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Original Research

Does Leave of Absence Affect Publication Productivity for Physician Trainees During Anesthesiology Residency?

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Introduction

Medical residency training occurs for most individuals in their mid-20s to mid-30s, often coinciding with the time of starting or expanding a family.[1] In the United States, the average age for women having their first child is 27.3 years.[2,3] In contrast, Cusimano et al[4] found the median age at first childbirth was 32 years in women physicians. Residents in medical training may face long work hours, demanding schedules, decreased sleep, and high stress environments; all can complicate parenthood.[5] Studies have demonstrated greater infertility and major pregnancy complications among woman physicians.[6-8] Although parenthood poses challenges for both men and women trainees, motherhood for women trainees may have a greater impact due to possible pregnancy-related complications, negative perceptions from peers, inadequate parental leave, insufficient breastfeeding policies, and perceived lack of institutional support.[9]

Per Sharpe et al,[10] anesthesiology residency program directors perceived that becoming a parent during training would negatively affect women trainees more than men trainees in their scholarly activities, standardized test scores, timeliness, technical skills, and procedural volume. Program directors also held the perception that a woman having a child during residency would negatively affect her co-residents' training experiences.[10] A survey of anesthesiology fellowship program directors had similar outcomes with a perceived greater negative impact on scholarly activities, standardized test scores, and procedural volume for women compared with men trainees.[11] Because these perceptions may not be accurate, this study seeks to determine if taking a leave of absence, such as parental, or other type of extended leave, during residency training impacts scholarly productivity of anesthesiology residents at a large medical institution across different campuses. We hypothesized there would be no relationship between taking a leave of absence and publication rates among anesthesiology residents.

Materials and Methods

The study was deemed exempt without the need of written informed consent by the Mayo Clinic Institutional Review Board. The Mayo Clinic Graduate Medical Education (GME) department provided the first and last names of residents in the graduating classes of 2016, 2017, 2018, 2019, 2020, and 2021 from the Department of Anesthesiology and Perioperative Medicine residency programs at Mayo Clinic's campuses in Arizona, Florida, and Minnesota. The list of names from each program was reviewed by the respective anesthesiology department faculty to determine if any name changes occurred during the training period and, when applicable, provided alternate names. A member of the study group (I.L.H.), not affiliated with the Department of Anesthesiology and Perioperative Medicine, searched Google Scholar, EMBASE, and PubMed databases for publications by the listed names during the corresponding years of residency training and 1 year after graduation, ranging from 2012 to 2022 depending on the year of graduation. In cases of uncertainty, author affiliations or co-authors were used to verify the correct author. Although abstracts were included, the low frequency of conference abstract publications (n = 34, 22.8%), meant that we were not able to look at likelihood of publishing abstracts as an outcome. Duplicate publications and preprints were excluded. In the case of a name change, the databases were searched for publications associated with the resident's original and changed names. After the data collection on publications was completed, the names were then sent to the GME representatives to blind the data and incorporate leave of absence data (type of leave, number of different leaves, and duration of each leave) for each resident during their residency training periods. Residents who requested a leave of absence had to categorize their request into emergency, medical, parental, or personal. Residents who had any amount of parental leave were included in the parental leave group. Residents who took ≥ 5 days of

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consecutive leave (including emergency, medical, or personal) were included in the extended leave of absence group and those who took fewer than 5 days were in the no leave group. This resulted in 3 leave groups: (1) parental leave, (2) extended leave without parental leave, and (3) no parental or extended leave. Five consecutive days was chosen as ≥ 5 working days (1 week) and was presumed more indicative of serious health or other conditions for leave of absence. Information collected on the residents' utilization of leave from work and their publication outcomes are listed in Supplemental Table 1. The data were de-identified by the GME representative and returned to the study members for data analysis.

Statistical Methods

SAS version 9.04 software was used to conduct the analyses. Continuous variables were summarized using mean and standard deviation, and median and interquartile range (IQR). Categorical variables were described using frequencies and proportions. A set of binary logistic regressions was used to examine the differences in publishing outcomes based on types of leave. Outcomes included the likelihood of having a publication (regardless of journal type or author number), a first author publication, a second author publication, and an original research article publication. In Models 1A and 1B, residents were categorized into 3 groups: (1) those who took any parental leave; (2) those who took an extended leave (≥ 5 days of consecutive leave) of any type except parental leave (medical, personal/unspecified, emergency/bereavement); and (3) those who did not fall into either of these categories (no parental or extended leave). Model 1A examined leave category as the independent variable, with the any amount of parental leave as the reference group. Model 1B added gender, graduation year, and total leave days (summed across all types) as covariates. In Models 2A and 2B, residents were categorized into 2 groups to investigate overall effects of prolonged leave, regardless of type: (1) those who took any parental or an extended leave (≥ 5 days of consecutive leave) of any type (medical, personal/unspecified, emergency/bereavement); and (2) those who did not fall into either of these categories (no parental or extended leave). There were no missing data in this study.

