Original Publication

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An Introduction to Research Work, Scholarship, and Paving a Way to a Career in Academic Medicine

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All appendices are peer reviewed as integral parts of the Original Publication.

Abstract

Introduction: Despite high faculty attrition and challenges to expanding the number of clinician-researchers, career development to heighten trainees' pursuit of an academic research career remains a relatively understudied topic. Completing peer-reviewed publications during medical school increases a trainee's likelihood of becoming a future faculty member. There is a lack of educational content to guide trainees in selecting research activities, publishing, and gaining self-efficacy to pave a path towards a clinician-researcher track. **Methods:** The Kern model was applied to create a multimodal workshop that would heighten trainee awareness of various research opportunities, skills for conducting research, best practices in publishing, and also help them develop a personal plan to pursue research. The workshop included a presentation, reflection exercises, and a case scenario. The workshop was implemented among trainees attending professional development conferences at nine medical schools. A questionnaire assessed participants' change in self-efficacy in completing research scholarship and pursuing an academic research career. **Results:** Sixty medical students and seven residents participated in the workshops. Paired-sample *t* tests indicated a statistically significant increase in participants' perception that academic medicine would allow them to engage in research work, and in their self-efficacy to publish and succeed along a clinician-researcher track. **Discussion:** The workshop not only exposed participants to a variety of research activities but also provided a sense that all research types are valid, aiding some participants to identify new research opportunities. In addition, participants gained clarity on how to publish and develop a research path, which may help maintain interest in a clinician-researcher track.

Keywords

Research, Academic Medicine Career, Clinician-Researcher

Educational Objectives

By the end of this session, learners will be able to:
  1. List different types of health research opportunities.
  2. Identify basic skills necessary to conduct research.
  3. Outline a personal plan to pursue research.
  4. Describe best practices for publishing their research.

Introduction

The implied responsibility of medical schools to enrich and improve the career development of those medical students interested in pursuing academic medicine remains a relatively understudied topic.[1] Associated changes to the landscape of medical education—from worsening faculty attrition to disinterest in academic careers among trainees—reveal complex challenges facing medical schools in developing programs to promote careers in academic medicine.[2-4] Specifically, research experience during medical school and residency—as a critical component of the training required for an academic career—has been shown to be integral to success in pursuing a future as a clinician-researcher.[5,6] The benefits of participating in research during medical school have been documented extensively.[7-9] Engagement in research activities strengthens trainees' application to graduate school and residency because of its perceived benefit in developing critical thinking skills and other cognitive faculties.[10,11] Moreover,

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achieving research scholarship, in the form of peer-reviewed publications, has been associated with gaining a future appointment as a full-time faculty member.[3,12]

Central to trainee interest in research is raising trainee awareness of the vast array of research opportunities. Historically, there has been heightened awareness of biomedical research secondary to pipeline initiatives funded by the National Institutes of Health (NIH) and the prestigious MD-PhD pathway. Over the past 2 decades, with the increased emphasis on public health and health disparities,[13] community-engaged participatory research,[14] and translational research,[15] there have been greater opportunities for trainees to consider other types of research activities. As students progress along their professional journey, there is an increased expectation not only to engage in research but also to complete research scholarship (e.g., oral and poster presentations and peer-reviewed publications).[16] Challenges to completing research scholarship include a lack of research experience prior to entering medical school, inexperience in publishing research, unfamiliarity with institutional review board processes, and insufficient institutional infrastructure to support research.[4]

As medical schools work towards diversifying their academic medicine workforce, it is also important to recognize the challenges to both increasing exposure to careers in academic medicine and involvement in research activities in medical school and into residency for underrepresented racial and ethnic minority (URM) individuals; women; lesbian, gay, bisexual, and transgender (LGBT) individuals; and other marginalized groups.[1,4,17-19] For example, it has been demonstrated that minority medical students are less likely, when compared to their white counterparts, to report interest in pursuing careers in academic medicine upon medical school entry and more likely to report decreased intention to consider academic medicine upon graduation.[4] In a retrospective study assessing variables independently associated with full-time faculty appointments among recent medical graduates, women, MD-PhD program graduates, and graduates who reported a career-setting preference for full-time university faculty on the Association of American Medical Colleges' Graduation Questionnaire were more likely to have a full-time faculty appointment; URM status was not independently associated.[3] The success of women in academia has been hampered by poor mentorship in research activities[20] and lower publication rates, especially early in their careers.[20,21] URM and LGBT individuals often desire to give back to their community through service and have been reported as questioning whether community-engaged research can be a part of or even valued through a career in academic medicine.[18,19] This is further compounded by the lack of concordant role models and mentors, especially at higher ranks, and concerns about isolation by colleagues if focused on research based on race, gender, or sexual orientation.

