NOTES FROM THE ASSOCIATION OF MEDICAL SCHOOL PEDIATRIC DEPARTMENT CHAIRS, INC.

The Impact of Primary Mentors and Career Development Committees on Junior Faculty Productivity in a Pediatric Academic Health Center

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Access to quality mentorship is an important factor in determining junior faculty members' career development, job satisfaction, and success, as well as a key component of institutions' endeavors to build the next generation of diverse faculty members and leaders in academic medicine.[1-7] However, few studies have rigorously evaluated the longitudinal association between mentorship initiatives and measures of academic productivity, such as manuscripts and grants.[8,9] Furthermore, little is known about the effectiveness of mentorship programs by sex or academic track (eg, clinical vs research) among academic faculty. Such evidence is essential to evaluate the effectiveness and return on investment of mentorship initiatives and to ensure that programs reach those who will benefit the most.

The majority of studies examining mentorship in academic medical centers have focused on reviews of mentorship program elements, characteristics of successful mentor–mentee relationships, and such program outcomes as participant satisfaction and retention rates in the mentoring programs, mentoring program meeting attendance, nominations for professional awards and committees, and attainment of promotion. For example, Kashiwagi et al[3] reviewed 16 articles describing 18 mentoring programs for physicians in academic medicine. Their study identified key program elements that might contribute to successful physician mentoring, including mentor preparation, organizing a planning committee, using mentorship compacts/contracts, pairing mentors and mentees, funding mentorship programs, compensating participants, and conducting program evaluations. The studies described in this systematic review used various measures to assess the effectiveness of the mentoring programs, including subjective data from mentees to assess satisfaction with the program, self-reported psychosocial benefits, and development of professional skills. They also obtained various objective measures to assess mentoring program retention rates, meeting attendance, nominations for professional awards and committees, and promotion.[3] In a systematic review of qualitative research studies, Sambunjak et al[10] examined the initiation and cultivation phases of mentoring relationships in academic medicine and identified a set of mentoring functions and characteristics that facilitated the mentee's academic and personal growth in academic medicine. Another review identified 21 studies that evaluated the impact of mentorship on research development and productivity.[9] A significant number of these studies examined the impact of mentors on mentees' confidence in research and desire to seek research training and the association between having a mentor and conducting research before medical school. The authors also examined the correlation between the presence of a mentor and successful completion of fellowship research requirements and the number of projects undertaken.[9] However, only 4 of these 21 studies examined the association between having an influential mentor and measures of academic productivity (publication of 1 or more papers annually and principal investigator [PI] on a federal grant). Two of those studies were reviews of primary care research fellowship programs.[11,12] The other 2 studies that examined the influence of a mentor on the mean number of publications for faculty were retrospective studies that focused solely on women faculty in departments of medicine[4] and full-time faculty of medical schools.[13] Neither of the studies that focused on faculty examined the effect of mentorship and sex (male vs female) or track (clinical vs research) on academic productivity.

To our knowledge, no published studies have longitudinally examined the association between mentoring and measures of academic productivity for junior faculty members in a pediatric academic health center, by academic track. Therefore, we conducted a study to examine whether implementation of a mentoring program for junior faculty, including the recommendation for all junior faculty to have a primary mentor and a Career Development Committee (CDC), was associated with measures of academic productivity and whether associations differed by track. Our specific aims were (1) to examine prospectively the association between having a primary mentor and/or a CDC and measures of academic productivity, including promotion, publications, and successful attainment of grants, and (2) to determine whether these associations differed by academic track. We hypothesized that junior faculty members' report of a primary mentor and/or a CDC would be associated with a higher number of grants attained and manuscripts published during the subsequent 1-year period, and that clinical track vs research track faculty would be more likely to benefit.

