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Going Beyond “Not Enough Time”: Barriers to Preparing Manuscripts for Academic Medical Journals

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Abstract

Phenomenon: Many researchers have difficulty transforming raw data into publishable full-length manuscripts. Among studies presented at professional meetings, registered as clinical trials, or declined from specific journals, nonpublication rates are estimated to range from 25% to 60%. We aimed to characterize major barriers to manuscript preparation, beyond lack of time, for academics from a broad range of specialties at a tertiary academic medical institution. We explored whether major barriers evolved with increasing publishing experience.

Approach: We surveyed registrants of 12 noncompulsory workshops on scientific publishing (April 2009–November 2015). Survey respondents indicated how many of their coauthored papers were accepted for publication in peer-reviewed journals in the past 5 years and stated what they found most difficult about preparing a manuscript, other than lack of time. Two investigators performed a content analysis of the reported barriers; mean agreement between coders was 98% ($SD = 2\%$), and the mean Scott π coefficient for interrater reliability was 0.81 ($SD = 0.26$). We used a multi-method analytic approach to determine whether the perceived barriers varied with level of publishing experience.

Findings: Surveys were returned by 201/256 registrants (79%). Thirty-eight percent of respondents had lower publishing experience (0–4 papers published in peer-reviewed journals in the past 5 years), 26% had medium experience (5–10 papers), and 35% had higher experience (>10 papers). Many respondents (57%) listed multiple barriers, but 5% listed 0 barriers. The content analysis of the 370 reported barrier items identified 8 categories covering 38 concepts. The most common concerns (ie, organization, writing, following journal format, defining the article scope, disliking writing, responding to reviewers) were not affected by author experience level. However, significantly more academics with higher experience expressed concerns about data presentation.

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Insights: Academics commonly reported barriers such as uncertainty about how to organize content, difficulty with developing succinct text, and frustration about meeting journal-specific formatting requirements. Greater experience in scientific publishing did not appear to mitigate these barriers. Academic institutions can provide targeted support for persistent challenges to scholarly productivity.

Keywords

authorship; education; language barriers; publication; scholarly communication

Introduction

Dissemination of research findings is essential for a successful academic medicine career, but many academics may have difficulty transforming raw data into publishable manuscripts. About half the studies that are presented at professional medical meetings are never published in peer-reviewed journals,¹⁻⁴ and one-quarter to one-half of registered clinical trials also appear to remain unpublished.⁵⁻⁷ Journals that tracked the fate of their declined manuscripts report nonpublication rates of 25% to 60%.⁸⁻¹⁰ Such omissions from the literature can potentially have harmful consequences (eg, evidence-based medicine skewing toward statistically significant results),¹¹ and underreporting of research even has been characterized as scientific misconduct.¹²

Numerous barriers to scholarly productivity are recognized. The competing demands of patient care, administrative work, and teaching responsibilities reduce the amount of time available for research-related tasks; unsurprisingly, lack of time is often cited as a major barrier to publication.^{13, 14} The perceived lack of skill in scientific writing is another obstacle,¹⁵ with an assessment of career development needs for academic clinicians showing “effective writing of grants and publications” as the top priority.¹⁶ Previous studies have explored barriers to manuscript publication,¹⁷⁻²¹ but some examined narrowly specific author groups, such as attendees of pancreas society meetings,²⁰ or included investigators who indicated that publication of their research was not a priority.²¹

We questioned whether barriers perceived by motivated authors from a broad range of specialties would differ from those whose careers were potentially less oriented toward research. To explore this question, we retrospectively reviewed responses to needs-assessment surveys of clinical, translational, and basic researchers at a tertiary academic medical center who attended a noncompulsory workshop on publishing scientific manuscripts. Our objective was to characterize their primary barriers to manuscript preparation other than lack of time. In addition, because we had anecdotally observed recurring themes in the survey responses, we sought to determine whether any barriers were specifically associated with the respondents’ level of publishing experience. We empirically posited that the major barriers would evolve with increasing experience in scientific publishing.