Numerous chances exist to help medical students and residents gain awareness of research-related opportunities and practical experience.[22-25] For instance, the NIH and the Centers for Disease Control and Prevention both afford summer and academic year opportunities to medical trainees to learn about basic science and public health–related research, respectively. Several medical schools offer MD-PhD programs and allow students to acquire secondary degrees such as a master's of public health or a master's of biomedical sciences.[26] Many medical schools have developed scholarly concentration programs with a particular focus on basic science and clinical/translational work, for students to explore a research career trajectory and achieve research scholarship.[27] Within the context of *MedEdPORTAL,* modules have been developed to instruct faculty on how to translate their clinical, educational, and service work into scholarship; to help research mentors become more effective in mentoring their mentees; and to develop program directors and research directors so they can mentor residents on their scholarly projects.[28-30] Missing in the published literature is an introductory educational resource tailored to the needs of medical students and residents interested in a career in academic medicine, in particular a clinician-researcher track. Specific needs that must be addressed in such a resource include an understanding of the various types of research opportunities available during medical training, guidance in selecting research activities that align with personal and professional interests, and emphasis on the value of participation in research scholarship early in the medical career to maintain a positive trajectory toward a career in academic medicine.

In the fall of 2015, the Building the Next Generation of Academic Physicians Initiative organized a group of 25 diverse trainees and educational leaders from across the country to create and review a series of workshops to encourage medical students and residents to consider a career in academic medicine. We seven coauthors undertook the primary lead in the development (Carolina Stefany Paredes Molina, Dennis J. Spencer, Maria Soto-Greene, John P. Sánchez) and modification (Carolina Stefany Paredes Molina, Karissa Culbreath, Leonor Corsino, Miguel Morcuende, John P. Sánchez) of this workshop. We include a medical student, a clinical fellow, and junior and senior faculty advisors who collectively have broad research expertise (Dennis J. Spencer, Karissa Culbreath—basic science research; Maria Soto-Greene, Carolina Stefany Paredes Molina, John P. Sánchez—educational research; Leonor Corsino—clinical, public health/population-based research). Additionally, we have significant experience in facilitating research experiences and training for undergraduate and graduate trainees. For example, Dr. Spencer is a former recipient of an NIH R13 award as co-principal investigator of the Physician-Researcher Initiative of the Student National Medical Association, and Dr. Corsino is the Associate Director, Master of Biomedical Sciences, Duke School of Medicine.

The six-step Kern model was utilized as a framework in the development and modification of the workshop.

1. *Problem identification and general needs assessment:* An initial literature review was conducted to understand facilitators and barriers to medical student and resident engagement in research, completion of research scholarship, and consideration of a research-focused academic career. Additionally, the literature was scanned and the perspectives of trainees and faculty gathered on educational activities to promote trainees' interest in research careers.
2. *Needs assessment for targeted learners:* A targeted needs assessment, consisting of a mixed-methods study design, was conducted among diverse trainees to better understand their awareness of, interest in, and preparedness for academic research careers.
3. *Goals and objectives:* Based on the literature review and information gathered from trainees and research faculty, the following learning objectives were drafted for this workshop: List different types of health research (e.g., basic, clinical, public health, health services, educational, etc.) opportunities, identify basic skills necessary to conduct research, outline a personal plan to pursue research, and describe best practices for publishing your research.
4. *Educational strategies:* Educational strategies included a didactic PowerPoint (PPT) presentation highlighting different research opportunities and best practices in achieving research scholarship, a reflection exercise on how to identify research projects that align with an individual's personal and professional interests, and a case scenario, discussed in a small- and large-group setting, on participating in research work during medical school and residency. The case scenario was developed with the intent to provide a personal context and highlight opportunities for engaging in research.
5. *Implementation:* The 1-hour workshop was implemented during an academic medicine career development conference for medical students and residents. Participants and speakers were from the hosting medical school or from nearby academic health centers. This format was chosen because it afforded students opportunities for career-specific learning, skills development, a positive learning environment, and networking with individuals beyond their own academic health center.
6. *Evaluation and feedback:* Participants were asked to complete a set of questions regarding their research-related self-efficacy before and after the workshop, and indicate the extent to which the learning objectives were met through the workshop.