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The authors declare no conflicts of interest.

https://doi.org/10.1016/j.jpeds.2020.10.037

Methods

Participants

At the beginning of the study, a total of 738 faculty members held primary appointments in the Department of Pediatrics (47% females; 53% males). Data were analyzed for faculty holding appointments as instructors or assistant professors at the time of the study (including MDs, PhDs, PsyDs, and EdDs). The faculty tracks at the time of the study included the following: clinician-educator (focus on clinical and educational work), research (focus on research), tenure (focus on developing an independent research career), and field service (terminally degreed but not in a traditional clinical or research track; focus on service to the organization).

Faculty Mentorship Initiative

The Office of Academic Affairs and Career Development at Cincinnati Children's Hospital Medical Center implemented a comprehensive faculty mentoring initiative in 2016 to (1) equip junior faculty members with the information, tools, skills, and support necessary for them to define and achieve their career objectives; (2) empower junior faculty members to align personal career goals with institutional goals so that they are well integrated into the institution and are optimally contributing to strategic initiatives in such areas as patient care, research, education, and quality improvement; and (3) foster a culture of excellent mentoring throughout the institution by providing evidence-based mentor and mentee training, utilizing the mentoring expertise of senior faculty, setting expectations for mentees and mentors, recognizing outstanding mentoring, and supporting multiple mentoring modalities including peer and group mentoring. The components of the program included mentorship resources, mentorship seminars and symposia, mentor training, and the expectation that all junior faculty have a primary mentor (CDC optional). This expectation was conveyed to division directors and faculty through multiple venues, including meeting presentations, e-mails, and seminars. All components of the mentorship initiative are outlined in **Table I** (available at www.jpeds.com). Participation in the program was encouraged but not required.

Data Collection and Statistical Analyses

Completion of an annual faculty evaluation, which takes place at the beginning of each calendar year, is required for all faculty in the Department of Pediatrics. In January 2017, 2 questions were added to the annual evaluation: (1) do you have a primary mentor? and (2) do you have a CDC? Instructors' and assistant professors' responses to these 2 questions were the independent variables for this study. Dependent (outcome) variables were measured for 2017 (postevaluation submission) and 2018, including (1) number of publications in 2017 through April 2018 (having at least 1 publication and mean/median total number of publications) measured using an electronic database; (2) promotion (yes/no), assessed using the institutional promotion database; and (3) external (foundation or federal) grants obtained as PI or site PI, assessed using the institution's electronic grant tracking system.

Faculty data were included in the analysis if they were a member of the Department of Pediatrics and an instructor or assistant professor at the time of their 2017 evaluation. Faculty hired in calendar year 2017 were not included. Additional information collected on the faculty included sex, race, initial hire date, current and previous rank, and division within the Department of Pediatrics.

Differences in the outcome variables (promotion, publications, and grants) were compared by independent variables (ie, report of a primary mentor, report of a CDC, and report of both) using either the χ^2 or Fisher exact test as appropriate, for categorical variables. Because the continuous variables of years at initial rank and number of publications were nonnormally distributed (significantly right-skewed for both variables), median with IQR values were reported, and the Kruskal–Wallis test was used to test associations. Because the faculty tracks are inherently different (eg, more research focused vs more clinically focused), we stratified the analyses by faculty track to evaluate possible differences in the associations by these factors. For the purpose of these analyses stratified by track, research and tenure track faculty were classified as "research." Because the field service track included only 15 faculty, the small sample size made it difficult to draw inferences regarding this group. Thus, we excluded data from field service track faculty from the stratified analyses. We also conducted an exploratory analysis to gain a better understanding of differences in mentoring and outcomes by sex.

Results

Faculty Characteristics

Data for all 319 junior faculty (instructors and assistant professors) in the Department of Pediatrics for calendar year 2017 were included in the main analyses: 28 (8.8%) were instructors, and 291 (91.2%) were assistant professors; 176 (55%) were women. The majority of faculty were on the clinician-educator track (n = 216; 67.7%), followed by the research track (n = 61; 19.1%), tenure track (n = 27; 8.5%), and field service track (n = 15; 4.7%). Among the junior faculty, the majority were white (n = 245; 76.8%), 17.9% (n = 57) were Asian, 2.5% (n = 8) were Black/African American, 1.3% (n = 4) were Hispanic, and 9 were listed as unknown race. One hundred and eight participants (34%) reported both a primary mentor and a CDC, 32% reported either a mentor or CDC, and 34% reported neither.