Methods

This study was exempted by the Mayo Clinic Institutional Review Board (protocol 15-001108; 3/27/15). In this report, we use the broad term *academic* to encompass everyone who writes original manuscripts and submits these manuscripts to peer-reviewed journals.

Study Setting

The study was conducted at Mayo Clinic, a tertiary academic medical institution with three campuses in the United States. The institution has 3 foundational activities, namely patient care (primary focus), research, and education. To support these activities, it employs more than 4,700 physicians and scientists, including more than 200 full-time scientific faculty and more than 700 physicians actively involved in research. External funding for research programs was \$490 million in 2018.

All staff physicians and scientists are expected to have an academic appointment and are encouraged to pursue activities that lead to academic promotion. For promotion from instructor to assistant professor, criteria for advancement vary, depending on the person's chosen area of scholarly emphasis. For example, an academic who focuses on research or clinical care is expected to publish more peer-reviewed scientific articles than someone with a sustained record of educational efforts (eg, being a program director). For further academic advancement, additional meaningful scholarly activity is required. The criteria for promotion to associate professor include having a national reputation as an authority in some aspect of their discipline, which is evidenced in part by having a senior author or principal collaborator role in meritorious, significant publications, among other scholarly activities. The criteria for promotion to professor include a having an international reputation for academic excellence and a bibliography that shows a major contribution to the understanding of a field. Overall, the criteria for academic promotion are consistent across the enterprise.

Workshop on Publishing Research

Our institution offers a 4-hour noncompulsory workshop entitled "Publishing Your Research." Initially taught in 2004 as part of a faculty development program, the workshop has been presented at least once a year since that time. Workshop invitations are sent to all employees with a human resources (HR) designation associated with a new career at our institution as a physician or scientist. (Note, HR designations are unrelated to academic rank.) These employees receive email invitations every time the workshop is offered until they either attend or obtain a different HR designation indicating that they are no longer relatively recent hires. More than 350 invitations are sent for each workshop. Workshop attendance is open to all employees, regardless of HR designation or academic rank, and capacity is limited to the first 25 registrants.

The invitation lists 6 learning objectives for the workshop. Participants will learn to 1) access Mayo resources for academics and understand what services they provide; 2) avoid common legal and ethical missteps; 3) select an appropriate journal and understand and meet the journal's expectations and requirements; 4) write with the reader in mind; 5) organize

and present data clearly; and 6) understand the publishing process through the perspectives of a published author and a journal editor. The workshop includes practical approaches to organizing the paper and improving the clarity of writing and data presentation. Reliable strategies are offered for common publication concerns, such as how to select an appropriate target journal. In addition, presenters address potential misconceptions about the peer-review process, and they explain the impact of high-quality research publications on academic promotion. The workshop content can be modified within the framework of the stated learning objectives. For example, the ethics portion initially gave equal emphasis to the three main elements of research misconduct (fabrication, falsification, and plagiarism).²² However, considering the spontaneous feedback from prior workshop attendees, the presenter currently emphasizes self-plagiarism,²³ standard practices for citation and quotation, and copyright infringement.

Survey Development, Survey Administration, and Demographic Data

Five workshop instructors (all professional manuscript editors, each with >10 years' experience in scientific editing and publishing) collaboratively developed a needs-assessment survey for registrants (Appendix) so that the workshop content could be customized to their needs. The first 2 survey questions ("In the past 5 years, how many manuscripts have you submitted to peer-reviewed medical or scientific journals?" and "How many of these submitted papers have been accepted for publication?") aimed to understand the registrants' recent experience in scientific publishing. For question 3 ("Other than finding the time, what do you find most difficult about preparing a manuscript for publication?"), we explicitly asked registrants to list difficulties other than insufficient time because lack of time is a well-established barrier to publication.^{13, 14} Question 4 ("Do you have a specific question you want answered during the workshop?") was included to ensure that the workshop would address any unusual concerns. Survey questions were not rigorously pretested (eg, no cognitive interviewing, only 1 pilot survey) before implementation.²⁴ For the current analysis, we retrospectively reviewed answers to surveys from 12 workshops offered from April 2009 through November 2015 (workshops were held once a year in 2009 and 2010 and twice a year from 2011 through 2015).

