

Research and Career Outcomes for Pediatric Hospital Medicine Fellowship Graduates

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ABSTRACT OBJECTIVES: Pediatric hospital medicine (PHM) fellowships have rapidly developed to meet established needs. The purpose of this research was to describe the research and career outcomes of PHM fellowship graduates. We hypothesized that graduates would report significant research and academic productivity.

METHODS: This was an institutional review board–approved, cross-sectional survey of PHM fellowship graduates in 2018. The 88-item survey was modified from an existing survey, developed by experts to address study objectives and pilot tested, and it included quantitative and qualitative items to assess characteristics of fellowship training and research and career outcomes.

RESULTS: A total of 63% of PHM fellowship graduates (143 of 228) completed the survey (graduation dates, 2000–2018). In total, 89% graduated from dedicated PHM fellowship programs, with 59% completing a 2-year fellowship and 78% now practicing primarily at a university or children’s hospital. Fellows conducted research in clinical research (53%), quality improvement (41%), health services (24%), and medical education (19%). A total of 77% of graduates continued to do research after graduation, with 63% publishing and 25% obtaining grant funding. Graduates of 2- and 3-year fellowships and those with a master’s degree were significantly more productive. Graduates now hold important roles in academic and health systems leadership. Graduates are highly satisfied with their decision to do PHM fellowship and identified 5 themes regarding how fellowship impacted their career outcomes.

CONCLUSIONS: In this study, we document robust research activity and leadership positions among PHM fellowship graduates and can serve as a benchmark for metrics that PHM educational leaders can use to assess outcomes and improve training regarding research and career development.

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The field of pediatric hospital medicine (PHM) has grown and developed over the last 25 years with the goal of advancing health care for hospitalized children.¹ Recognizing the imperative to research and study how best to care for children requiring hospitalization and to enhance clinical training, among other reasons, PHM leaders have created fellowship programs, with the earliest dating back to the early 1990s.^{2,3} As more fellowships emerged with varying lengths and requirements,^{4,5} fellowship leaders collaborated to develop a framework for competency in PHM that includes high value care, leadership, patient safety, quality improvement, advocacy, and research.^{6,7} In 2017, the American Board of Medical Specialties, at the recommendation of the American Board of Pediatrics, approved a petition to recognize PHM as a pediatric subspecialty.⁸⁻¹¹ The Accreditation Council for Graduate Medical Education (ACGME) subsequently announced in 2017 that it would begin accrediting 2-year PHM fellowship programs.

Currently, the ACGME requires that 8 months of PHM fellowship be dedicated to an individualized curriculum,^{12,13} and a curricular framework suggests the curriculum also includes 8 months of improvement science, research, medical education, leadership, business administration, patient safety, and advocacy. Past studies have revealed that PHM fellowship graduates are more productive than nonfellowship graduates in research.¹⁴ In a 2014 study, Oshimura et al¹⁵ reported on the career outcomes and perceived training needs of 51 PHM fellowship graduates. This study revealed that graduates benefited from the mentorship, resources and time to conduct research, training, and national networking and that those who completed 2 years or longer of fellowship training had fewer training needs than those who completed a 1-year fellowship. With the rapid growth of PHM fellowships over the last 10 years, a more comprehensive evaluation of the outcomes of PHM fellowship graduates is needed. The objective with this study is to describe the research and career outcomes of PHM

fellowship graduates. We hypothesized that graduates would report significant research and academic productivity on the basis of the premise that people who chose PHM fellowships often sought to pursue academic PHM, that PHM fellowship programs generally required research, and that past work revealed that the majority of PHM fellows conduct research¹⁵ and have scholarship oversight committees.⁵

METHODS

This was a multi-institution cross-sectional study of graduates of PHM fellowship programs from the United States and Canada conducted between July and December 2018. Graduates were eligible to participate if they had completed either a PHM fellowship program or an Academic General Pediatrics (AGP) fellowship program with a hospitalist focus. We chose to include AGP fellows with a hospitalist focus because we sought to be comprehensive in including all hospitalists who pursued fellowship training to become a pediatric hospitalist and recognized that an AGP fellowship was an early path to do so. The study was approved by the participating institutional review boards.

Survey Development

We developed a survey on the basis of review of the literature to address study objectives. We adapted several survey questions with permission from a previously published study of fellowship graduates from AGP programs.¹⁶ Eleven local and national content and survey design experts reviewed the survey items for clarity, construct, and content validity. On the basis of expert review, we revised or eliminated confusing items and added additional items to address missing content areas. The survey was then pilot tested by 4 AGP fellows, who were demographically similar to the study population. Further modifications were made on the basis of feedback from pilot testing. The final survey contained 88 items, primarily multiple-choice questions with several open-ended questions, and addressed participant demographics, characteristics of fellowship training, and research and career outcomes (Supplemental Fig 4).

