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Perception of barriers to research among internal medicine physician hospitalists by career stage

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Abstract

Background: Physician hospitalists may participate in research and generate knowledge for evidence-based hospital practice. Despite this, physician hospitalists are primarily involved in patient care, and there is sparse information on barriers for their participation in research and if these barriers differ by career stage.

Methods: We conducted a survey of physician hospitalists at Mayo Clinic sites based in four states (Arizona, Florida, Minnesota, and Wisconsin). We surveyed physician hospitalists on demographics, academic rank, current research skills, barriers for participation in research, and research skills they aspire to acquire. Responses were summarized using descriptive statistics and categorized by early-career (<10 years), mid-career (10–20 years) and later-career (≥20 years) stages at Mayo Clinic. The survey was conducted from March-April 2019.

Results: Of 188 physician hospitalists, there was a 52% response rate with 71% in early career, 21% mid-career, and 7% late career, with 39% female. Physician hospitalists at early-career (90%), mid-career (76%), and later-career (71%) stages were interested in participating in research. Among physician hospitalists with ≤3 peer-reviewed publications, barriers for participation in research included lack of mentorship, time, research skills, and funding. Among physician hospitalists with ≥4 peer-reviewed publications, factors for research success included mentorship (89% early-career, 38% mid-career, 75% later-career; p=0.002) and membership in a research team. Compared to mid- and later-career physician hospitalists, a higher proportion of early-career hospitalists was interested in acquiring skills to both critically review the literature (70% early-career, 43% mid-career, 0% later-career; p=0.006) as well as write manuscripts (86% early-career, 57% mid-career, 50% later-career; p=0.02); there was generally similar interest across career stages to acquire skills to conduct literature searches and write grants.

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Conflict of Interest

The authors report no conflicts of interest.

Conclusion: The generally similar responses from physician hospitalists across career stages highlight system-level opportunities to increase research mentorship, promote acquisition of research skills, and reduce barriers for participation in research.

Keywords

hospital medicine; research barriers; hospitalist research; mentorship; research skills; academic promotion

Introduction

Patients hospitalized with multiple medical comorbidities or undifferentiated medical conditions are frequently managed by hospitalists.[1] Given their integral role in patient care, physician hospitalists are optimally positioned to lead research initiatives and generate knowledge for the delivery of evidence-based care for patients hospitalized with common general medical conditions. Despite this, physician hospitalist involvement in research is suboptimal, and the reasons are incompletely understood.[2] Without greater involvement in research, the legitimacy of the field of hospital medicine could be threatened.[2]

Over the last two decades, the number of hospitalist-based programs increased, and physician hospitalists are involved in patient care, education, administration, and quality improvement initiatives.[3–8] Since the mid-1990s, the number of hospitalists increased from few hundred to more than 50,000 (in 2016) making hospital medicine the fastest growing specialty in American medicine.[9,10] At present, hospital medicine is the largest of all internal medicine specialties including cardiology (~22,000 physicians).[9] Consequently, hospitalist based programs are associated with increased efficiency in delivered care.[7,11] At university-based hospitalist programs, physician hospitalists may be involved in teaching and research, in addition to patient care, whereas at community-based hospitalist programs, they are primarily involved in patient care. At both types of institutions, physician hospitalists have been less active in research, attributed to lack of mentorship, research skills, institutional support, and funding.[5,12] Although physician hospitalists voiced their concern that mentorship and productivity are of vital importance in avoiding physician burnout and turnover, there continues to be a lack of both financial and philosophical support of academic hospitalist development from institutional leadership.[8] Recently, the Society of Hospital Medicine (SHM) surveyed 100 hospital medicine programs in the United States (US) to characterize the state of research.[2] Of the 28 programs that responded (representing 1,586 faculty members), 12% of hospitalists received or currently had intramural or extramural funding. Among those with funding, more than half (58%) had less than 25% effort protected for research.[2] In comparison, among early-career academic cardiologists in the US, 35% dedicated <40% of time for research and 22% dedicated ≥40% of time for research.[13] Similarly, among nephrologists in the US, 57% of group practice nephrologists spent 50+ hours on patient care compared to 17% of academic nephrologists, the latter group spending more time on research.[14] Despite these studies, there is sparse knowledge on the current research skills of physician hospitalists and skills that they would like to acquire or develop. Further, it is unknown if physician hospitalists at different career stages face different barriers to participate in research.