Results

All 149 residents who graduated from the residency programs during the study period were included. Graduation year, gender, and leave of absence data are summarized in Table 1. There were 17 (11.4%) residents who graduated from the Arizona program, 23 (15.4%) from Florida, and 109 (73.2%) from Minnesota. Of these residents, 49 (32.89%) took parental leave and 19 (12.75%) took other types of extended leave (≥ 5 days). There were 118 residents (79.2%) who had at least 1 publication during residency or 1-year post-graduation. Eighty-one residents (54.4%) had at least 1 first author publication during residency and 51 (34.2%) had at least 1 second author publication. Eighty-eight residents (59.1%) had at least 1 peer-reviewed publication. All parental leave taken by women residents was for childbirth, not adoption.

Those who took parental leave did not differ in likelihood of being published compared with those who took other types of extended leave ($P = .066$; Model 1A) or no parental or extended leave ($P = .447$) (Table 2). Those who took parental leave also did not differ in likelihood of being published as first author, second author, or original research publication compared with those who took an extended leave (≥ 5 days of consecutive leave) of any type except parental leave (medical, personal/unspecified, emergency/bereavement) (Table 2). This did not change when controlling for gender, year of graduation, or total number of leave days. When combining those who had taken any amount of parental leave and those with an extended leave, there was no difference in likelihood of being published compared with those who took no parental or extended leave ($P = .406$) (Table 2). Supplemental Table 2 compares publication outcomes by gender.

Discussion

Anesthesia and surgery program directors perceived parenthood to affect the training and the well-being of women residents more adversely than that of men residents.[10,12] However, our study revealed that leave of absence, including parental and other types of extended leave, was not associated with a reduced likelihood of any of the publication outcomes during anesthesia residency during the study period. Our results contrast the reported perceptions, finding childbirth exhibiting no negative impact on the publication productivities of both women and men physician trainees during anesthesiology residency. Our study results were consistent with a national survey of 190 radiation oncology residents, finding both gender and parental status exhibiting no effect on the number of manuscript publications.[13]

Negative perceptions about parental leave, particularly for women medical residents, may affect their career paths and choice of specialty or fellowship. Parental leave may delay residency graduation date, consequently postponing the start of fellowship training. Variations in specialty board regulations regarding training interruptions and qualifications for board certification may impact decisions regarding family planning, the duration of parental leave, and the use of vacation days for such leave. For anesthesiology training before 2019, a 12-week parental leave typically extended training, potentially delaying board eligibility by 6 months to a year and postponing fellowship training by at least a year.[14] The American Board of Anesthesiology has revised their absence from training policy allowing an additional 40 days away from training for parental or family leave or serious medical illness without extending training.[15] A survey by Kraus et al[11] indicates that fellowship directors view residents who complete their training outside of the standard cycle at a disadvantage for fellowship training. This belief may influence both the pursuit of and acceptance into advanced training programs, thereby altering career trajectories.

Women trainees' decisions regarding family planning can also be influenced by their concerns regarding career impact, potentially leading to postponed childbearing. Cusimano et al[4] found the median age at first childbirth was 32 years in women physicians and 27 years in nonphysicians. One study found that approximately 1 in 10 women anesthesiologists would counsel medical

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students against a career in anesthesiology due to obstacles pertaining to motherhood.[16] Consequently, the perceived obstacles might influence the timing of childbearing and the number of children. Such delays, driven by professional considerations, could negatively affect overall career satisfaction. Family building and fertility concerns among women physicians may contribute to the gender disparities within the specialty.[6]

Generous parental leave policies may improve staff retention among health care workers.[17] Research suggests that parental leave confers significant maternal health benefits, including mental health, as well as improved outcomes in infants.[18-20] When institutional parental leave policies are perceived as fair and transparent by women physicians in academic positions, the intent to remain within their current position is higher.[21] During our study period, the residency parental leave policy stated only 5 days of leave from work could be defined as parental leave, but the residents were allowed to take an additional 42 days of medical leave. This policy made it difficult to clearly differentiate the duration of medical and parental leaves, as residents were required to cobble together different types of leave from work, such as vacation, medical leave, and elective time.[22] To improve policy clarity, the Accreditation Council for Graduate Medical Education (ACGME) implemented new institutional requirements in 2022 to ensure that all ACGME-accredited programs offer trainees 6 weeks of *paid* parental, medical, or caregiver leave.[23] Clear policies on leaves of absence may be viewed as consistent support.