Of the participants, 233 (73%) had at least 1 publication during the study period (2017-2018); the median number of publications was 2 (IQR, 0-5). During the study period, 37 individuals (11.6%) received promotions; 5 were promoted from instructor to assistant professor and 32 were promoted from assistant professor to associate professor. One

Table II. Characteristics and measures of academic productivity by mentor category for all junior faculty

Characteristic	Mentor and CDC (N = 108)	Mentor or CDC (N = 102)	Neither (N = 109)	*P* value
Female sex, n (%)	61 (56.5)	49 (48.0)	66 (60.6)	.18
Race, n (%)				.33
White	78 (72.2)	79 (77.5)	88 (80.7)	
Asian	22 (20.4)	18 (17.7)	17 (15.6)	
Black/African American	2 (1.9)	4 (3.9)	2 (1.8)	
Unknown	6 (5.6)	1 (1)	2 (1.8)	
Hispanic	0	2 (2)	2 (1.8)	.47*
Initial faculty rank, n (%)				.53
Instructor	9 (8.3)	8 (7.8)	13 (11.9)	
Assistant professor	99 (92.7)	94 (92.2)	96 (88.1)	
Years at initial rank, median (IQR)	4.5 (3-6)	5 (3-7)	6 (4-10)	.01
Faculty track, n (%)				
Clinician-educator	71 (65.7)	63 (61.8)	82 (75.2)	.02
Research	35 (32.4)	34 (33.3)	19 (17.4)	
Field service	2 (1.9)	5 (4.9)	8 (7.3)	
Measures of academic productivity				
Promoted in 2017, n (%)	15 (13.9)	10 (9.8)	12 (11.0)	.64
At least 1 publication 2017/2018, n (%)	91 (84.3)	79 (77.5)	63 (57.8)	<.0001
Number of publications in 2017/2018				
Mean (SD)	4.9 (5.7)	3.5 (4.2)	2.3 (3.5)	
Median (IQR)	3 (1-7)	3 (1-5)	1 (0-3)	<.0001
Received at least 1 externally funded award, as PI or site PI, in 2017/2018, n (%)	53 (49.1)	36 (35.3)	39 (35.8)	.07

*Fisher exact test.

Table III. Associations between having a mentor and/or a CDC and measures of academic productivity, analyses stratified by track (clinician-educator and research)

Parameter	Mentor and CDC	Mentor or CDC	Neither	*P* value
Clinician-educator track	N = 71	N = 63	N = 82	
Promoted in 2017, n (%)	10 (14.1)	5 (7.9)	10 (12.2)	.53
At least 1 publication in 2017/2018, n (%)	61 (85.9)	50 (79.4)	45 (54.9)	<.0001
Number of publications in 2017/2018				
Mean (SD)	4.3 (5.2)	3.1 (3.6)	1.5 (2.1)	<.0001
Median (IQR)	3 (1-6)	2 (1-4)	1 (0-2)	
Received at least 1 externally funded award, as PI or site-PI, in 2017/2018, n (%)	27 (38)	18 (29.6)	23 (28.1)	.35
Research track	N = 35	N = 34	N = 19	
Promoted in 2017	5 (14.3)	5 (14.7)	2 (10.5)	1.0*
At least 1 publication in 2017/2018, n (%)	29 (82.9)	26 (76.5)	15 (79)	.80
Number of publications in 2017/2018				
Mean (SD)	6.3 (6.6)	4.7 (5.2)	6.1 (5.5)	
Median (IQR)	5 (2-9)	4 (2-5)	5 (3-9)	.28
Received at least 1 externally funded award, as PI or Site-PI in 2017/2018, n (%)	25 (71.4)	17 (50)	13 (68.4)	.15

*Fisher exact test.

hundred twenty-three faculty (40.5%) received extramural funding as a PI or site PI during the study period.