To address these knowledge gaps, we surveyed physician hospitalists at Mayo Clinic, an institution with over 15 hospitals in four states. Since 2016, the US News & World Report has ranked Mayo Clinic, Rochester, as the number 1 hospital in the US.[15] At Mayo Clinic, in 2020, physician hospitalists provided care to approximately30% of hospitalized patients. We surveyed physician hospitalists on barriers for research, factors for success in research, and research skills they aspire to acquire. This information could guide the development of hospitalist-based programs to increase and sustain academic productivity.

Materials and Methods

The Institutional Review Board (IRB) at Mayo Clinic, Rochester, approved this study (IRB 19–001729).

Sites

In March-April 2019, physician hospitalists at the Mayo Clinic in Rochester MN, Jacksonville FL, Scottsdale AZ, and Mayo Clinic Health System hospitals in Minnesota (Albert Lea, Austin, Cannon Falls, Fairmont, Lake City, Mankato, Owatonna, and Red Wing) and Wisconsin (Barron, Bloomer, Eau Claire, La Crosse, Menomonie, and Osseo) were sent an electronic survey via e-mail to assess their perceptions regarding research and barriers for participation in research. The survey respondents were divided into three groups based on years worked at Mayo Clinic: early-career (<10 years), mid-career (10–20 years), and later-career (≥20 years).

Participants

Participants were internal medicine physician hospitalists at Mayo Clinic. We included full time and part-time hospitalists. Mayo Clinic has a multishield commitment to research, education, and clinical practice. Physicians are expected to participate in all three shields. Physicians can fulfill this expectation through clinical practice and participation in quality improvement, research, and education initiatives. We excluded medical students, residents, and fellows from participation.

Survey Development and Administration

Our survey team developed the survey instrument based on a review of the literature and expert faculty input from all sites. Survey domains included demographic information, current academic rank, research skills and experience, barriers for participation in research, and research skills that hospitalists would like to acquire. The survey responses were de-identified to protect the privacy of respondents. The study data were recorded and managed using Research Electronic Data Capture (REDCap®).[16,17] Each hospitalist received an e-mail with a unique link to the electronic survey; non-respondents received up to two reminders over a six-week period. Participation in the survey was voluntary, de-identified responses were analyzed, and participants were not compensated for their time.

Data Analysis

Data were analyzed using SAS® University Edition (SAS Institute Inc., Cary, NC). Responses on a 5-point Likert scale were condensed into three categories: disagree (strongly

disagree or disagree), neutral, and agree (agree or strongly agree). Responses among physician hospitalists at different career stages were compared using Fisher's Exact test with statistical significance at $p<0.05$.

Results

Participant characteristics

Of 188 physician hospitalists, 52% (n=98/188) responded, which comprised 71% early-career, 21% mid-career, and 7% later-career hospitalists (Table 1). One faculty member had reached the academic rank of 'Professor'. The proportion of female hospitalists ranged from 29% (mid-career) to 43% (later-career). Of the early-career physician hospitalists, 13% worked >50% night shifts. Overall, 90% of early-career physician hospitalists (vs. 76% mid-career and 71% later-career; p=0.41) were interested in participating in research, and most physician hospitalists at all career stages were willing to commit time for research.

Barriers for participation in research

The majority of early-career physician hospitalists had ≤3 publications, whereas the majority of mid-career and later-career hospitalists had >4 publications (Table 1). Physician hospitalists with ≤3 publications reported on barriers for participation in research (Table 2). The barriers, including lack of time, research skills, research funding and mentorship, were similar across career stages (Table 2). Among early-career physician hospitalists, barriers for participation in research included lack of mentorship, time, and research skills despite 47% having a research area of interest.