Recruitment

We identified eligible participants from a database of all PHM fellowship graduates maintained by the Council of Pediatric Hospital Medicine Fellowship Directors. Graduates from both PHM fellowship programs and AGP fellowships with a hospitalist focus were identified by fellowship directors. A total of 228 fellowship graduates with identifiable e-mail addresses were included. Surveys were electronically distributed by Research Electronic Data Capture (www.projectredcap.org) to all eligible participants with autoreminders sent up to 3 times. The survey was deidentified, participation was voluntary, and consent was obtained.

Analysis

We analyzed demographic data using descriptive statistics. We used Fisher's exact test, *t* tests, and analysis of variance tests to determine if research outcomes were associated with fellowship duration and presence of a master's degree using GraphPad (GraphPad Software Inc, San Diego, CA). We coded the qualitative data using conventional content analysis and 2 coders to develop categories and themes.¹⁷

RESULTS

Demographics

Sixty-three percent of PHM fellowship graduates (143 of 228) completed the survey (Table 1). Participants graduated from fellowship programs between 2000 and 2018 in 20 different states in the United States and Canada. Of the respondents, 72% graduated between 2014 and 2018, 21% between 2009 and 2013, and only 7% between 2000 and 2008.

The majority of participants (89%) graduated from a dedicated PHM fellowship program, whereas 9% graduated from an AGP program with inpatient clinical experience, and 2% graduated from combined fellowship programs, such as combined PHM and Health Services Research fellowships. The majority of participants (59%) completed a 2-year fellowship. Some graduates held additional training qualifications, including 47% with a master's degree and 24% with a certificate. Six graduates each held 2

TABLE 1 Demographic Characteristics of Fellowship Graduates

Characteristic	<i>n</i> (%), <i>N</i> = 143
Type of fellowship completed	
PHM	127 (88.9)
AGP	13 (9.1)
Other	3 (2.1)
Fellowship regions	
South (Alabama, District of Columbia, Florida, Georgia, South Carolina, Texas, Virginia)	51 (35.7)
West (Arizona, California, Colorado, Utah)	37 (25.9)
Midwest (Illinois, Indiana, Missouri, Ohio)	27 (18.9)
Northeast (Massachusetts, New Jersey, New York, Pennsylvania)	14 (9.8)
Canada	14 (9.8)
Fellowship duration	
1 y	32 (22.4)
2 y	84 (58.7)
3 ⁺ years	27 (18.9)
Residency type	
Pediatrics	141 (98.6)
Medicine pediatrics	2 (1.4)
Sex	
Female	98 (68.5)
Male	35 (24.5)
Prefer not to answer or data missing	10 (7)
Additional degrees	
No	76 (53.1)
Yes	67 (46.9)
MBA	1
MEd or MHPE	8
MPH	20
MS	36
Other master's or doctoral degree	8
Current faculty appointment	
Yes	126 (88.1)
Tenured	5
Tenure track, not yet tenured	22
Nontenure track	56
Clinician Educator	54
Other	2
No	12 (8.4)
Missing data	5 (3.5)
Current faculty rank (<i>n</i> = 126)	
Instructor	17 (13.5)
Assistant professor	92 (73)
Associate professor	12 (9.6)
Professor	3 (2.4)
Adjunct faculty	2 (1.6)

master's degrees, and no fellowship graduates held a Doctor of Philosophy. Of the master's degrees obtained, 23% were

obtained before fellowship, 64% during fellowship, and 21% after fellowship.

Practice Setting

At the time of the survey, 88% of participants had a faculty appointment, primarily at the assistant professor rank, nontenure track, and in clinician educator lines, and 45% were employed by their fellowship institution, including 41.7% of 2014 to 2018 graduates who were employed by their fellowship institution. The majority (78%) practiced primarily at a university or children's hospital, with 5% practicing primarily at a community hospital and 17% practicing at both a university or children's hospital and a community hospital.

Satisfaction With Fellowship

Participants were on average "very" to "extremely" satisfied with their decision to do PHM fellowship (mean: 4.4 of 5, SD: 0.77). They also reported that they were "likely" to "extremely likely" to recommend PHM fellowship to others (mean: 4.3 of 5, SD: 0.71). Open-ended comments analyzed with conventional content analysis revealed that participants were satisfied in joining a "family-friendly" specialty and in finding mentorship and friendship in the field.

Research and Scholarship During Fellowship

Nearly all graduates (98%) reported conducting research during fellowship, and, among those who reported research, they reported the largest categories as clinical research (53%), quality improvement research (41%), health services research (24%), and medical education research (19%) (Table 2). Many fellows reported participating in multiple categories of research during fellowship.

