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Imposter Syndrome Among Orthopaedic Surgery Residents is Extremely Common and Disproportionately Affects Female Residents

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Introduction: Imposter syndrome is a psychological phenomenon in which individuals experience persistent self-doubt and feelings of inadequacy despite achieving objective measures of success. This phenomenon is associated with lower job satisfaction, increased rates of burnout, and reduced productivity. Therefore, the purpose of this study was to determine the prevalence of imposter syndrome among orthopaedic surgery residents and determine whether specific individual or residency characteristics predict higher rates of imposter syndrome.

Methods: An anonymous survey was distributed to residents at 7 ACGME-accredited orthopaedic surgery residencies. Respondents provided deidentified demographic data and completed the Clance Imposter Phenomenon Scale (CIPS) assessment. CIPS scores were used to categorize imposter syndrome severity as none to mild, moderate, significant, or intense. Differences were calculated and compared using t-test and χ^2 analyses. Multivariable regression analysis was used to identify predictors of increased symptom severity.

Results: One hundred orthopaedic surgery residents completed the survey. Forty percent of respondents were female, and the mean age was 30.6 ± 2.8 years. The prevalence of significant or intense imposter syndrome was 73%. CIPS scores and significant or intense imposter syndrome did not vary by age, gender, sexual orientation, race/ethnicity, level of training, program region, research year, non-MD degrees, and Step 1, Step 2, or Orthopaedic In-Training Examination (OITE) scores on univariable analyses. On multivariable analysis, female residents were 5.64 (OR = 5.64 [1.04-30.63]) times more likely to have significant or intense imposter syndrome (p = 0.045). Residents at western programs were 0.13 (OR = 0.13 [0.02-0.90]) times as likely to experience significant or intense imposter syndrome (p = 0.039). In addition,

continued

*These authors contributed equally to the manuscript and are thus co-first authors.

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women (estimate = 8.72 [1.41-16.04]; p = 0.0201) and those with OITE scores in the 0 to 25th (estimate = 11.92 [0.29-23.54]; p = 0.0446) and 51st-75th (estimate = 12.73 [2.79-22.67]; p = 0.0128) percentiles had higher CIPS scores.
Conclusions: Imposter syndrome is common among orthopaedic surgery residents, with 73% experiencing significant or intense symptoms. Female gender, lower OITE scores, and training in nonwestern regions predicted increased imposter syndrome severity. Targeted programs may help reduce burnout and improve career satisfaction and advancement.

Introduction

Imposter syndrome is a psychological phenomenon that was first described in 1978 in which individuals experience persistent feelings of self-doubt[1]. Among medical professionals in the United States, imposter syndrome can exacerbate depression and anxiety and has been linked to higher rates of burnout and diminished career advancement[2-5]. This phenomenon is common among medical students, with rates reported from 22% to 60%[6-8]. Unfortunately, imposter syndrome persists in graduate medical education, as surveys of dermatology and pharmacy residents have found that 89% and 57.5% of respondents, respectively, experienced imposter syndrome[9,10].

Previous research has demonstrated that imposter syndrome is more prevalent among surgeons[4,11,12]. Studies analyzing the prevalence of this phenomenon among general surgery residents and attendings have reported significant or severe imposter syndrome in 76% of respondents[4,11]. Interestingly, no demographic or academic variables were identified that explain these findings. Similarly, a cross-sectional survey of residents in neurosurgery and young neurosurgeons (40 years or younger) depicted the prevalence of imposter syndrome to be 81.6%, with level of education (junior resident, senior resident, fellow, or attending), female sex, and academic achievements (assessed by the presence of a PhD degree) noted as predictive factors of imposter syndrome[12]. In particular, female neurosurgeons, residents in neurosurgery, and individuals having a PhD degree were all more likely to be affected by imposter syndrome.

A study of surgical residents, fellows, and attending physicians across medical specialties (orthopaedics = 82.8%, obstetrics and gynecology = 3.7%, urology = 3.4%, general surgery = 3.0%, colorectal surgery = 1%, gynecologic oncology = 0.7%, thoracic surgery = 0.3%, ophthalmology = 0.3%, otolaryngology = 0.3%, other = 4.7%) found that imposter syndrome was more common among female and younger surgeons[13]. Data have previously shown that symptoms of imposter syndrome can translate to surgical decision making, as a survey of hand and upper extremity attending surgeons demonstrated that imposter syndrome was correlated with decreased intraoperative confidence and tolerance of uncertainty[14]. Despite evidence that imposter syndrome exists among orthopaedic surgeons and affects surgeon behavior, the prevalence of this phenomenon among orthopaedic surgery trainees remains unknown. Therefore, the purpose of this study was to determine the prevalence of imposter syndrome among orthopaedic surgery residents and whether specific individual or residency characteristics predict higher rates of imposter syndrome.