Factors for success in research and publishing

Physician hospitalists with ≥4 publications (n=48/98) were surveyed on factors for success in research (Table 3). Across career stages, the factors identified were research skills acquired through an advanced degree and being part of a research team. The proportion of physician hospitalists who agreed that mentorship contributed to success differed across early-career, mid-career, and later-career hospitalists (p=0.002). Importantly, a minority of early- and mid-career hospitalists identified funding as a contributor to success: HIM division funding, Mayo Clinic funding, and external (i.e., non Mayo Clinic sources) funding (Table 3). Later-career physician hospitalists identified Mayo Clinic funding and external funding as contributors to success.

Current research skills

Across career stages, physician hospitalists reported generally similar skills to conduct literature searches, critically review the literature, use REDCap®, use EndNote®, submit IRB applications, and write manuscripts (Appendix Table 1). The majority of physician hospitalists had skills to conduct a literature search and review the literature, whereas, relatively fewer had skills to use REDCap®, use EndNote®, submit an IRB application, and write grants (Appendix Table 1).

Development of research skills

Physician hospitalists interested to participate in research reported on research skills they would like to acquire (Table 4). Compared to mid-career and later-career hospitalists, a higher proportion of early-career physician hospitalists was interested in acquiring skills to critically review the literature (p=0.006) and write manuscripts (p=0.02), whereas there was generally similar interest in acquiring skills to conduct literature reviews, use REDCap®, and write grants (Table 4). The observation that physician hospitalists reported having research skills, yet, aspire to develop their skills, suggests that their current skills may be rudimentary and might benefit from further development.

Discussion

We performed this survey of physician hospitalists to compare career stages with attitudes toward research. We observed that most physician hospitalists were interested in participating in research, valued academic promotion, and were willing to commit time for research. Across career stages, the barriers for participation in research were generally similar and included lack of mentorship, time, and funding. Most physician hospitalists with ≥4 publications attributed their research success to mentorship and to being part of a research team. Most physician hospitalists were interested in acquiring diverse research skills to support their academic productivity. Overall, our study characterized attitudes of physician hospitalists based on career stage and identified opportunities for system-level interventions to promote acquisition of research skills.

In this study, early-career physician hospitalists reported several barriers for participation in research including lack of mentorship, time, and research skills. Supporting this observation, early-career physician hospitalists with ≥4 publications attributed their research success to mentorship and being part of a research team. Our results are consistent with previous reports on the role of mentorship in research productivity. A study of hospitalists from 25 programs showed the negative association between lack of mentorship and publishing peer-reviewed first-author papers and non-peer reviewed papers.[5] Our observations may be linked to different mentorship experiences of men and women hospitalists and based on the academic track (clinical education vs. traditional tenure track).[18] Differences in mentorship and scholarly productivity may affect career progression including achievement of leadership positions and academic rank, as recently reported among academic hospital programs.[19] In addition to inadequate mentorship, hospitalists may not receive adequate protected time for research, which contributes to delays in academic promotion and success.[20] Additionally, hospitalists are often expected to focus on patient care, and academic hospitalist leaders reported suboptimal division/departmental support to offer mentorship for nonclinical activities including research.[8] This lack of leadership support on academic and long-term career development of hospitalists can lead to career dissatisfaction, and increased sense of burnout, and ultimately, physician turnover.[8]

In this study, the majority of mid- and later-career hospitalists agreed that lack of funding was a barrier for research, and a minority of early-career physician hospitalists agreed that funding (intramural or extramural) contributed to their success. For early-career physician hospitalists, mentorship, research skills, and time are potentially more critical prerequisites

for research success prior to obtaining funding. This also highlights that early-career researchers may rely on funding from mentors prior to obtaining independent funding. In a national survey, 61% of hospital medicine programs reported receiving ≤$500,000 in total intramural and extramural funding from sources including the Centers for Disease Control and Patient-Centered Outcomes Research Institute. However, most programs in this survey were large, and the level of funding at smaller programs is presumably lower.[2] Without clear funding streams, time for research, and skills to write grants and manuscripts, the research pursuits of hospitalists will likely lag in favor of patient care or local quality improvement initiatives that are prioritized by institutions.