During fellowship, 87% of participants reported presenting research at a regional or national conference, with 83% presenting an original research project and 31% presenting a workshop. Thirty-eight percent reported having work accepted for publication during fellowship, including 29% publishing a research article and 29% publishing a book chapter, perspective, or nonresearch article. In addition, 34% of participants applied for a

TABLE 2 Research and Scholarship Outcomes

	During Fellowship, <i>n</i> (%), <i>N</i> = 143	After Fellowship, <i>n</i> (%), <i>N</i> = 143
Conducted research?		
Yes	140 (97.9)	110 (76.9)
No	3 (2.1)	33 (23.1)
Had or have a research mentor?		
Yes	124 (86.7)	71 (49.7)
No	19 (13.3)	72 (50.3)
Had scholarship oversight committee?		
Yes	91 (63.6)	—
No	50 (35)	—
Unsure	2 (1.4)	—
Categories of research (multiple possible, <i>N</i> = 140 during, 110 after fellowship):		
Clinical research	74 (52.9)	59 (53.6)
Quality improvement	57 (40.7)	59 (53.6)
Health services research	34 (24.2)	30 (27.3)
Medical education	27 (19.3)	36 (32.7)
Global health	3 (2.1)	5 (4.5)
Basic science	1 (0.1)	3 (2.7)
Other	8 (5.7)	7 (6.4)
Primary fellowship research published? (<i>n</i> = 140)		
Yes	—	63 (45)
No	—	57 (40.7)
Other	—	20 (14.3)
Presentations at regional conferences?		
Yes	79 (55.2)	41 (28.7)
First author	66 (46.2)	24 (16.8)
Coauthor	24 (16.8)	32 (22.4)
Workshops	17 (11.9)	18 (12.6)
No	64 (44.8)	98 (68.5)
Missing data	—	4 (2.8)
Presentations at national conferences?		
Yes	116 (81.1)	96 (67.1)
First author	102 (71.3)	72 (50.3)
Coauthor	50 (35)	70 (49)
Workshops	35 (24.5)	59 (41.3)
No	27 (18.9)	43 (30)
Missing data	—	4 (2.8)
Article accepted?		
Yes	54 (37.8)	77 (53.8)
First-author peer-reviewed original research	37 (25.9)	62 (43.4)
Coauthor peer-reviewed original research	23 (16.1)	59 (41.3)
Other (eg, book chapters, perspectives, nonresearch articles)	41 (28.7)	54 (37.8)
No	84 (58.7)	61 (42.7)
Missing data	5 (3.5)	5 (3.5)
Applied for grant?		
Yes	48 (33.6)	48 (33.6)

grant during fellowship and 21% were awarded a grant. Participants reported that 45% had published their primary fellowship research, and another 11% reported that they had submitted or were preparing to submit their primary fellowship research for publication.

Research and Scholarship After Fellowship

After fellowship, 77% of graduates reported working on a research project, with the largest categories of postfellowship research being clinical research (54%), quality improvement research (54%), health services research (27%) and medical education research (33%).

After fellowship, 71% of participants reported presenting research at a regional or national conference, with 66% presenting an original research project and 44% presenting a workshop. More than half (54%) published after fellowship, including 50% publishing a research article and 38% publishing a book chapter, perspective, or nonresearch article. Participants reported that 34% had applied for a grant and 25% were awarded a grant after fellowship.

Master's Degree and Research Productivity

Subgroup analysis revealed a significant difference in research outcomes for fellowship graduates that held a master's degree compared with those who did not. Specifically, graduates with a master's degree were more likely than fellows without an additional degree to continue research after fellowship, to publish, to apply for grant funding, and to be awarded grant funding (Fig 1).

Fellowship Duration and Research Productivity

In comparing participants by duration of fellowship training (1, 2, or 3 years) by using analysis of variance, there was no significant difference in whether fellowship graduates reported continuing to do research or not ($P = .08$); however, there was a significant impact on likelihood

TABLE 2 Continued

	During Fellowship, <i>n</i> (%), <i>N</i> = 143	After Fellowship, <i>n</i> (%), <i>N</i> = 143
Internal grant	28 (19.6)	37 (25.9)
Foundation grant	20 (14)	22 (15.4)
K-series grant	3 (2.1)	14 (9.8)
Non-K-series federal grant (eg, NIH, AHRQ, PCORI)	2 (1.4%)	6 (4.2)
Other grant	15 (10.5)	10 (7)
No	90 (62.9)	90 (62.9)
Missing data	5 (3.5)	5 (3.5)
Received grant?		
Yes	30 (21)	36 (25.2)
Internal grant	19 (13.3)	27 (18.9)
Foundation grant	14 (9.9)	13 (9.1)
K-series grant	1 (0.7)	10 (7)
Non-K-series federal grant (eg, NIH, AHRQ, PCORI)	0 (0)	4 (2.8)
Other grant	5 (3.5)	6 (4.2)
No	113 (79)	107 (74.8)
Protected time for research during the first 3 years postfellowship?		
Yes	—	67 (46.9)
No	—	76 (53.1)

AHRQ, Agency for Healthcare Research and Quality; NIH, National Institute of Health, PCORI, Patient-Centered Outcomes Research Institute; —, fields that were not assessed for the specified timepoint.

to publish ($P = .03$), to apply for grant funding ($P < .001$), and to be awarded grant funding ($P = .005$) (Fig 2). On further analysis using *t* tests, 2-year fellowship graduates, compared with 1-year fellowship graduates, were not significantly more likely to do research but were significantly more likely to publish ($P = .024$), to apply for grant funding ($P = .003$), and to be awarded grant funding ($P = .014$). Of note, graduates of 3-year fellowship programs, compared with 2-year fellowship graduates, were not more significantly likely to do research ($P = .05$), publish ($P = .48$), apply for grant funding ($P = .19$), or be awarded grant funding ($P = .13$).

