-authors, work with the student directly instead of through research assistants, and understand the constraints (e.g., time) and expectations (e.g., desire to explore the field and publish findings) of medical students. Students should shy away from mentors who are unresponsive to emails, lack recent publications, and have had poor reviews from former students.

Beginning and Managing a Project

For students who have a research topic in mind, it is essential they begin with forming a research question and then conducting a literature review to ensure that they are not reinventing the wheel. This exercise will also teach students how to read academic papers and determine what makes a good research project and publication. For students unsure of a project, they can begin the literature review after they meet with their mentor.

Other important considerations when deciding upon a project are group versus individual work, funding, and establishing a timeline. Students should determine if they want to work with a group or by themselves. A team can take on a larger project, especially when time is limited. However, group projects can be weighed down by the complexity of large-team dynamics; there may be more opportunities for any one person to delay the project, which can be difficult for students with significant time constraints. Inexperienced students should consider taking on small individual projects where they can benefit from a close working relationship with a primary faculty mentor and increase their chances of obtaining a publication. Regardless of the size of the research team, students should have a discussion with their research mentor to establish authorship requirements, especially for students aiming to be a first author on an abstract or manuscript.

Funding for a project may not always be available, though

Table 1. Sample Timeline for a Summer Research Project

DATES	Planned Work	Objectives for Mentor Interactions*
October	Search for topic and meet with prospective mentor(s)	Finalize topic
November	Conduct background research and literature review	Plan project, timeline and mentor meeting schedule
December	Write project's introduction, purpose, methods and limitations and incorporate into funding proposal (e.g., SA); provide updated CV to mentor for letter of support	Revise funding proposal
January	Submit funding proposal	Finalize funding proposal
February–April	If applicable, meet with IRB coordinator and prepare and submit IRB proposal	Revise and finalize IRB proposal
June	Collect data	Organize results
July	Analyze data	Review primary findings
Late July to Early August	Prepare abstract and manuscript	Revise abstract and manuscript
September	Submit abstract to target conference and manuscript to target peer-reviewed journal	Project summary and future plans

*Email, telephone calls and face-to-face meetings as needed.

Abbreviations: SA, Summer Assistantship; IRB, Institutional Review Board.

students should thoroughly investigate research-funding opportunities at their institutions. At the AMS, there are numerous funding opportunities for student research and research-related travel.⁸ Beginning students should consider choosing projects such as chart reviews, which are less likely to require financial support.

Developing a detailed timeline will significantly increase the chance of completing a project. Medical students often have only a few months to dedicate to research due to the demands of their academic schedules. Students should ensure their mentor understands these limitations. Ideally, students and mentors should set target dates for each of the important components of the project, including Institutional Review Board (IRB) proposal submission, data collection, data analysis, and abstract and manuscript preparation. While targets may change as the project continues, good mentors will advise students on their timelines. Students should also be frank about their commitment to making these deadlines achievable. A sample timeline for a summer project is listed in **Table 1**. Notably, we recommend aiming to complete the project, including manuscript writing, by the end of the summer (or the allotted research time): the remaining project tasks – such as revising a manuscript in response journal reviewers' comments – are less likely to interfere with the demands of students' academic schedules in the fall.

Establishing rules of communication with faculty mentors can help avoid significant delays. Students and mentors should agree on rules of communication: for example, an accepted time frame to respond to emails and when to send follow-up emails. It is important to set dates for regular

meetings in advance, come prepared to each meeting with a written agenda, and leave with clear action items for both parties to keep the project on track.

Writing: Institutional Review Boards, Abstracts, and Manuscripts

Beginning student researchers often believe that abstract and manuscript writing occur after data analysis. However, introductory elements can be written even before any data is collected. By writing the introduction, purpose, and methods in abstracts and manuscripts, students can better understand their research question and methodology. This process also clarifies the goals of data collection and analysis.

Writing these portions of the manuscript can also help students with their IRB proposals, if their projects require it. Learning how to prepare and submit an IRB proposal is an excellent experience, but also time consuming. Additionally, a project can be derailed by a delay in the IRB-approval process. If students need to complete IRBs for a project, it is essential they start working early with experienced mentors and staff (e.g., institutional IRB coordinator) who can help guide them through the IRB process. Students should plan to have IRB approval obtained *before* the summer (or allotted research time). Students without adequate experience and time to navigate the IRB process should consider, if possible, starting with projects (e.g., a systematic literature review) that will not need IRB approval or projects that are already IRB approved.

When data collection and analysis is completed, students should establish a target conference and journal with their mentor and understand all conference abstract and journal

Table 2. Five Tips for Success as a Medical Student Researcher

1. Find a good mentor: look for those who are interested in medical students, understand the constraints of medical school, have a track record of recent student-authored publications, and communicate promptly and directly.
2. Start projects with a literature review to establish a knowledge base on the topic of interest and find new ideas.
3. Set realistic deadlines for all stages of the project, including preparing the institutional review board application (if required), collecting the data, analyzing the data, and writing the abstract and manuscript.
4. Prepare the preliminary sections of the abstract and manuscript in advance and read major journals for models.
5. Begin with a small, more manageable project to increase its likelihood of being completed.

requirements before writing the results and discussion portions of the abstract and manuscript. Students should expect and allot time for multiple revisions, especially if they lack experience in writing scientific papers. Reviewing articles from major journals can help students understand the anatomy of a clear abstract and concise paper.

CONCLUSION

In summary, we hope that this symposium will assist AMS students in bringing their research projects to fruition. A list of key take-home messages is provided in **Table 2**. We plan to continue this symposium annually, incorporating new information to meet the changing needs of student researchers. Future topics include research software, poster design, and conference presentation style.

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Disclosures

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