Despite the challenges associated with research, physician hospitalists are willing to commit time to acquire skills for research. In our study, across career stages, physician hospitalists were generally interested in acquiring similar research skills. To our knowledge, this study is the first to characterize barriers for research, current research skills, and research skills that physician hospitalists would like to acquire, based on career stage. This highlights the opportunity to build institution-wide programs to acquire research skills to review the literature, conduct a literature search, build reference libraries, and develop web-based surveys. Such programs could be developed through collaborations with institutional scientific librarians, survey research centers, biostatisticians, and researchers. Such programs would create dual opportunities for mentorship and acquisition of research skills, which may be valuable for newer hospital medicine programs that lack established hospitalist researchers to serve as mentors. As previously suggested, a research agenda in hospital medicine could explore areas including epidemiology, health care delivery, health economics, and decision analysis.[21] Other institutions created programs such as the Successful Hospitalists in Academics and Research (SCHOLAR) Program and Faculty Development Programs to support structured, holistic growth of hospitalists and foster research productivity.[6,22] In addition, there are several scientific platforms for physician hospitalists to publish scholarly work (Appendix Table 2). However, these changes must occur in concert with division- and/or department-level leadership to support the growth of physician hospitalists beyond their clinical role. Ultimately, creating opportunities for career satisfaction could reduce the risk of burnout and facilitate retention, which are particular challenges for early-career and mid-career physicians.[23]

A significant challenge for hospitalists is the paucity of formal programs to develop hospitalist researchers. Physicians can work as hospitalists without completing a fellowship. Sub specialty fellowship programs (e.g., cardiology, nephrology) often incorporate research into fellowship training, which may better positions trainees for continued research productivity after fellowship. The SHM survey showed that 5 of 28 surveyed programs had research training or a fellowship program to develop hospitalist researchers. The other 23 programs cited barriers including lack of funding and lack of a pipeline of hospitalists seeking research training.[2] The SHM website listed 24 hospital medicine programs of varying duration (1–3 years), patient care responsibilities (few weeks to 11 months per year), and rigor of research training (week long courses to formal graduate programs).[24] In comparison, academic general internal medicine was founded in the 1970s (hospital medicine emerged in the mid-1990s) and by 2010, there were over 150 general internal medicine divisions, with better research training programs.[25] Hospital internal medicine will

require a concerted, nationwide effort to develop rigorous, structured programs to develop the next generation of hospitalist investigators.[2] In our study, hospitalists were interested in acquiring research skills, but we did not ask if they would accept a lower salary to reduce patient care duties and acquire research skills, as is typical of research intensive programs.

This study has limitations. The response rate was low at 52%; however, it is higher than the response rate of 28% and 43% reported for surveys of internal medicine specialists.[2,26] The results from this study may not reflect the perceptions and barriers of non-responders, or of physician hospitalists outside of hospital internal medicine. This survey was conducted at several sites within the same institution, and the shared institutional culture may increase homogeneity across sites and may not reflect perceptions and barriers of physician hospitalists at other institutions. This study was a survey and was amenable to recall bias. The career-stage of physician hospitalists was based on years working at Mayo Clinic and did not incorporate prior work experience. Also, we included nocturnists (hospitalists with >50% night shifts), which may lower participation in research activities. Further, this survey focused on foundational research skills, and future studies should survey hospitalists on skills including statistical modeling, predictive analytics, and qualitative research skills. Despite these potential limitations, our study has several strengths. Our survey included a large number of physician hospitalists at different career stages working at hospitals in different geographic regions in the United States. Our survey obtained granular information on specific skills that physician hospitalists would like to acquire. Our results provide a blueprint to develop an institution-wide program to foster research productivity as well as baseline data for subsequent monitoring and evaluation of productivity and success.