Several weeks before each workshop, surveys were sent as plain-text emails to all workshop registrants; respondents returned emails with free-text answers of unrestricted length. None of the communications were blinded (ie, data were not collected anonymously). No incentives to complete the survey were offered. For each survey, two email reminders were sent to nonrespondents. We did not verify accuracy of self-reported publication history or perform response validation of survey answers.

Demographic data of workshop registrants (eg, education, gender, academic rank, etc) were obtained from HR records; we could access data only for those registrants who were current Mayo employees as of September 2018. In addition, because of a computer systems change in May 2013, before the study was conceived, survey respondent status for attendees in 2009-2012 was not available. Thus, our comparison of characteristics of survey respondents vs nonrespondents was limited to those who attended workshops after May 2013. However, all reported barrier items were included in the content analysis.

Multi-Method Study Design

All data were stored on a secured institutional network. Data were de-identified by the survey administrator (S.L.C.) before content analysis. Two investigators (J.O. and K.E.V.) performed a content analysis of the responses to question 3 (“Other than finding the time, what do you find most difficult about preparing a manuscript for publication?”). Responses to question 4 (“Do you have a specific question you want answered during the workshop?”) were excluded from the analysis because many answers closely echoed those of question 3. The median comment length was 9 words (interquartile range, 5-19 words). The median number of barrier items (statements) per respondent was 2 (interquartile range, 1-3).

Content analysis of barriers was performed by using a general inductive approach.²⁵ Briefly, all responses were read in full to identify key concepts. Key concepts were assigned codes and related codes were then grouped into categories to develop the initial analytic framework. Definitions of categories and concepts were iteratively refined (ie, revised, combined, added, deleted) until no new concepts emerged, and the investigators were satisfied that the framework for coding was comprehensive and that categories and concepts were nonoverlapping. The final framework consisted of 8 categories covering 38 concepts (Table 1). Each unit of analysis was defined as a word or phrase that represented a single concept, and 1 survey response could be assigned as many codes as concepts represented. For example, “Organizing my thoughts and formatting according to journal specifications” was characterized as representing two concepts: 1) organizing information appropriately and 2) compliance with journal-specific format. Although this approach might disproportionately represent barriers of the more-verbose respondents, we lacked the context to prioritize multiple barriers (ie, identify the respondent’s primary barrier) and also thought it was unreasonable to believe that authors should have only one major impediment to manuscript preparation.

Training for content analysis was performed by consensus-coding approximately 20% of responses over two sessions. The remaining 80% of responses were independently coded, using the established coding framework, over four sessions. The coding framework remained flexible and was updated if a new concept emerged. No survey responses were excluded. During each coding session, discordance between investigators was resolved through discussion until consensus was achieved. The analysis was completed over a 7-month period. Reliability coefficients were calculated with ReCal2 software (<http://dfreelon.org/utills/recalfront/>).^{26, 27} For the independently coded responses, the mean agreement between coders was 98% ($SD = 2\%$) and the mean Scott π coefficient for interrater reliability was 0.81 ($SD = 0.26$).

We next stratified respondents on the basis of their relative experience in publishing peer-reviewed scientific articles (eg, original research articles, reviews, case reports). We assumed that authorship was a proxy for a meaningful contribution to the study and manuscript²⁸ and therefore reasoned that some publishing experience was gained with each accepted manuscript. Respondents were categorized into three groups: 1) lower experience was defined as 0-4 papers accepted for publication in a peer-reviewed journal in the past 5 years; 2) medium experience was defined as 5-10 papers accepted; and 3) higher experience was defined as >10 papers accepted. The threshold for higher experience (>2 publications/year

for 5 years) was selected because it was at least double the reported average scientific publication rate (range, 0.98-1.11 publications/year) of successful postdoctoral fellows,²⁹ early career academics,³⁰ and full professors,³¹ with data gathered from multiple institutions.