Associations Among Faculty Characteristics, Measures of Academic Productivity, and Mentor Categories

The median years at the initial rank was significantly associated with mentor category: number of years was highest for those with neither a mentor nor a CDC (Table II). However, time in rank was not associated with publications or extramural funding (data not shown). Faculty track was also associated with mentor category; a higher proportion of clinician-educator track faculty and field service track faculty had neither a mentor nor a CDC compared with a mentor and/or a CDC, whereas a higher proportion of research track faculty had a mentor and/or a CDC compared with neither.

Junior faculty had higher productivity over the 1-year period following assessment of mentorship as measured by publications if they identified both a primary mentor and CDC vs only a primary mentor or CDC vs neither. Faculty who identified both a primary mentor and CDC were also more likely to have received at least 1 externally funded award, although this difference was not statistically significant ($P = .07$).

Analyses stratified by track are shown in Table III. Having a mentor and a CDC was significantly associated with publications (at least one publication and median number of publications) among clinician-educator track faculty, but not among research track faculty. No associations were noted between having a mentor/CDC and either promotions or extramural grant funding for either faculty track.

Analyses stratified by sex are shown in Table IV. Among female faculty, having a mentor and a CDC was associated with having at least 1 publication, a higher median number of publications, and having received at least 1 externally funded award. These associations between mentor categories and academic productivity metrics were not noted among male faculty.

Finally, we explored differences in mentor categories and academic productivity by sex. Female faculty were more likely than male faculty to be on the clinician-educator track. There were no differences between female and male faculty in terms of whether they had a mentor and/or a CDC, initial faculty rank, or years at rank (Table V). Differences did exist in academic productivity metrics, however. Compared with male faculty, female faculty were less likely to be promoted, had fewer publications, and were less likely to have received at least 1 externally funded award.

Discussion

Compared with junior faculty who reported having either a mentor or CDC or neither, those who reported having a primary mentor and a CDC published more manuscripts over the following 1-year period, as hypothesized. Our findings are consistent with studies of medical research fellowship

Table IV. Associations between having a mentor and/or a CDC and measures of academic productivity, analyses stratified by sex

Parameter	Mentor and CDC	Mentor or CDC	Neither	*P* value
Female faculty	N = 61	N = 49	N = 66	
Promoted in 2017, n (%)	8 (13.1)	4 (8.2)	3 (3.0)	.10*
At least 1 publication in 2017/2018, n (%)	51 (83.6)	36 (73.5)	31 (47)	<.0001
Number of publications in 2017/2018				<.0001†
Mean (SD)	4.0 (4.1)	3.2 (3.6)	1.3 (2.1)	
Median (IQR)	3 (1-6)	2 (0-5)	0 (0-2)	
Received at least 1 externally funded award in 2017/2018, n (%)	28 (45.9)	14 (28.6)	16 (24.2)	.03
Male faculty	N = 47	N = 53	N = 43	
Promoted in 2017, n (%)	7 (14.9)	6 (11.3)	10 (23.3)	.28
At least 1 publication in 2017/2018, n (%)	40 (85.1)	43 (81.1)	32 (74.4)	.44
Number of publications in 2017/2018				
Mean (SD)	6.0 (7.2)	3.9 (4.7)	3.9 (4.4)	.19†
Median (IQR)	4 (1-8)	3 (1-4)	3.0 (0-6)	
Received at least 1 externally funded award in 2017/2018, n (%)	25 (53.2)	22 (41.5)	23 (53.5)	.39

*Fisher exact test.
†*P* value derived from a Kruskal–Wallis test, and refers to the difference between the medians, because the data were skewed.