Conclusion

In summary, many internal medicine physician hospitalists are interested in developing research skills and initiatives. Our results support creating system-level initiatives to acquire research skills while providing supportive mentorship to facilitate individual growth and progress. Future studies should focus on interventions to increase productivity and research success.

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Appendix

Appendix Table 1:

Current research skills of responding physician hospitalists, by career-stage

	Career stage			
	Early n=70	**Mid n=21**	**Later n=7**	**p-value***
	no. (%)	**no. (%)**	**no. (%)**	
Conduct literature search				0.93
Disagree	4 (6)	1 (5)	0 (0)	
Neutral	7 (10)	3 (14)	0 (0)	
Agree	59 (84)	17 (81)	7 (100)	
Critically review literature				0.84
Disagree	7 (10)	1 (5)	1 (14)	
Neutral	14 (20)	3 (14)	1 (14)	
Agree	48 (70)	17 (81)	5 (71)	
Use REDCap®				0.29
Disagree	39 (57)	7 (33)	5 (71)	
Neutral	10 (14)	5 (24)	1 (14)	
Agree	20 (29)	9 (43)	1 (14)	
Use EndNote®				0.89
Disagree	36 (51)	11 (52)	4 (57)	
Neutral	12 (17)	4 (19)	0 (0)	
Agree	22 (31)	6 (29)	3 (43)	
Submit IRB application				0.37
Disagree	24 (34)	6 (29)	4 (57)	
Neutral	15 (21)	2 (10)	0 (0)	
Agree	31 (44)	13 (62)	3 (43)	
Write manuscripts				0.10
Disagree	21 (30)	2 (10)	4 (57)	
Neutral	14 (20)	3 (15)	0 (0)	
Agree	35 (50)	15 (75)	3 (43)	
Write grants				0.10
Disagree	56 (80)	11 (52)	5 (71)	
Neutral	8 (11)	6 (29)	1 (14)	
Agree	6 (9)	4 (19)	1 (14)	

Career stage based on years employed at Mayo Clinic at time of survey: early-career (<10 years), mid-career (10–20 years) and later-career (≥20 years).

Percentages may not add to 100 due to rounding.

Abbreviations: REDCap®: Research Electronic Data Capture; IRB: institutional review board

* Fisher's Exact Test with statistical significance at $p<0.05$

Appendix

Appendix Table 2:

Journals for hospitalists to publish research*

Journal	Weblink
American Journal of Medical Quality	https://journals.sagepub.com/home/ajm
American Journal of Medicine	https://www.amjmed.com/
Annals of Internal Medicine	https://annals.org/aim
BMJ Quality & Safety	https://qualitysafety.bmj.com/
BMJ Open	https://bmjopen.bmj.com/
CMAJ	https://www.cmaj.ca/content/about-cmaj
Hospital Practice	https://www.tandfonline.com/toc/ihop20/current
JAMA	https://jamanetwork.com/journals/jama
JAMA Internal Medicine	https://jamanetwork.com/journals/jamainternalmedicine
Journal of General Internal Medicine	http://www.jgim.org/
Journal of Hospital Medicine	https://www.journalofhospitalmedicine.com/jhospmed
Journal of Interprofessional Care	Journal of Interprofessional Care
Mayo Clinic Proceedings	https://www.journalofhospitalmedicine.com/jhospmed
PLoS Medicine	https://journals.plos.org/plosmedicine/
Southern Medical Journal	https://sma.org/smj-home/
The BMJ	https://www.bmj.com/
The Lancet	https://www.thelancet.com/
The New England Journal of Medicine	https://www.nejm.org/

* non-exhaustive list, in alphabetical order

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Table 1:

Characteristics of responding physician hospitalists, by career-stage

Characteristics	All stages	Career-stage			
	Total n=98	Early n=70	Mid n=21	Later n=7	p-value*
	no. (%)	no. (%)	no. (%)	no. (%)	
Women	38 (39)	29 (41)	6 (29)	3 (43)	0.57
Current academic rank					<0.0001
No academic rank$^{\phi}$	33 (34)	31 (44)	1 (5)	1 (14)	
Instructor	24 (24)	20 (29)	2 (10)	2 (29)	
Assistant Professor	35 (36)	19 (27)	13 (62)	3 (43)	
Associate Professor	5 (5)	0 (0)	4 (19)	1 (14)	
Professor	1 (1)	0 (0)	1 (5)	0 (0)	
Number of publications					0.0009
0–3	45 (48)	37 (57)	5 (24)	3 (43)	
≥4	48 (52)	28 (43)	16 (76)	4 (57)	
Important to receive and/or be promoted through academic rank					0.12
Disagree	14 (15)	8 (11)	3 (16)	3 (43)	
Neutral	18 (19)	12 (17)	4 (21)	2 (29)	
Agree	64 (67)	50 (71)	12 (63)	2 (29)	
Interested to participate in research	80 (82)	59 (84)	16 (76)	5 (71)	0.41
Interested to participate in HIM research at Mayo Clinic**	77 (96)	56 (97)	16 (100)	5 (100)	1.00
Time that could be committed for research**					0.58
None	1	1 (2)	0 (0)	0 (0)	
1–5 hours per month	26	21 (36)	4 (25)	1 (20)	
6–10 hours per month	32	21 (36)	7 (44)	4 (80)	
>11 hours per month	20	15 (26)	5 (31)	0 (0)	

Career stage based on years employed at Mayo Clinic at time of survey: early-career (<10 years), mid-career (10–20 years) and later-career (≥20 years).

Percentages may not add to 100 due to rounding.

Abbreviations: HIM: hospital internal medicine.

$^{\phi}$Academic appointment application is in process

*Fisher's Exact Test with statistical significance at p<0.05

**Based on number of respondents 'interested in participating in research'

Table 2:

Barriers for research among physician hospitalists with ≤3 publications, by career-stage

	Career stage			
	Early n=37	Mid n=5	Later n=3	p-value*
	no. (%)	no. (%)	no. (%)	
Pursuing other interests				0.85
Disagree	9 (26)	1 (20)	0 (0)	
Neutral	6 (17)	0 (0)	0 (0)	
Agree	20 (57)	4 (80)	3 (100)	
Not interested in research				0.32
Disagree	18 (50)	2 (40)	0 (0)	
Neutral	6 (17)	0 (0)	1 (33)	
Agree	12 (33)	3 (60)	2 (67)	
No time for research				0.94
Disagree	7 (19)	1 (20)	0 (0)	
Neutral	6 (17)	0 (0)	0 (0)	
Agree	23 (64)	4 (80)	3 (100)	
No funding for research				0.68
Disagree	10 (28)	0 (0)	0 (0)	
Neutral	12 (33)	2 (40)	1 (33)	
Agree	14 (39)	3 (60)	2 (67)	
No mentorship for research				0.32
Disagree	5 (14)	0 (0)	0 (0)	
Neutral	7 (19)	3 (60)	0 (0)	
Agree	24 (67)	2 (40)	3 (100)	
No research skills				0.73
Disagree	7 (19)	1 (20)	0 (0)	
Neutral	8 (22)	2 (40)	0 (0)	
Agree	21 (58)	2 (40)	3 (100)	
No research area of interest				0.96
Disagree	17 (47)	2 (40)	1 (33)	
Neutral	6 (17)	1 (20)	1 (33)	
Agree	13 (36)	2 (40)	1 (33)	

Career stage based on years employed at Mayo Clinic at time of survey: early-career (<10 years), mid-career (10–20 years) and later-career (≥20 years).

Percentages may not add to 100 due to rounding.