This study has limitations. The data were collected from residency programs within a single educational institution. Further, the rates of leave and publication among the residents were higher than national averages, limiting the generalizability of our results. In addition, due to blinding, timing of the leave in relation to publication was not available, nor was extension of clinical training because of leave. The only information available was if a leave was taken and the duration of the leave. As each resident was assigned a physician advisor within the institution for all residency-related activities in clinical practice, education, and research, the productivity of the residents might be correlated to the quality of mentorships,[24,25] which was not evaluated in this study. The robust librarian and scientific writing editorial services available at our institution may also limit generalizability. An additional limitation of this study was the reliance on names to identify the perceived gender, which may not accurately reflect an individual's gender identity, particularly for non-binary or gender-nonconforming individuals. It was impossible to blind the names from the data collector, but the presumed gender, race, and other social background associated with the names should not affect the data collection. Also, it was impossible to distinguish pure parental leave from a combination of parental plus medical or personal leave due to the policy on leave of absence at the time of the study. To overcome this limitation, the statistical analysis created a model that combined residents who took any amount of parental with any other types of extended leave.

Despite negative perceptions about how leaves of absence affect resident productivity and training, our study found that taking parental leave did not adversely affect publication output among anesthesiology residents at our institution. Further studies, at other institutions or with larger sample sizes, would be beneficial to provide more data regarding whether these negative perceptions that exist about parental leave are warranted.

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Abstract

Background: Residency occurs for most physicians during the childbearing years. As residents face demanding work schedules, the training experiences may be further stressed by parenthood. There is a perception that residents who take parental leave are less academically productive.

Methods: We obtained the names of anesthesia residents from Mayo Clinic graduating classes of 2016 to 2021. Google Scholar, EMBASE, and PubMed were used to search for publications by the names of residents. Gender and leave of absence data for each resident during residency were identified. A set of logistic regressions was used to examine leave from work related to the residents' publication outcomes.

Results: Of the 149 residents included in the study, 49 (32.9%) took parental and 19 (12.75%) took other types of extended leave (≥ 5 days). Those who took parental leave did not differ in likelihood of being published compared with those who took other types of extended leave (P = .066) or no leave (P = .447). No relationship was found between taking parental leave with total number of publications, first author publications, second author publications, or original research publication after controlling for gender, graduation year, or total number of days of leave.

Conclusions: Taking parental leave did not adversely affect scholarly output among anesthesiology residents at a single multi-site institution.

Keywords: Anesthesiology, internship and residency, parental leave, perception, publishing, personnel staffing and scheduling

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Tables

Table 1. *Summary of Collected Demographic and Leave Data*

	No Parental or Extended Leave (n = 81)	Parental Leave (n = 49)	Other Type of Extended Leave (n = 19)	Total (n = 149)	*P* Value
Gender, n (%)					.0698[a]
Women	30 (37.0)	25 (51.0)	12 (63.2)	67 (45.0)	
Men	51 (63.0)	24 (49.0)	7 (36.8)	82 (55.0)	
Graduation Year, n (%)					.0207[a]
2017	13 (16.0)	5 (10.2)	6 (31.6)	24 (16.1)	
2018	14 (17.3)	9 (18.4)	1 (5.3)	24 (16.1)	
2019	9 (11.1)	10 (20.4)	6 (31.6)	25 (16.8)	
2020	12 (14.8)	10 (20.4)	2 (10.5)	24 (16.1)	
2021	14 (17.3)	12 (24.5)	0 (0.0)	26 (17.4)	
2022	19 (23.5)	3 (6.1)	4 (21.1)	26 (17.4)	
Sum of All Leave Days					<.0001[b]
N (Missing)	81 (0)	49 (0)	19 (0)	149 (0)	
Mean (SD)	3.8 (3.35)	42.2 (35.62)	31.1 (20.57)	19.9 (28.12)	
Median (IQR)	3.0 (1.0, 5.0)	34.0 (8.0, 72.0)	33.0 (12.0, 46.0)	7.0 (3.0, 21.0)	
Range	0.0, 13.0	4.0, 133.0	6.0, 71.0	0.0, 133.0	

Abbreviation: IQR, interquartile range.