training programs[11,12] as well as 2 previous studies of women in Departments of Medicine[4] and full-time medical school faculty,[13] all of which suggested that mentored individuals are more likely than individuals without mentorship to have higher academic productivity. This finding may be explained by the fact that navigating the academic health center as a junior faculty member may be quite challenging without the benefit of advice and coaching from a mid- or senior-level faculty mentor. Mentors may provide junior faculty members with support critical to achieve professional success, including psychosocial support, expertise, recommendations for relevant collaborators outside the division, skills gap identification, sponsorship, leadership skill development, advice regarding alignment of career goals and activities, and acclimation to the expectations and culture in academic medicine.[10] The results of our study also provide evidence that CDCs further enhance the productivity of junior faculty members, even those who already have a primary mentor. This could be explained by the fact that given the complexity in today's academic health center environments and time constraints resulting from the multiple demands on faculty members' time, it is highly improbable that a single mentor will be able to meet the various mentoring needs of a junior faculty member.[14]

Table V. Characteristics and academic productivity by sex (female and male faculty)

Characteristics/academic productivity	Female faculty (N = 176)	Male faculty (N = 143)	*P* value
Mentor categories, n (%)			
Mentor and CDC	61 (34.7)	47 (32.9)	
Mentor or CDC	49 (27.9)	53 (37.1)	.18
Neither	66 (37.5)	43 (30.1)	
Faculty track, n (%)			.0001
Clinical-educator	133 (75.6)	83 (58.0)	
Research/tenure	32 (18.2)	56 (39.2)	
Field services	11 (6.3)	4 (2.8)	
Initial faculty rank, n (%)			.33
Instructor	14 (8)	16 (11.2)	
Assistant professor	162 (92)	127 (88.8)	
Years at initial rank, median (IQR)	5 (3-7)	5 (4-8)	.18
Promoted in 2017, n (%)	14 (8)	23 (16.1)	.02
At least 1 publication 2017/2018, n (%)	118 (67.1)	115 (80.4)	.007
Number of publications in 2017/2018			
Mean (SD)	2.8 (3.5)	4.6 (5.6)	
Median (IQR)	2 (0-4)	3 (1-6)	.0003*
Received at least 1 externally funded award, as PI or site-PI, in 2017/2018, n (%)	58 (33)	70 (49)	.004

*Wilcoxon rank-sum test.

In analyses stratified by track, the association between having a primary mentor and a CDC and academic productivity (as measured by number of publications) was only significant for junior faculty on the clinician-educator track, not for those on the research track. One explanation for this finding is that traditional mentor–mentee relationships are deeply embedded in the academic and postdoctoral training processes for basic scientists; however, the same may not be true for physician training programs. Furthermore, in addition to research and teaching requirements, faculty on the clinical track also engage in the provision of clinical services. These clinical activities can be unpredictable and time-consuming and often require a significant number of hours outside the clinical setting for tasks such as documentation, follow-up with patients and collaborating physicians, and clinical recertification. These clinical activities, in combination with administrative responsibilities and research expectations, put clinical faculty at risk for having inadequate time to provide and receive mentorship. Putting into place systems and adequate time to ensure adequate mentorship for this group is critical for their academic success[15-17]; however, many clinician-researchers experience significant challenges in identifying quality mentors and maintaining productive mentoring relationships.[17]

Finally, in analyses stratified by sex, we found that having a primary mentor and a CDC was associated with measures of academic productivity (publications as well as external grants) in junior faculty women but not men. Decades of research have documented the challenges that female faculty face in academic medicine, including climates that are generally less supportive of women than of men, delays in promotion of women despite comparable accomplishments and time at rank, experiences with overt sex bias, systematic exclusion from networking activities, the need to provide more evidence of competence than men to be seen as equally competent, and lack of available or willing senior women to be mentors/role models.[1,4,5,18,19] Our findings suggest that primary mentors and CDCs may be particularly important protective factors against some of the barriers that female junior

faculty face, including those that impede academic productivity.