We used a convergent parallel multi-method approach²⁵ to compare the quantitative data (number of papers accepted for publication in 5 years) and transformed qualitative data (coded barriers to manuscript preparation) that were obtained simultaneously from our cohort. We compared the 2 datasets to assess the possibility that the perceived barriers varied with level of publishing experience. Data are summarized with descriptive statistics. The continuous variable (age) was compared with the 2-tailed *t* test. Categorical variables were compared with the Fisher exact test or χ^2 test. *P* values <.05 were considered significant. Statistical analysis was performed by using the Social Science Statistics online calculator (<http://www.socscistatistics.com/>).

Results

Respondent Characteristics and Publication History

In total, 256 employees registered to attend the 12 workshops held during the study period. Surveys were returned by 201 registrants (79%). Demographic characteristics of workshop attendees are shown in Table 2. For the subset of attendees with known survey response status, respondents and nonrespondents were similar in terms of education, gender, and age (the HR database lacked details about race/ethnicity). Most were relatively new to Mayo Clinic (hired <2 years before the workshop date) and represented 87 specialties. Attendees generally were early career academics; 76% were still ranked as instructors or assistant professors at the time this study was conducted. We did not explicitly ask registrants to indicate why they were interested in the workshop, but we presume that the learning objectives presented in the course description met at least 1 learner need.

We stratified the 201 survey respondents by publishing experience: 77 (38%) had lower experience (0-4 papers), 53 (26%) had medium experience (5-10 papers), and 71 (35%) had higher experience (>10 papers). Thirteen respondents (6%) had no publication experience (ie, had never submitted a manuscript or had no manuscripts accepted in the past 5 years), and 12 (6%) had published >30 manuscripts. The majority of respondents (n=191 [95%]) indicated at least 1 barrier to manuscript preparation, and many respondents (n=114 [57%]) listed multiple barriers (total, 370 barrier items reported). Sample responses are shown in Table 3. Although nearly everyone reported at least 1 barrier to manuscript preparation, the overall publication success rate was 90%. Lower-experience academics had published 96 of 131 (73%) submitted manuscripts, medium-experience academics had published 259 of 301 (86%) submitted manuscripts, and higher-experience academics had published 1,118 of 1,213 (92%) submitted manuscripts. Publication success rates were significantly higher for academics in the higher-experience group compared with the lower-experience group (Fisher exact test; *p*<.001).

Common Barriers to Publication

When comments were stratified by relative experience level, the most frequently mentioned barriers were not significantly different across groups (Table 4). The barrier most commonly cited by our cohort pertained to appropriate organization of information (n=51 [25%]). Many described uncertainty about whether to place information in the Introduction or Discussion sections, used the word *organize* (or similar), or mentioned *flow*. Others struggled with decisions about whether specific material should be included in the manuscript at all. The second most common barrier pertained to lack of wordsmith skills (n=30 [15%]), with respondents describing difficulty producing what they termed *succinct*, *clear*, or *effective* writing. Twenty-seven (13%) mentioned writer's block or stated that they disliked writing in general. A minority of respondents indicated primary barriers that were not directly associated with manuscript preparation. For example, 12 (6%) reported barriers that pertained more to overcoming emotional responses (eg, "regrouping after a rejection"), and 13 (6%) described coauthor interactions as being most problematic (eg, "authorship fights").

Extrinsic Factors as Barriers

A few respondents perceived extrinsic factors such as journal editors (n=3) or reviewers (n=2) as major barriers. One stated, "Feel of bias by editor or associate editors"; another described reviewers as being "absolutely unpredictable or too demanding." However, most comments about journal editors and reviewers were less charged and often described not knowing how to get their approval ("Understanding editor's perspective on what constitutes an 'attractive' topic or paper"). Others seemed to accept that it was the authors' responsibility to make a strong case for publication ("Convince editors and reviewers that my work needs to be published") and to write with the needs of their readers in mind ("[how to] convey the important info... in a way that will not overwhelm reviewers and turn them off"). Interestingly, all the individuals quoted above were from the medium- or higher-experience groups.