Materials and Methods

Study Design and Setting

This multi-institutional study was approved by the lead institution's institutional review board. An online, standardized, and anonymous survey (Qualtrics, Seattle, WA) was administered to residents at 7 ACGME-accredited orthopaedic surgery training programs across the country from March to October 2022. Respondents were voluntary participants among the selected residency programs. The total possible number of participants was 297, of which 103 completed the survey, yielding a response rate of 34.7%. In this study, imposter syndrome was assessed using the Clance Imposter Phenomenon Scale (CIPS), the most used analytic measure of imposter syndrome consisting of 20 self-report questions answered on a 5-point Likert-type scale[1,11]. Importantly, this metric captures self-reported, subjective feelings of imposter syndrome and does not validate these perceptions against objective measures of competence. The final totaled self-reported score from all questions was categorized to define imposter syndrome severity (score 0-40: none to mild imposter syndrome; 41-60: moderate imposter syndrome; 61-80: significant imposter syndrome; and 81-100: intense imposter syndrome). The survey also gathered self-identified demographic and academic information. Respondent characteristics included age, gender identity, lesbian, gay, bisexual, transgender or queer identity (LGBTQ+) identity, race/ethnicity, postgraduate year of training, geographic region of the program, Step 1 scores, Step 2 scores, and Orthopaedic In-Training Examination (OITE) scores. Residents were also polled about whether they completed a research year or obtained a non-MD degree. The final survey used in this study is present in the Appendix.

Primary and Secondary Study Outcomes

Our primary goal in this study was to delineate the prevalence of imposter syndrome among the orthopaedic surgery residents surveyed, which was defined as the proportion of respondents reporting significant or intense imposter syndrome (i.e., CIPS ≥61). Our secondary goal was to determine if certain individual or residency characteristics predicted higher imposter syndrome. To explore independent associations, we performed univariable and multivariable analyses to examine the relationship between these factors and both CIPS scores and imposter syndrome severity.

Statistical Analysis

Surveys with incomplete data entry were excluded from analysis. In cases where a participant reported multiple racial/ethnic

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identities, all identities were included and recorded in the analyses. Demographic variables were characterized through mean and standard deviation for continuous variables or frequency and percentage for categorical variables. Differences in mean CIPS scores based on demographic variables were assessed using Student's *t*-test for 2 groups and one-way analysis of variance (ANOVA) for 3 or more groups. Univariable analysis was performed to compare imposter syndrome severity using the Student's *t*-test for continuous variables and χ^2 test for categorical variables. Multivariable logistic regression was used to identify any risk factors associated with significant or intense imposter syndrome via odds ratios (OR). Multivariable linear regression was used to delineate predictors of higher CIPS scores. Across all tests, statistical significance was set at a value of $p < 0.05$. All analyses were conducted using R (version 4.3.3).

Results

Prevalence of Imposter Syndrome

The survey was distributed to 297 residents, and 103 responses (response rate = 34.7%) were received. Three were excluded due to missing data, leaving a final cohort of 100 respondents. In this cohort, 40% (n = 40) were female, 8% (n = 8) identified as LBGTQ+, and the mean age was 30.6 ± 2.8 years. The racial/ethnic breakdown was as follows: 70.8% (n = 75) White, 15.1% (n = 16) Asian American or Pacific Islander, 7.5% (n = 8) Black or African American, and 6.6% (n = 7) Hispanic or Latino. Most residents attended academic institutions in the Northeast (35%, n = 35), followed by West (27%, n = 27), Midwest (25%, n = 25), and South (13%, n = 13). There was an even distribution of residents across various levels of training. Across all residents surveyed, 23% (n = 23) had taken a research year and 27% (n = 27) obtained non-MD degrees (Table I). The overall prevalence of significant or intense imposter syndrome in this cohort was 73% (n = 73). Only 2% (n = 2) of the cohort had scores correlating with no or mild imposter syndrome, while 25% (n = 25) had moderate, 48% (n = 48) had significant, and 25% (n = 25) had intense imposter syndrome (Fig. 1).