Leadership Positions

Participants reported holding a number of academic and health system leadership roles, most notably as medical directors and fellowship directors, with a number of other key educational, quality, and research roles also represented (Fig 3).

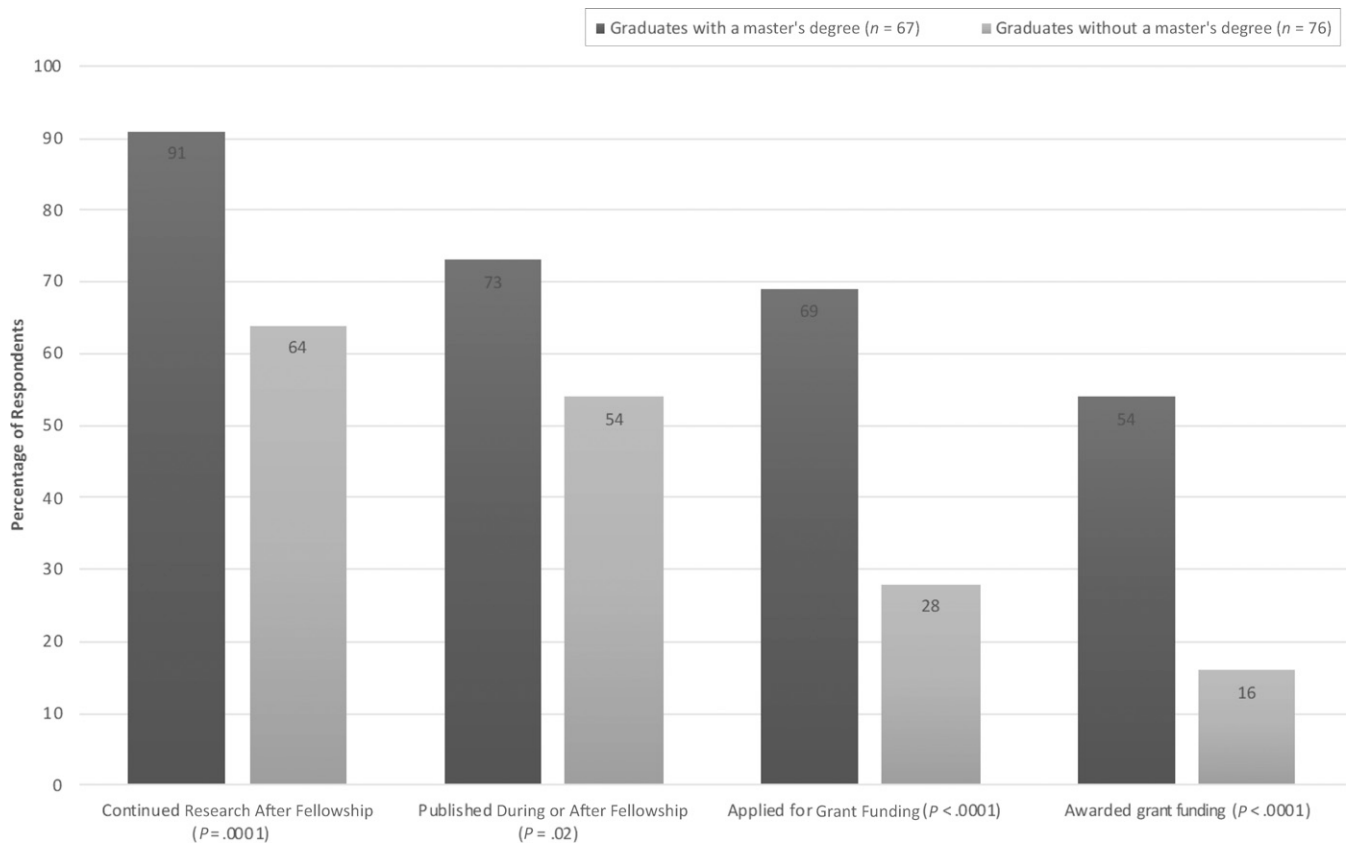


FIGURE 1 Research outcomes for fellowship graduates with and without a master's degree.