Methods

This 1-hour workshop was developed for medical students and residents. It has three educational components: (1) a PPT presentation (Appendix A) introducing different research opportunities and best practices in achieving research scholarship, (2) a reflection exercise on how to identify research projects that align with an individual's personal and professional interests, and (3) a case scenario, discussed in a

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small- and large-group setting, on participating in research work during medical school and residency. The case scenario was developed with the intent to provide a personal context and highlight opportunities for engaging in research. The workshop can be conducted within 60 minutes by using the following time line:

- Introduction of facilitator(s) and objectives: PPT slides 1-2 (3 minutes).
- Presentation of slides on different types of health research opportunities and basic skills necessary to conduct research: slides 3-14 (22 minutes).
- Small-group case exercise: slides 15-20 (20 minutes).
- Personal journey, best practices for publishing, clinician-researcher definition, and Q&A: slides 21-28 (15 minutes).

If there is flexibility in the length of the workshop, an extra 15-30 minutes can be afforded to allow participants to discuss their current research projects and challenges to completing research scholarship. Facilitators should also keep in mind that the small-group case exercise is the optimal time for participants to reflect on a personal plan to pursue research and how they can achieve research scholarship through any current projects. If the facilitator can communicate with the participants ahead of time, then participants can be asked to review PPT slides 3-14 (health research opportunities and basic skills), 21-22 and 25 (publishing), and 26-27 (clinician-researcher track) and reflect on their prior research experiences, knowledge and skill gaps, and publishing challenges. Participants can also be encouraged to review the referenced articles on slides 3-7 to gain an appreciation of published basic science, clinical, health services, public health, and educational research.

This workshop should be facilitated by one or two individuals. Facilitators should have experience in completing their own research scholarship, and in guiding trainees on gaining research experience and achieving research scholarship. We restricted each workshop session to no more than 50 participants, including medical students and residents, in order to create and foster a safe space for participants to discuss professional ambitions and challenges in respect to their current experiences and future career goals.

In preparation for the delivery of the workshop, the facilitator should review the PPT presentation (Appendix A), facilitator guide (Appendix B), case scenarios and handouts (Appendix C), and evaluation instrument (Appendix D). Furthermore, we offer a video guide to supplement the slide instructions (Appendix E). The approximate amount of time required for review of the material is 1-2 hours. It is highly recommended that facilitators review and practice the material prior to their presentation. We recommend that in the event more than one individual is presenting, all participating facilitators schedule a phone conversation and/or brief face-to-face discussion to outline roles and expectations of each member of the team. Below, we summarize the content of the materials provided as appendices.

Workshop Content by Appendix

Appendix A. Research Scholarship PPT Presentation: The PPT presentation includes 28 slides detailing different types of research activities and research methodologies, offering recommendations on selecting research work that aligns with personal and professional interests, outlining best practices in completing research scholarship, and describing a clinician researcher.

Appendix B. Research Scholarship Facilitator Guide: This Word document provides the facilitator with a detailed explanation of the intent and content of each PPT slide. Facilitators are encouraged to include their own professional journey and anecdotes throughout the presentation.

Appendix C. Research Scholarship Handouts: Handouts are distributed to the participants during the workshop and detail different research opportunities for Michelle, the case scenario's protagonist, to consider during medical school and residency. The handout also contains questions regarding the pros

and cons of different experiences, how the research experience supports an academic career, and opportunities for research scholarship for small groups to consider.

Appendix D. Research Scholarship Evaluation Form: Workshop participants were asked to answer a set of questions prior to and/or after the conclusion of the workshop. The questions were intended to gauge participants' self-efficacy in participating in research and in completing research scholarship, and to assess how well the objectives of the workshop were met. The questions were as follows:

Using a 5-point Likert scale (0 = *No confidence,* 4 = *Complete confidence*), indicate "How much CONFIDENCE do you have in your ability to . . ."