Factors Associated with Imposter Syndrome

Raw CIPS scores did not vary significantly by gender, although both men (72.2 ± 15.9) and women (67.5 ± 13.8) had an average score reflecting significant imposter syndrome. Similarly, there were no significant differences in CIPS scores when respondents were stratified by LGBTQ+ status, race/ethnicity, level of training, geographic region, Step 1 score, Step 2 score, research year, non-MD degrees, or OITE scores (Table II). Although 73% (n = 73) of residents experienced significant or intense imposter syndrome, this metric did not vary by demographics when categorizing imposter syndrome severity into 2 subgroups: none or moderate and significant or intense (Table III). However, when expanding it into 4 subgroups (none to mild, moderate, significant, and intense), imposter syndrome severity differed significantly by gender, as women were more likely to experience intense imposter syndrome than

TABLE I Demographics of Orthopaedic Surgery Residents Surveyed*

Demographic	Overall (n = 100)
Age, mean (SD)	30.6 (2.8)
Gender, n (%)	
Female	40 (40.0)
Male	60 (60.0)
LGBTQ+, n (%)	8 (8.0)
Race/ethnicity, n (%)	
White	75 (70.8)
Black or African American	8 (7.5)
Hispanic or Latino	7 (6.6)
Asian American or Pacific Islander	16 (15.1)
American Indian or Native American	0 (0.0)
Other	0 (0.0)
Level of training, n (%)	
PGY1	25 (25.0)
PGY2	14 (14.0)
PGY3	17 (17.0)
PGY4	25 (25.0)
PGY5	19 (19.0)
Region, n (%)	
Northeast	35 (35.0)
Midwest	25 (25.0)
South	13 (13.0)
West	27 (27.0)
Step 1, n (%)	
<220	4 (4.0)
221-235	6 (6.0)
236-250	40 (40.0)
251-265	41 (41.0)
266+	9 (9.0)
Step 2, n (%)	
<220	3 (3.0)
221-235	3 (3.0)
236-250	28 (28.0)
251-265	50 (50.0)
266+	16 (16.0)
Research year, n (%)	23 (23.0)
Non-MD degrees, n (%)	27 (27.0)
OITE, n (%)	
0-25	21 (21.0)
26-50	24 (24.0)
51-75	36 (36.0)
76-100	19 (19.0)

*Continuous variables are described as means and standard deviations. Categorical variables are described as frequencies and percentages. LGBTQ+ = lesbian, gay, bisexual, transgender, or queer identity, OITE = Orthopaedic In-Training Examination, and PGY = postgraduate year.

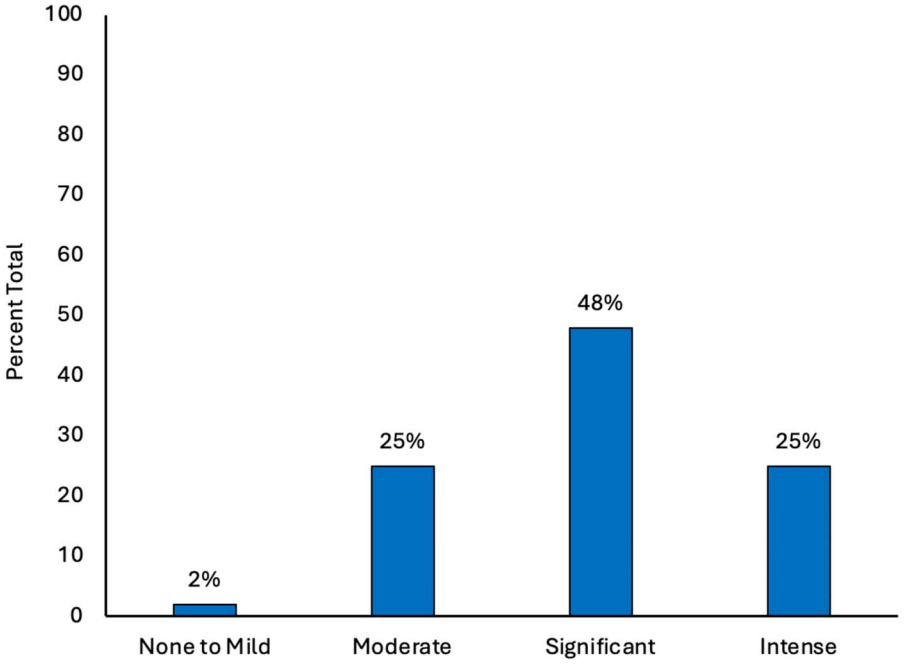

Fig. 1
Distribution of imposter syndrome severity in this cohort of orthopaedic surgery residents.