[a] Chi-square *P* value.

[b] Kruskal-Wallis *P* value.

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Table 2. *Analysis of Publication Rates When Controlling for Demographic and Types of Leave with Odds Ratios and 95% Confidence Intervals for Models 1A-2B*

Model	Variable	Publishing	First Author	Second Author	Original Research
1A	Model AUC	0.581	0.564	0.564	0.536
	Parental vs Extended Leave	2.990 (0.899-9.937)	1.914 (0.655-5.588)	0.497 (0.164-1.506)	1.55 (0.531-4.526)
	Parental vs No Leave	1.262 (0.496-3.211)	1.68 (0.813-3.473)	0.614 (0.282-1.337)	1.246 (0.601-2.584)
1B	Model AUC	0.659	0.601	0.581	0.592
	Gender	0.743 (0.269-2.054)	0.936 (0.416-2.106)	0.868 (0.377-2.00)	1.065 (0.47-2.415)
	Graduation Year	0.895 (0.707-1.132)	0.879 (0.725-1.066)	0.918 (0.751-1.122)	0.896 (0.738-1.088)
	Total Leave Days	0.944 (0.969-1.019)	0.996 (0.978-1.015)	0.994 (0.975-1.013)	0.99 (0.971-1.01)
	Parental vs Extended Leave	2.876 (0.927-10.003)	1.766 (0.581-5.371)	0.445 (0.138-1.436)	1.338 (0.44-4.069)
	Parental vs No Leave	1.009 (0.308-3.303)	1.496 (0.563-3.972)	0.474 (0.158-1.42)	0.897 (0.338-2.382)
2A	Model AUC	0.517	0.541	0.534	0.512
	Parental & Extended vs No Leave	0.870 (0.394-1.921)	1.394 (0.727-2.671)	0.76 (0.383-1.506)	1.099 (0.57-2.117)
2B	Model AUC	0.601	0.596	0.555	0.597
	Gender	0.884 (0.328-2.382)	1.014 (0.457-2.247)	0.779 (0.343-1.77)	1.11 (0.497-2.478)
	Graduation Year	0.882 (0.697-1.116)	0.873 (0.72-1.058)	0.928 (0.76-1.134)	0.893 (0.735-1.083)
	Total Leave Days	0.990 (0.967-1.014)	0.994 (0.976-1.013)	0.997 (0.979-1.016)	0.989 (0.971-1.008)
	Parental & Extended vs No Leave	0.648 (0.233-1.801)	1.199 (0.502-1.199)	0.675 (0.266-1.718)	0.802 (0.334-1.923)

Abbreviation: AUC, area under the curve.

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Supplemental Online Material

Supplemental Table 1. *Data Collection on Resident Publication and Leave of Absence*

Publication	Total number of publications		
	Individual publication	Type	Abstract Book chapter Case report Case series Letter to editor Meta-analysis Original research Review article Systematic review
		Name of journal	
		Authorship position	First Second Other
Resident	Gender		
Leave of Absence	Utilization of leave from work	Type	Emergency / Bereavement Medical Parental Personal / Unspecified
		Designated year during residency when leave was taken	Designated year during residency training when additional leave was taken (if applicable)
		Total length of leave (day)	

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Supplemental Online Material *continued*

Supplemental Table 2. *Publishing Outcomes by Gender*

	Gender			
	Woman (n = 67)	**Man (n = 82)**	**Total (n = 149)**	***P* Value**
Published, n (%)				.4313[a]
No	12 (17.9)	19 (23.2)	31 (20.8)	
Yes	55 (82.1)	63 (76.8)	118 (79.2)	
First Author, n (%)				.6020[a]
No	29 (43.3)	39 (47.6)	68 (45.6)	
Yes	38 (56.7)	43 (52.4)	81 (54.4)	
Second Author, n (%)				.4731[a]
No	42 (62.7)	56 (68.3)	98 (65.8)	
Yes	25 (37.3)	26 (31.7)	51 (34.2)	
Original Research Publication, n (%)				.6321[a]
No	26 (38.8)	35 (42.7)	61 (40.9)	
Yes	41 (61.2)	47 (57.3)	88 (59.1)	

[a] Chi-square *P* value.