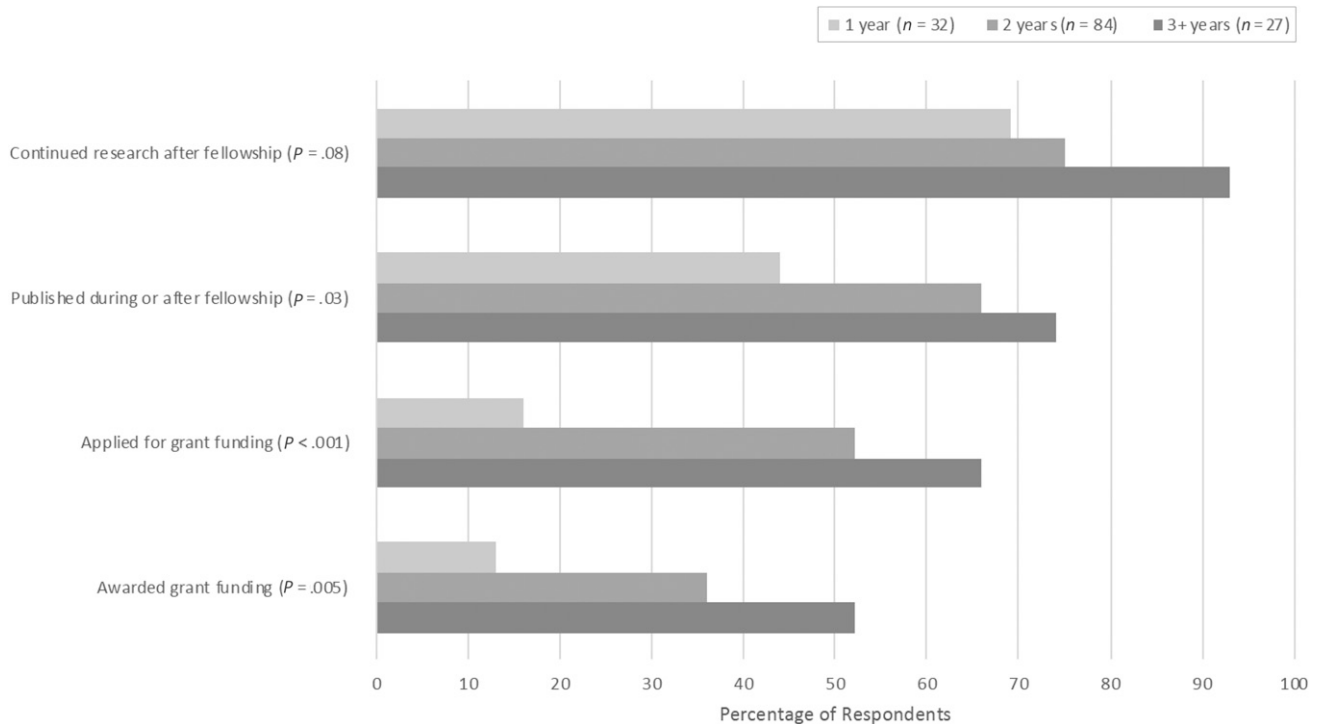


FIGURE 2 Research outcomes for fellowship graduates by fellowship duration.

Awards

Approximately 40% of graduates reported notable accomplishments and awards during or after fellowship training. Notable accomplishments included clinical program development, national leadership and committee work, and community engagement. Graduates also reported successful completion of training programs in education, research, and quality improvement. Participants received awards in areas such as clinical care, teaching, research, quality improvement, advocacy, service, and leadership.

Impact of Fellowship on Career

Analysis of qualitative data from participants' open-ended comments about the impact of fellowship on graduates' careers yielded 5 themes: (1) fellowship provides exposure to diverse career paths and helps fellows develop an academic niche; (2) fellows develop expertise in health systems and clinical care; (3) fellows build a foundation in QI, advocacy, research, and education; (4) fellowship teaches research

skills and provides scholarly opportunities; and (5) fellowship accelerates career trajectory through mentorship, networking and professional opportunities (Table 3).

Fellowship Provides Exposure to Diverse Career Paths and Helps Fellows Develop an Academic Niche

Fellowship provides experiences in the breadth of opportunities and diversity of career paths in the field. During training, fellows have opportunities to develop a broad foundation in many skills necessary to succeed in academic medicine. They are ultimately able to focus on developing their niche in academic PHM through mentorship, protected time, and specific career development opportunities.

Fellows Develop Expertise in Clinical Care and Health Systems

Fellowship is a time of rapid development of clinical skills, such as management of medically complex children and clinical leadership skills. Fellows learn from exposure to various practice settings, such as community hospitals and freestanding

children's hospitals, as well as from caring for different groups of patients (newborns, older children, complex care, surgical comanagement). They also learn about the infrastructure and management of health care systems.

Fellows Build a Foundation in Quality Improvement, Research, Education, and Advocacy

Beyond clinical training, fellows are able to build specific skills in other core competencies, including quality improvement, medical education, advocacy, global health, and health care technology. Often, these skills lead to specific scholarship or subsequent leadership positions.