Although we did not collect data on the time from first submission through acceptance in our survey, we noted several comments about the sustained effort needed to shepherd a manuscript through to publication ("Such a long, drawn out process. [It] hangs over my head for months..."). Peer review and manuscript revision are fundamentally time-consuming activities, especially if a paper is not accepted by the first-choice journal. Historically, in a cohort of papers edited by our institution's Scientific Publications editing service,³² only 54% were accepted by the first-choice journal; the median time from first journal submission through eventual acceptance for that group was 224 days (range, 3-1,571 days; manuscripts were followed through up to 7 journal submissions).

Discussion

The barriers most frequently reported by our cohort were difficulties with organizing information appropriately and developing succinct and effective wording, and these barriers were mentioned across all experience levels. The comments suggest that academics understood the potential impact of a skillful narrative³³ but lacked confidence in their

ability to develop a compelling manuscript. Others stated that they struggled with journal-specific formatting, defining the appropriate scope of the article, responding to reviewers, and preparing figures and tables. Many appeared to dislike writing in general or had writer's block. Again, most of these barriers were unaffected by the level of publishing experience. Altogether, the comments suggest that many academics registered for the workshop because they had multiple uncertainties about how to best prepare their manuscripts and hoped to learn tips to make the process more efficient and palatable.

The cohort's overall high publication success rate (90%) indicates that these barriers, while varied and prevalent, are not insurmountable. Notably, the publication success rate was significantly higher for the higher-experience group compared with the lower-experience group (92% vs 73%). The positive effect of greater experience was unsurprising and likely reflects the development and maturation of numerous research-related skills, not just manuscript preparation. Perceptions about publishing also may shift with increasing experience. We noted comments from medium- and higher-experience academics that acknowledged their responsibilities as authors for making the case for publication. This apparent internal locus of control may partially account for their relatively high publication rate. In addition, respondents with more publication experience may have reached a stage of their academic journey in which they are seeking to better understand the criteria by which their work is evaluated.

Although studies exploring authors' barriers to manuscript preparation and publication are not new, the current study is novel because it sought to determine whether the perceived barriers varied with level of publishing experience while excluding "lack of time" as a potential response. We did not attempt to determine the relative importance of time for our cohort because prior reports already established lack of time a major barrier to publication;^{13, 14} further, prohibiting it as an answer likely increased the diversity of responses and allowed insight into the other difficulties.

Limited Effect of Experience on Perceived Barriers

For our cohort, the most commonly reported barriers to manuscript preparation (eg, organizing information appropriately, succinct and effective wording) were not ameliorated by increased experience in scientific publishing. We explored whether major barriers would evolve as academics became familiar with the tasks inherent to manuscript preparation and peer review, and respondents with higher experience more commonly mentioned aspects of the peer-review process that may have been unknown to those with less experience (eg, creating publication-quality figures and tables). However, most differences between higher- and lower-experience groups were not significant. From an institutional point of view, barriers that persist throughout the arc of an academic career should be examined thoughtfully so that targeted assistance can be provided.

Strengths and Limitations

The high number of barrier items reported, the diverse specialties of respondents, and the consistency of barriers across publishing experience levels strengthen the validity of these findings. We further believe that the barriers reported here are relevant to other academic

research programs. Even though our cohort was employed at a single institution, most participants attended the workshop within 2 years of being hired, and the reported barriers therefore are unlikely to be unique to Mayo Clinic's training environment or culture.

The workshop registrants represented only a small portion of academics who publish scientific research manuscripts at our institution, and our findings must be interpreted in the context of considerable selection bias. The workshop is noncompulsory and likely attracts academics who are intrinsically motivated to get their work published. We could not characterize the perceived barriers of academics who did not attend our workshops because those who chose not to register generally did not communicate their reasons for declining. Some might have felt adequately supported to write manuscripts, and others may not have been ready for a practical workshop at the time they were invited. Likewise, the reasons for delaying workshop attendance for several years are unknown, but we speculate that delays could be attributable to a changing level of interest in research or even to scheduling conflicts. Given the varying potential scenarios, those who did not attend may have different publication rates and different perceived barriers compared with our study cohort.