1. Succeed along a clinician-researcher track.
2. Publish your research work.

Using a 5-point Likert scale (1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Neither Agree nor Disagree,* 4 = *Agree,* 5 = *Strongly Agree*), indicate "An academic career in academic medicine would . . ."

1. Allow me to engage in research work.

Using a 5-point Likert scale (1 = *Strongly Disagree,* 2 = *Disagree,* 3 = *Neither Agree nor Disagree,* 4 = *Agree,* 5 = *Strongly Agree*), indicate "To what extent do you agree that the workshop learning objectives were met?"

1. List different types of health research opportunities.
2. Identify basic skills necessary to conduct research.
3. Outline a personal plan to pursue research.
4. Describe best practices for publishing your research.

After recording their responses to the above learning objectives, participants were asked to answer two open-ended questions:

1. What did you like about this workshop?
2. What suggestions do you have to improve this workshop?

Appendix E. Research Scholarship Train the Trainer Video: This video is an adjunct to the facilitator guide. The video offers facilitators visual and audio instruction on how to implement the workshop. The 11-minute video features Dr. Dennis J. Spencer, coauthor of the workshop, explaining the intent of the slides, how to implement the cases, and how to provide anecdotes and experiences.

Materials

- Pens.
- AV equipment, including computer and projector.
- Chairs and tables to support approximately three to five participants per table.
- Flip chart and markers to take notes and record the small-group comments and discussion during the cases.
- Printed copies of the case scenario handouts and evaluation form.

Results

Nine regional conferences were conducted between June 2016 and March 2017. The workshop was facilitated by a total of 13 presenters (five single presenters and four pairs of cofacilitators). The workshop faculty included facilitators at various levels in their careers. We had three assistant professors, four associate professors, four full professors, one associate dean, and one MD-PhD student. All facilitators

were actively engaged in research activities, including basic, biomedical, clinical, educational, or other research types, such as patient safety, quality improvement, teamwork, and outcomes research.

Sixty-seven individuals participated in the workshop and completed an evaluation. The 67 respondents were a diverse sample—30 (44.8%) identified as women; 32 (47.8%) as men; 14 (21.0%) as lesbian, gay, bisexual, or queer; 17 (25.4%) as Hispanic/Latino; 19 (28.4%) as white; 16 (23.9%) as African-American/black; 18 (26.9%) as Asian; and one (1.5%) as American Indian. A total of 60 medical students and seven residents took part in the workshop. Participants came from graduate programs in 17 different states and Washington, DC.

Ninety-one percent (61 out of 67) of learners responded to the pre- and postworkshop questions summarized in Table 1. Postworkshop responses indicated participants were more likely to feel that a career in academic medicine would allow them to engage in research work. Additionally, participants reported a statistically higher level of confidence in their ability to publish their research work and succeed along a clinician-researcher track.

Table 1. Summary of Learner Responses to the Pre- and Postworkshop Questions

Question	Preworkshop M	Postworkshop M	p[a]
A career in academic medicine would . . .			
Allow me to engage in research work.[b]	4.21	4.43	.015
How much CONFIDENCE do you have in your ability to . . .			
Succeed along a clinician-researcher track.[c]	2.21	2.95	.000
Publish your research work.[c]	2.38	4.43	.000

[a]The paired-sample t test was applied to assess a statistically significant change in confidence ($p < .05$).
[b]Five-point Likert scale (1 = *Strongly Disagree,* 5 = *Strongly Agree*).
[c]Five-point Likert scale (0 = *No confidence,* 4 = *Complete confidence*).

One hundred percent (67 out of 67) of learners responded to the question, "To what extent do you agree that the workshop learning objectives were met?" Over 85% agreed or strongly agreed that all four objectives had been met. Their specific responses are summarized in Table 2.

Table 2. Learner Responses ($N = 67$) to the Question, "To What Extent Do You Agree That the Workshop Learning Objectives Were Met?"