Fellowship Teaches Research Skills and Provides Scholarly Opportunities

Scholarly training is a core mission of PHM fellowship, and fellows feel prepared to launch research careers. Many fellows benefit from specific research coursework or obtain a master's degree during fellowship. They develop lifelong research

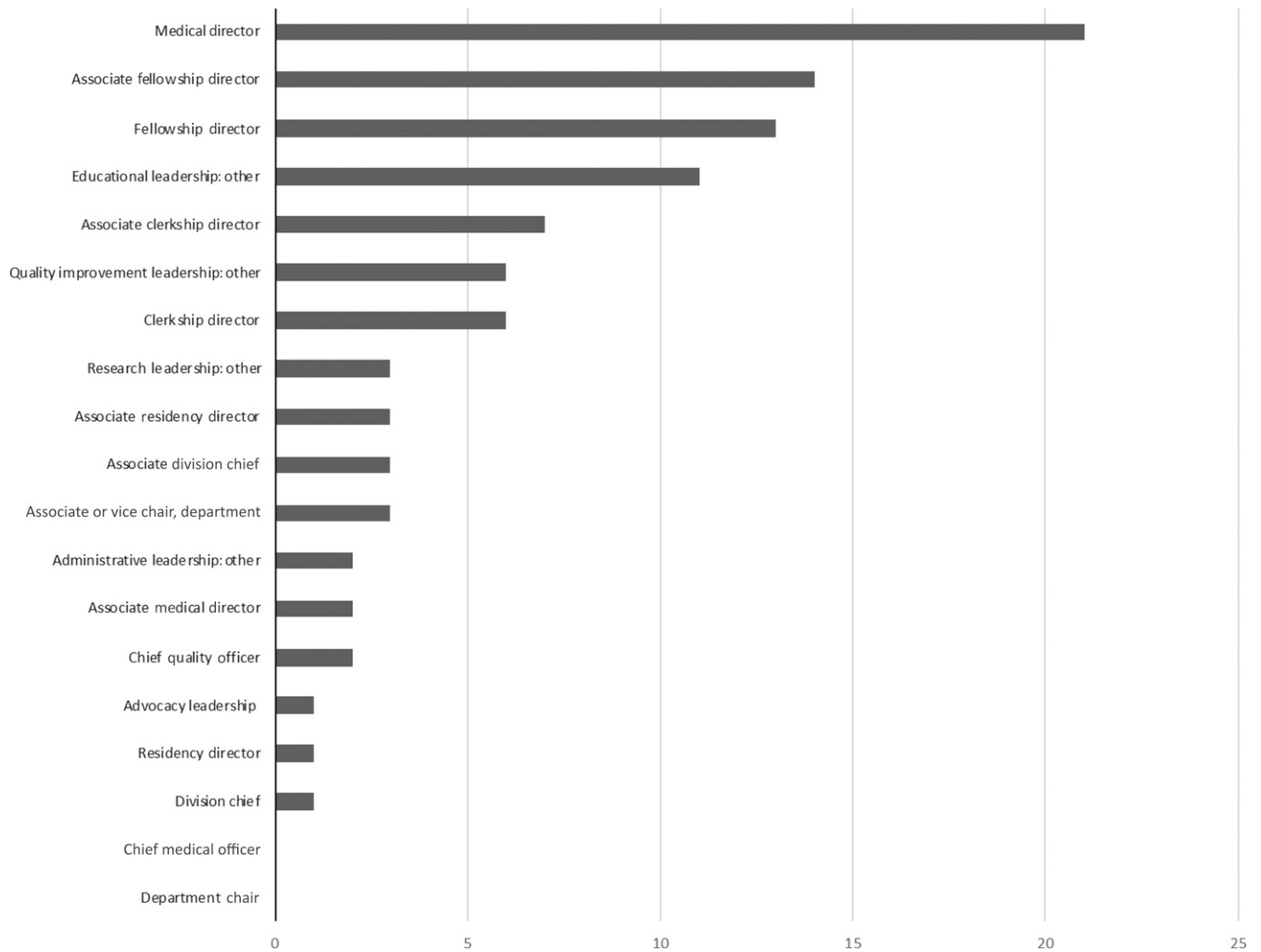


FIGURE 3 Number of fellowship graduates holding leadership positions.

collaborations, mentors, and academic focus. They learn how to apply for grants and to plan, conduct, and disseminate research.

Fellowship Accelerates One's Career Trajectory Through Mentorship, Networking, and Professional Opportunities

Many graduates feel fellowship helped them launch a successful academic career in PHM. They have a sense of community within the field, created through national collaborations, networking, and mentorship. Completing fellowship helped them secure competitive jobs and leadership positions, opened career opportunities, and gave them negotiating power in the job search. Participants

reflected that fellowship helped build their academic portfolio, taught academic rigor, and led to increased future productivity.