We relied on self-reported data for publication rates, which potentially were affected by recall bias, and we did not verify accuracy of the responses. We aimed to minimize recall bias by giving participants ample time to look up their publication histories, with multiple reminders over several weeks to complete the survey. We also presumed that the responses were accurate because of the stated purpose of the survey (no obvious benefit to falsifying one's publication history). However, if publication numbers were inaccurately reported, respondents could have been stratified incorrectly and the primary finding of no major differences in barriers among groups might not be true. Future research could track workshop attendees longitudinally and assess whether their reported needs were associated with their subsequent scholarly productivity

Because this study was conducted retrospectively, we did not perform any response validation (member checking) of survey answers, and we acknowledge that the typically terse survey responses did not allow us to fully develop the "context, personal meaning, emotional and social nuances, and layers of detail" that are necessary for robust qualitative investigations.³⁴ Although the investigators conducting the content analysis had strong agreement and interrater reliability, the opinions and interpretations of the investigators may have influenced codebook development. Thus, we cannot be certain that the categorization of barriers accurately reflected the intended meaning of the survey respondents. A prospective survey that includes response validation would address this concern.

Interventions aimed at improving scholarly productivity were beyond the scope of the current study, and the question remains whether greater education in writing improves long-term publication rates. Future research could compare scholarly productivity of academics who have or have not obtained in-depth education about scientific writing.

Recommendations

In the absence of quality mentoring or a suitable workshop on publishing, some academics may be uncertain about how to acquire the relevant knowledge or a develop sense of

competence regarding manuscript preparation.³⁵ For those who seek help in organizing information, we recommend consulting appropriate publishing checklists and guidelines, such as CONSORT³⁶ and STROBE,³⁷ which describe where and how study elements should be reported in the manuscript. These tools also can be useful when the research project is in the planning stage. For academics who want quick tips to improve the clarity of their writing, the prose structures recommended by Gopen and Swan³⁸ provide a strong foundation. For academics who would like to undertake an in-depth effort to improve their writing skills, numerous books specifically about writing scientific research publications are available.³⁹⁻⁴² Zeiger⁴¹ describes principles of effective writing and includes many samples of unclear writing and clearer revisions; the book also provides self-study exercises to help readers hone their judgement about writing choices. Morrison et al⁴² similarly offer a practical, step-by-step approach to manuscript development, but they also address less-discussed topics such as how to prioritize a commitment to publishing research.

Numerous respondents also indicated that they disliked writing or had writer's block. For academics with predominantly psychological or emotional barriers to manuscript preparation, one way to address them is to join a support group for academic writing. A writing support group can help individuals develop personal writing strategies, foster a positive attitude about writing (including self-confidence), and establish collaborative relationships for peer feedback.^{43, 44} We additionally posit that the camaraderie and emotional support provided by such a group⁴⁵ are key factors that facilitate publication output.

It is important to recognize that, in addition to the workshop on publishing, our institution provides many services to support scholarly activity (Table 5), with particular attention paid to relieving academics of potentially time-consuming tasks. Services include literature searches, statistical analyses, substantive editing and copyediting of manuscripts, creation of publication-quality tables and figures, and journal-specific formatting. Nevertheless, the high number of barriers reported suggests that even in a resource-rich setting, academics may perceive enduring barriers to manuscript preparation. Table 5 also shows services that currently are not offered by Mayo Clinic at an institutional level; however, we propose that they might positively affect scholarly productivity.

Conclusion

In our cohort of writing workshop attendees, common barriers to manuscript preparation pertained to organizing information, writing, following journal format, defining the scope of the article, and responding to reviewers. Barriers appeared persistent because increasing experience in scientific publishing did not mitigate these difficulties. Academic institutions can provide targeted support for enduring challenges to scholarly productivity.

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Appendix.: Survey.

Thank you for registering for the “Publishing Your Research” workshop coming up on [date]. The facilitators are interested in learning more about your writing needs and interests.