Objective	No. (%)				
	Strongly Agree	Agree	Neither Agree nor Disagree	Disagree	Strongly Disagree
List different types of health research opportunities.	46 (68.7)	20 (29.9)	1 (1.5)	0 (0)	0 (0)
Identify basic skills necessary to conduct research.	35 (52.2)	26 (38.8)	4 (6.0)	1 (1.5)	0 (0)
Outline a personal plan to pursue research.	30 (44.8)	26 (38.8)	9 (13.4)	1 (1.5)	0 (0)
Describe best practices for publishing your research.	42 (62.7)	22 (32.8)	2 (3.0)	0 (0)	0 (0)

Below, we present participants' comments in response to the two open-ended questions. Responses, organized by their relevance to the learning objectives, to the question, "What did you like about this workshop?" included the following:

- Objective 1: List different types of health research opportunities.
  - "I appreciated that we discussed that all research is valid research. Helped me find ways to pursue research."
  - "It was clear and succinct in the types of research and how to go about it."
  - "Positive: strong examples of different research types."
  - "The overview of the different types of research as well as Q+A."
  - "Very informative. Gave a balanced depiction of the pros and cons of different types of research."
- Objective 2: Identify basic skills necessary to conduct research.
  - "Solid overview of types of research and basic research skills."
  - "This workshop gave me an idea of what next steps need to be taken when conducting research. Helped to clarify some steps in my research path."

- Objective 3: Outline a personal plan to pursue research.
  - "I liked how it provided an accessible and tangible way for me as a MS1 to pursue research opportunities."
  - "I liked the interactive portion of the presentation. It enabled me to visualize my opinions when it comes to research."
  - "Laid out paths for pursuing a research project in an interesting topic."
  - "I liked the outlined trajectories for what options are available in a research setting."
- Objective 4: Recognize the benefits of publishing your research.
  - "Walked through the steps necessary to navigate the field of 'Research Scholarship' while also giving tips."

By learning objective, responses to the question, "What suggestions do you have to improve this workshop?" included the following:

- Objective 1: List different types of health research opportunities.
  - "Other information presented seemed basic for a group interested in and with research experience."
  - "I would have liked to do less of a basic overview and focus more on challenges faced by minority students engaged in research scholarship."
- Objective 2: Identify basic skills necessary to conduct research.
  - "Discuss the specifics of basic skills necessary to conduct research."
- Objective 3: Outline a personal plan to pursue research.
  - "Elaborate more on structuring a personal plan to pursue research."
- Objective 4: Recognize the benefits of publishing your research.
  - "More time on 'best practices for trainee publishing.'"
  - "Suggestion: more time spent on different steps towards conducting and publishing research."

Discussion

Our multimodal workshop was well received by our diverse medical student and resident participants, and helped them realize that a career in academic medicine would allow them to engage in research work. Furthermore, the workshop gave these participants greater self-efficacy in publishing their research work and succeeding along a clinician-researcher track. Of particular importance for diverse trainees, the workshop provided a sense that all research types are valid, aiding some to identify new research opportunities. Several of the participants commented that the interactive case in particular helped them clarify a research path.

The workshop was developed to provide an introduction to the different types of research opportunities and to offer trainees direction to achieve research scholarship. Our participants varied in their level of prior research experience and completion of scholarship. For a few, the initial slides were too basic, while others desired greater clarification of the basic skills section. This presents a common challenge for any facilitator—to tailor the content to the participants. To address this issue, facilitators can take inventory of participants' prior range of research activities, scholarly accomplishments, and challenges, then focus the workshop accordingly. This issue also raises the importance of selecting facilitators with significant research experience who can provide recommendations on overcoming challenges that were not detailed in the slides.

Although the workshop was successful and of significant benefit to our participants, it is important to consider the following limitations of our evaluation process:

1. Lack of long-term follow-up: With the current design, we are not able to show long-term impact of our workshop due to a lack of long-term follow-up. A solution to this limitation includes a follow-up survey (at 6, 12, or 18 months) after completion of the workshop.

2. Inability to demonstrate sustained knowledge or behavioral change postworkshop: Demonstrating sustained knowledge or behavioral change after an intervention is challenging, and future work will need to be conducted to identity the best tool and measurement to appropriately capture the impact of our workshop on participants' behavior.

The workshop was developed for and evaluated by medical trainees but may also be of benefit to others along the pipeline, including college students interested in exploring a research career or junior faculty with limited research experience. If the workshop is implemented among a different target audience, it is important to modify the Michelle case (e.g., educational stage, setting) to be more relatable.

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