DISCUSSION

In this survey, we found that the majority of PHM fellowship graduates held academic appointments and practiced in a university or children's hospital, often at the institution where they completed fellowship. The majority of participants held academic and health system leadership roles, most often as medical directors or fellowship directors. Graduates were highly satisfied with their fellowship training and were highly likely to recommend fellowship to others. The frequent retention of fellowship graduates

at their fellowship institution highlights the impact of fellowship development on faculty recruitment.

Ninety-eight percent of participants reported doing research during fellowship, and the majority continued research after fellowship. Fellowship graduates conduct research predominantly in the areas of clinical research, quality improvement, health services research, and medical education, and they reveal robust scholarly activity, with more than half having published articles and one-quarter receiving grant funding. Graduates with a master's degree had significantly greater research productivity than those without, and graduates of 2- and 3-year fellowship programs were significantly more

TABLE 3 Themes, Subthemes, and Representative Quotes about How Fellowship Impacted Graduates' Careers

Themes and Subthemes	Representative Quotes
<p>Fellowship provides exposure to diverse career paths and helps fellows develop an academic niche</p> <ul style="list-style-type: none"> Provides academic skill development Provides time, structure, and focus to develop niche Exposes various career paths Highlights breadth of PHM Opens new career paths 	<p>"Allowed me time to obtain ample mentorship and experience in different areas of academia. I was able to develop research skills during fellowship and discover my academic niche."</p> <p>"It opened my eyes to a whole world of nonclinical opportunities and interests, including QI and medical education."</p> <p>"Introduced new career paths in hospital medicine."</p>
<p>Fellows develop expertise in clinical care and health systems</p> <ul style="list-style-type: none"> Expand clinical skills See diverse practice settings and areas of PHM Develop expertise in health care systems 	<p>"It helped me to strengthen my clinical skills and to become a better teacher and mentor to all levels of learners."</p> <p>"Allowed me to broaden my horizons and skill-set. It not only made me a better clinician, but it also allowed me to explore other areas of interest that then set me up for success within our organization."</p> <p>"Improved knowledge of hospital system and administration."</p>
<p>Fellows build a foundation in QI, research, education, and advocacy</p> <ul style="list-style-type: none"> Develop skills in QI, advocacy, research, education, and informatics Learn content from national PHM Fellows' Conference 	<p>"Fellowship was key to providing me with the time and guidance to explore my scholarly interests. It provided me with the basic training in research, QI, education, and leadership that I needed to pursue an academic career."</p> <p>"Laid the groundwork for education and QI projects, which continue to this day."</p> <p>"The protected time and mentorship I had in fellowship allowed me to hone my clinical and education skills as well as gain research and QI skills that probably would have taken years for me to develop had I not done a fellowship."</p>
<p>Fellowship teaches research skills and provides scholarly opportunities</p> <ul style="list-style-type: none"> Provides opportunities to obtain a master's degree Encourages research collaborations Promotes presentation opportunities Fosters successful grant applications Increases scholarly productivity 	<p>"The mentorship, research experience and leadership training was so critical to getting me to where I am now."</p> <p>"I walked through all the parts of a clinical research project from concept, IRB, conduction, analysis, and publication."</p> <p>"Completion of a PHM fellowship allowed me to complete my master's degree, gain local and national mentorship, and to participate in multiple research endeavors. This subsequently allowed me to obtain a faculty position with protected time for research, which aligned with my career goals."</p>
<p>Fellowship accelerates one's career trajectory through mentorship, networking, and professional opportunities</p> <ul style="list-style-type: none"> Fosters professional community Promotes networking and collaborations Teaches administrative skills Encourages rigor Builds academic portfolio Provides career opportunities and negotiating power, including for competitive jobs and protected time Opens doors for leadership roles 	<p>"It connected me to national leaders in PHM and gave me lifelong career and research mentors. It definitely gave me a boost in the job search too."</p> <p>"Put me on the fast track to institutional leadership roles and allowed me to create a network that has led to multiple national collaborations."</p> <p>"Extremely valuable for mentorship . . . and resultant networking nationally. Armed me with leadership and QI research skills and practical application, allowed me to apply for academic jobs which would not have been open to me had I not done fellowship."</p> <p>"Clinically, administratively, academically and regarding research/QI, I was at the level of colleagues 5 years my senior who did not do a fellowship. I was able to step into leadership roles 2 years after fellowship."</p>

QI, quality improvement.

productive compared with graduates of a 1-year fellowship program.