*Fisher's Exact Test with statistical significance at p<0.05

Table 3:

Factors for success in research among physician hospitalists with ≥4 publication, by career-stage

	Career stage			
	Early n=28	Mid n=16	Later n=4	p-value*
	no. (%)	no. (%)	no. (%)	
HIM division funding				
Disagree	16 (59)	10 (63)	3 (75)	
Neutral	6 (22)	1 (6)	1 (25)	0.49
Agree	5 (19)	5 (31)	0 (0)	
Intramural (Mayo Clinic) funding				0.11
Disagree	16 (59)	6 (38)	2 (50)	
Neutral	7 (26)	2 (13)	0 (0)	
Agree	4 (15)	8 (50)	2 (50)	
Extramural (non-Mayo Clinic) funding				0.80
Disagree	17 (61)	10 (63)	2 (50)	
Neutral	5 (18)	3 (19)	0 (0)	
Agree	6 (21)	3 (19)	2 (50)	
Mentorship				0.002
Disagree	3 (11)	7 (44)	1 (25)	
Neutral	0 (0)	3 (19)	0 (0)	
Agree	25 (89)	6 (38)	3 (75)	
Research skills through advanced degree				0.73
Disagree	17 (61)	8 (50)	2 (50)	
Neutral	2 (7)	3 (19)	0 (0)	
Agree	9 (32)	5 (31)	2 (50)	
Being part of research team				0.84
Disagree	4 (14)	4 (27)	1 (25)	
Neutral	2 (7)	1 (7)	0 (0)	
Agree	22 (79)	10 (67)	3 (75)	

Career stage based on years employed at Mayo Clinic at time of survey: early-career (<10 years), mid-career (10–20 years) and later-career (≥20 years).

Percentages may not add to 100 due to rounding.

Abbreviations: HIM: hospital internal medicine

*Fisher's Exact Test with statistical significance at $p<0.05$

Table 4:

Research skills that physician hospitalists would like to acquire, by career-stage

	Career stage			
	Early n=59	Mid n=16	Later n=5	p-value*
	no. (%)	no. (%)	no. (%)	
Conduct literature search				0.49
Disagree	7 (13)	4 (29)	0 (0)	
Neutral	14 (26)	3 (21)	2 (50)	
Agree	33 (61)	7 (50)	2 (50)	
Critically review literature				0.006
Disagree	6 (11)	2 (14)	0 (0)	
Neutral	11 (19)	6 (43)	4 (100)	
Agree	40 (70)	6 (43)	0 (0)	
Use REDCap®				0.86
Disagree	4 (7)	2 (13)	0 (0)	
Neutral	11 (20)	3 (20)	1 (25)	
Agree	41 (73)	10 (67)	3 (75)	
Use EndNote®				0.14
Disagree	4 (7)	0 (0)	0 (0)	
Neutral	10 (18)	3 (20)	3 (75)	
Agree	42 (75)	12 (80)	1 (25)	
Learn IRB process				0.07
Disagree	7 (12)	2 (14)	0 (0)	
Neutral	15 (26)	4 (29)	4 (100)	
Agree	35 (61)	8 (57)	0 (0)	
Write manuscripts				0.02
Disagree	2 (4)	3 (21)	1 (25)	
Neutral	6 (11)	3 (21)	1 (25)	
Agree	49 (86)	8 (57)	2 (50)	
Write grants				0.33
Disagree	7 (12)	3 (21)	2 (50)	
Neutral	15 (26)	3 (21)	0 (0)	
Agree	36 (62)	8 (57)	2 (50)	

Respondents interested in participating in research (see Table 1) were surveyed about skills

they would like to acquire. Career stage based on years employed at Mayo Clinic at time of survey: early-career (<10 years), mid-career (10–20 years) and later-career (≥20 years).

Percentages may not add to 100 due to rounding.

Abbreviations: REDCap®: Research Electronic Data Capture; IRB: institutional review board

*Fisher's Exact Test with statistical significance at $p<0.05$