Please complete the following survey by [date] to assist them with workshop preparation.

Thank you!

- 1) In the past 5 years, how many manuscripts have you submitted to peer-reviewed medical or scientific journals?
- 2) How many of these submitted papers have been accepted for publication?
- 3) Other than finding the time, what do you find most difficult about preparing a manuscript for publication?
- 4) Do you have a specific question you want answered during the workshop?

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Table 1.

Overview of the Coding Framework

Category	Example Concepts
Planning and logistics	Uncertainty about how to organize information; difficulty defining scope of the paper; lack of time for writing
Writing	Unskilled at (or dislikes) writing; writer's block; nonnative English writer
Journals	Frustration about revising to follow journal-specific format; unsure how to identify the best target journal; difficulty meeting word limits
Reviewers	Poor at anticipating reviewer criticisms; unsure how to best respond to critiques; difficulty identifying potential reviewers
Coauthors	Disagreements about authorship order or status; unable to get coauthors to do timely or quality work
Resources and support	Lack of mentoring; no knowledge about available resources (if they exist, how to access them)
Study design and conduct	Difficulty with statistical analysis; lack of funding
Personal effort	Difficulty overcoming negative emotional responses (eg, feeling personally rejected); difficulty maintaining project momentum

Table 2.

Characteristics of Workshop Attendees

Characteristic	All Attendees (n=229) ^{a,b}	Respondents (n=56)	Attendees in 2013-2015 ^{b,c}		Test Statistic, P Value
			Non-respondents (n=38)		
Education, No. (%) ^d					$\chi^2(2, N = 93) = 2.19, p = .33$
MD, DO, MBBS, or other medical degree	183 (80)	44 (79)	28 (74)		
PhD	29 (13)	9 (16)	4 (11)		
Dual degree (eg, MD-PhD, MD-DDS, MBBS-PhD)	16 (7)	3 (5)	5 (13)		
Women, No. (%)	105 (46)	26 (46)	14 (37)		Fisher exact test, $p = .40$
Age, mean (SD), y	39.2 (7.1)	38.6 (7.5)	39.8 (6.7)		$t(90) = -0.82, p = .41, d = 0.17$
Hired <2 y before workshop attendance, No. (%) ^d	136 (59)	33 (62)	21 (75)		Fisher exact test, $p = .32$
Specialty, No. (%) ^{d,e}					$\chi^2(3, N = 81) = 0.32, p = .96$
General internal medicine	53 (23)	4 (8)	3 (11)		
Radiation oncology	7 (3)	3 (6)	2 (7)		
Gastroenterology	7 (3)	2 (4)	1 (4)		
Other	149 (65)	44 (83)	22 (79)		
Academic rank ^{d,f}					$\chi^2(3, N = 92) = 2.51, p = .47$
Instructor	29 (13)	5 (9)	7 (18)		
Assistant professor	145 (63)	41 (73)	27 (71)		
Associate professor	35 (15)	6 (11)	2 (5)		
Professor	11 (5)	2 (4)	2 (5)		

^aData are shown for participants who attended any workshop from 2009-2015.

^bWe had access to demographic data only for attendees who were employed by Mayo Clinic as of September 2018. (Human resource records were not available for past employees.)

^cRespondent and nonrespondent data are from academics who attended 1 of 4 workshops that were presented from 2013-2015 and are current employees as of September 2018 (36% of all attendees). Survey respondent status was not available for academics attending workshops held before 2013.

^dOne nonrespondent did not have an advanced degree. Hire date and specialty could not be verified for 3 respondents and 10 nonrespondents. Two respondents did not have an academic appointment (no academic rank).

^eIn total, 87 unique specialties were reported. The most common specialties are shown. The high proportion of attendees from general internal medicine is consistent with the percentage of physician appointments in that specialty at our institution.

^fAcademic rank as of September 2018. Rank is not necessarily the same as when respondents attended the workshop and answered the survey.

Table 3.**Sample Responses Describing Barriers to Manuscript Preparation^a**

Higher experience

Outlining the format of presentation, writing the data in a presentable and sequential flow, incorporating references.