Of importance in this study is that nearly three-quarters of our participants were within 5 years of fellowship graduation and >86% were at the assistant professor or instructor level, with some only 1 year or less out from graduation. Despite their relative youth, our participants showed early evidence of robust scholarly output that could lead to greater productivity over time. The field of PHM is ripe with opportunities to conduct scholarship to improve health and systems of care. Many advances in research and health care systems innovations have occurred through the birth of the field of PHM. Our study added to the literature by revealing that fellows felt equipped with skills and experience to define an academic niche and launch a career in PHM. Our data align with data from other fields, including ophthalmology and pediatric plastic surgery, that have revealed increased scholarly productivity among fellowship graduates compared with non-fellowship-trained physicians.^{18,19}

Graduates of 2-year fellowship programs were significantly more likely to publish, to apply for grants, and to receive grants than graduates of 1-year programs. Our data did not reveal significant differences in productivity between graduates of 2- and 3-year fellowship programs, although there was a trend suggesting possible increased productivity for 3-year fellowship graduates. Nonetheless, the finding that 2-year fellowship graduates demonstrated significant research and scholarly productivity is important because the American Board of Pediatrics seeks to ensure all pediatric subspecialists are competent in conducting research while not wanting to extend training duration unnecessarily. Some 3-year fellowship programs exist, which provide an important option for fellows who would like expanded research training, which often includes a master's degree. Although 1-year fellowship programs have phased out, a number of our participants had completed a 1-year fellowship program, and those graduates

reported continued engagement in research, but less productivity in their research efforts compared with graduates from 2+ year programs. This finding suggests that their training was suboptimal in preparing them for research, which aligns with the study by Oshimura et al¹⁵ revealing greater unmet research training needs for fellows who completed a 1-year as compared with a 2-year or longer fellowship. Other 2-year pediatric fellowship models have also revealed research productivity in their graduates, most notably AGP fellowships.¹⁶ With the shift in PHM fellowships toward ACGME Accreditation beginning in 2019, some programs may have shifted their balance between clinical and scholarly time, such as by increasing or decreasing clinical time. In addition, new PHM fellowships are developing primarily in the form of 2-year programs. These shifts in scholarly training time may result in changes to scholarly productivity, which will require ongoing evaluation.

In our qualitative data analysis, we found evidence that fellowship prepares graduates well for diverse academic career paths, helps them build a strong foundation in key health systems and scholarly areas, provides important research training and opportunities, and accelerates their career paths through mentorship, networking and professional opportunities. The concepts of mentorship, networking, and training are important in building research and academic success and are crucial elements of fellowship training. The development and expansion of PHM fellowships is serving an important role in providing these critical resources for PHM fellows, who represent an important part of the pediatric hospitalist workforce, which has previously been described as desiring to do research but reporting obstacles related to lack of time, mentorship, and resources.²⁰ The importance of fellowship training in quality improvement and research also aligns with a study by Librizzi et al, which revealed higher levels of competence in these areas for PHM fellowship graduates compared with hospitalists who had not completed fellowship training.¹⁴

Our data can serve as a benchmark for fellowship leaders to inform improvements for PHM training programs. Specifically, fellowship programs may be able to examine their own graduates' outcomes to determine opportunities to improve the training they provide in research, quality improvement, leadership and career development. Our findings can also help educational leaders advise potential fellowship candidates about the career paths of PHM fellowship graduates. These data may be useful for prospective applicants seeking to understand the career outcomes of PHM fellowship graduates and for employers to understand the value of completing a PHM fellowship. Finally, our findings reveal how a 2-year fellowship can prepare graduates for careers in academia and leadership, which may be useful for other specialties. Some residents have cited duration of specialty training as a barrier to pursuing a fellowship;^{21,22} therefore, our data may be useful to other pediatric subspecialties facing workforce shortages and seeking to shorten the duration of their fellowship training to 2 years while still promoting significant scholarly activity.

There are several limitations to our study. First, this was a descriptive study in which we used self-reported data intended to describe a population of PHM fellowship-trained hospitalists; we therefore did not have a control group, and our data could have been subject to recall bias. Second, we sampled graduates who were at different phases of their career, including some who had graduated within the last year as well as some who were up to 18 years out from graduation. Therefore, our participants' career outcomes were heterogeneous and represented varying stages of careers. Third, although we had a >60% response rate, our study may have been subject to sampling bias and nonresponse bias. We are unable to report any data on the participants who did not complete the survey because our survey was deidentified and we do not have data on the nonrespondents. Finally, our participants were PHM fellowship graduates who made a choice to do fellowship at a time when PHM fellowships

were not required for subspecialty certification. As such, they may not represent current and future PHM fellows who may enter fellowship in part because of the American Board of Pediatrics PHM certification requirements.

CONCLUSIONS

This is the largest study to date to describe the research and career outcomes of PHM fellowship graduates. PHM fellowship graduates demonstrate robust scholarly activity and positions in academic and health systems leadership. In this study, we highlight key factors that impact research and career outcomes, including duration of fellowship and training characteristics, and can inform future improvements in fellowship programs. Building off past collaborations from the PHM Fellowship Directors' Council, which has developed shared curricula, goals and objectives, research training materials, mentorship and networking opportunities, and career development opportunities, this study adds to the council's outcomes and can serve as a benchmark for future metrics in PHM fellowship graduate research and career outcomes.

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