This study has several limitations. Participants from one institution were included, limiting generalizability of the findings to other institutions. However, our findings highlight the potential impact of mentorship on traditional academic outcomes and perhaps can be used to inform junior faculty mentorship initiatives at other institutions. Confounding by indication is plausible; establishment of mentors and career development committees may be associated with other factors that predict future academic productivity. Although the study was not designed to evaluate these associations, and we could not assess the duration of the mentoring relationship or CDC, it provides preliminary data to justify future longitudinal studies that will allow us to evaluate the temporal relationship between factors that may predict success (eg, tendency to seek out mentoring and understand mentee expectations, prior productivity, duration of the mentoring relationship or CDC), having a mentor or CDC, and future academic productivity. Such a study would also help determine the efficacy of different mentoring program components on mentees' and mentors' knowledge, skills, attitudes, and behaviors, as well as the amount of time it takes to produce desired productivity outcomes. Self-reports of mentors and CDCs as well as assessment of academic productivity measures are subject to error. The number of underrepresented minority faculty was too small to stratify analyses based on race. This study does provide compelling preliminary evidence of the importance of mentoring and CDCs for future academic productivity, especially for women and clinical faculty, which should be examined further in larger and more diverse samples. ■

Submitted for publication Oct 16, 2020.
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Table I. Components of the mentorship initiative

Mentoring initiative component	Description
Mentorship resources	• Mentorship handbook providing background information on contemporary models of mentorship, the benefits of mentorship, and keys to establishing effecting mentoring relationships and other tools, including: ○ Mentorship agreement template ○ Tools to facilitate mutually beneficial relationships through reflecting on past mentorship experiences, defining career goals, and integrating work and life ○ Practical tips on building and maintaining healthy and effective mentoring relationships ○ Step-by-step guidance for developing, implementing, and maintaining a CDC ○ Individual development plan template to assist junior faculty with documenting their short- and long-term goals, barriers, accomplishments, and plans for acquiring the skills necessary to achieve their goals ○ Developmental network plan template to guide junior faculty in developing a plan for identifying and reaching out to individuals who might assist them in filling skills gaps they may encounter throughout the course of their careers ○ Hyperlinked bibliography of mentorship resources • Comprehensive mentorship webpage including: ○ Access to institutional mentorship resources available to faculty ○ Articles and other resources that support the provision of excellent general mentorship, mentorship of women and underrepresented minorities, and peer mentorship ○ Direct links to reappointment, promotion, and tenure criteria and resources • Recognition of excellent mentoring provided through annual junior and senior faculty mentoring awards
Mentorship seminars	• Offered throughout the academic year, including content on: ○ Addressing equity and inclusion in mentoring relationships ○ Peer mentorship ○ Different mentoring models
Biennial mentorship symposia	• Designed to bring together mentors and mentees from across the medical center and the University of Cincinnati College of Medicine for learning opportunities that span the breadth of mentoring practice including sessions on: ○ Existing institutional mentoring resources ○ Specific mentoring strategies for basic scientists and translational researchers, clinical, educational, and quality improvement researchers, clinician-educators; peer mentoring ○ Developing effective mentoring relationships ○ Speed mentoring ○ Addressing equity and inclusion in mentoring relationships ○ Mentoring across generations ○ Mentoring trainees
Mentor training workshops	• Mentor training workshops were offered for faculty members who serve as mentors to junior faculty, based on the Entering Mentoring Series, an interactive case-based curriculum developed by the Wisconsin Program for Scientific Teaching (https://cimerproject.org/entering-mentoring/). • Workshops consisted of four 2-hour sessions covering the following topics: ○ Maintaining effective communication ○ Aligning expectations ○ Assessing understanding ○ Addressing equity and inclusion ○ Fostering independence ○ Promoting professional development
CDCs	• CDCs were composed of 3-4 mid- and senior-level faculty (selected by the junior faculty member in collaboration with leadership and/or the primary mentor) that convene at least twice annually to: ○ Provide junior faculty (instructors and assistant professors) with feedback on their short and long-term career goals ○ Collaboratively develop appropriate metrics to monitor progress toward achieving these career goals and ultimately promotion ○ Ensure alignment of junior faculty members' career goals with institutional strategic initiatives • These committees include at least: ○ One member who has been promoted in the junior faculty member's track ○ One member from outside the junior faculty member's division • The junior faculty member is responsible for planning and documenting the meetings as well as following up with committee members regarding specific action items suggested by committee members.