Understanding editor's perspective on what constitutes an 'attractive' topic or paper, anticipating reviewer's objections, setting the stage well in the introduction to establish originality.

What to do when the paper has been rejected from 3-4 different journals—essentially, do you give up and move on or continually try to re-tool it for somewhere else.

The actual submission part and re-referencing/reformatting articles for publication in different journals following rejection.

Writers block. I also find the configuring of figures challenging.

Medium experience

Writing the introduction. Depending on the subject, it can be difficult to know how much to include in this section.

English language, staying clear and logic even after many corrections. To improve my skills of presenting myself, presenting our results.

The actual writing. I love the research, but struggle with the organization of ideas and articulation.

Lower experience

Effectively communicating complex, trans-disciplinary content of great depth and breadth, especially in introductory and discussion/implications sections, within highly restrictive word limits.

I really don't understand the process of finding the appropriate journal for submission. I think I have anxiety about the process in general because I received little mentorship in research during my training so the process is largely unknown to me. I would be concerned about putting a lot of time into a research product and then not have it accepted for publication.

Writing is hard!

^aA lower level of experience was defined as 0-4 manuscripts accepted for publication in a peer-reviewed journal in the past 5 years; medium, 5-10 manuscripts; and higher, >10 manuscripts.

Table 4.

Most Common Barriers to Manuscript Preparation, Stratified by Relative Publishing Experience (n=201)

Barrier ^{a,b}	Relative Publishing Experience, No. (%) ^c			P Value ^d
	Lower (n=77)	Medium (n=53)	Higher (n=71)	
Organizing information appropriately (Planning and logistics)	19 (24.7)	16 (30.2)	16 (22.5)	.85
Succinct and effective wording (Writing)	10 (13.0)	8 (15.1)	12 (16.9)	.64
Compliance with journal-specific format (Journals)	9 (11.7)	9 (17.0)	10 (14.1)	.81
Defining the scope of the article (Planning and logistics)	13 (16.9)	9 (17.0)	5 (7.0)	.08
General dislike of writing or having writer's block (Writing)	9 (11.7)	6 (11.3)	12 (16.9)	.48
Responding to reviewer concerns (Reviewers)	2 (2.6)	5 (9.4)	7 (9.9)	.09
Creating publication-quality figures and tables (Writing)	0 (0)	2 (3.8)	8 (11.3)	.002

^aThe key concept is listed (with category shown parenthetically).

^bTen respondents did not report any barriers (3 with a lower level, 3 with a medium level, and 4 with a higher level of experience).

^cA lower level of experience was defined as 0-4 manuscripts accepted for publication in peer-reviewed journals in the past 5 years; medium, 5-10 manuscripts; and higher, >10 manuscripts.

^dComparison of lower- and higher-experience groups only; Fisher exact test.

Table 5.

Resources to Support Scholarly Activity

Resource	Example Services Provided
Resources Currently Available at Mayo Clinic^a	
Library	Literature search, information retrieval, training resources for reference software use
Division of Biostatistics and Informatics	Core statistical support and collaboration for clinical research programs, including clinical trials and translational research
Scientific Publications	Substantive editing of manuscript (eg, organization, content, logic, word choice, phrasing), journal-specific formatting, manuscript submission
Media Support Services	Creation of data figures, artist renderings, audiovisual supplements, conference posters
Strategic Funding Office for Research	Development of grant applications for extramural funding
Additional Resources^b	
Writing groups for peer mentoring	Mentor-facilitated small groups for collaborative writing and support; members establish individual writing goals, offer feedback on each other's manuscript drafts
Mentorship programs	Connects authors with established academics or like-minded peers
Career development advisors	A centralized hub with knowledge about ongoing research needs; advisors should be capable of directing academics to appropriate institutional or departmental resources

^aThis is not a comprehensive list of the services provided by each department.

^bDepartments and individuals can establish their own support networks; the resources in this section currently do not exist at an institutional level at Mayo Clinic.