men (64.0%, n = 16 vs. 36.0%, n = 9) (p = 0.0215) (Table IV; Fig. 2). Imposter syndrome severity also varied by geographic location, with most residents experiencing significant imposter syndrome training at a program in the Northeast (52.0%, n = 25) and intense imposter syndrome in the Midwest (36.0%, n = 36) (p = 0.0136) (Table IV; Fig. 3).

Multivariate analysis revealed female residents were 5.64 (OR = 5.64 [1.04-30.63]) times more likely to have significant or intense imposter syndrome compared with male residents (p = 0.045) (Table V). Training at an orthopaedic surgery residency program in the West was associated with lower odds (OR = 0.13 [0.02-0.90]) of experiencing significant or intense levels of imposter syndrome compared with Northeast programs (p = 0.039). Age, LGBTQ+ identity, race/ethnicity, level of training, and academic attributes (Step 1 score, Step 2 score, OITE score, research year, non-MD degree) were not associated with significant or intense imposter syndrome. On average, female residents had risk-adjusted CIPS scores 8.7 points higher than their male counterparts (estimate = 8.72 [1.41-16.04]; p = 0.0201). Residents with OITE scores in the 0 to 25th percentile (estimate = 11.92 [0.29-23.54]; p = 0.0446) and 51st-75th percentile (estimate = 12.73 [2.79-22.67]; p = 0.0128) had higher average CIPS scores compared with those in the 76th-100th percentile (Table VI).

Discussion

In this multi-institutional survey study, we found that 73% of orthopaedic surgery residents reported symptoms that correlated with significant or intense imposter syndrome, and only 2% of residents' scores correlated with no or mild imposter syndrome. Predictive characteristics of more intense imposter syndrome were female gender, lower OITE scores, and training at nonwestern residency programs. To our knowledge, this is the first study specifically analyzing imposter syndrome among orthopaedic surgery trainees.

Previous survey studies in other surgical subspecialties have corroborated our findings—most surgical residents and/or faculty experience some level of imposter syndrome, which can exacerbate mental health and contribute to burnout[3,4,11-15]. In addition, the lower self-esteem and decreased confidence perpetuated by imposter syndrome can impair a surgeon's ability to manage uncertainty and display effective problem-solving skills, which are essential for any practicing surgeon[14]. The prevalence of frequent or intense imposter syndrome, as measured by CIPS, was reported to be 61.7%, 76%, and 48.9% in plastic surgery, general surgery, and neurosurgery, respectively[11,12,15]. In addition, Liu et al. conducted a survey across 4 distinct training programs (family medicine, pediatric medicine, anesthesiology, and general surgery) and identified imposter syndrome in 62.7% of all participants, with general surgery residents having the greatest risk of burnout among all specialties analyzed[3]. In comparison with careers outside of medicine, physicians demonstrate greater rates of imposter syndrome, burnout, suicidal ideation, and decreased professional fulfillment[2-5]. A subsequent study assessing burnout at different stages in the MD training pathway (e.g., medical students, residents/fellows, and attendings) found that residents experienced the highest rates of burnout across training levels[16]. Similarly, other studies have reported a positive correlation between CIPS scores and the incidence of burnout among resident physicians[3,4,17]. Among surgeons, increased imposter syndrome severity has been postulated to be explained by the intrapersonal traits of individuals pursuing surgery, such as perfectionism and high self-efficacy[13].

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TABLE II Analysis of CIPS Scores, Stratified by Demographics*

	CIPS Score, Mean (SD)	p
Gender		0.1285
Female	72.2 (15.9)	
Male	67.5 (13.8)	
LGBTQ+		0.3913
No	68.9 (14.7)	
Yes	74.1 (15.6)	
Race/ethnicity		0.5866
White	69.3 (15.3)	
Black or African American	69.5 (15.4)	
Hispanic or Latino	76.3 (10.8)	
Asian American or Pacific Islander	67.1 (12.2)	
Level of training		0.6343
PGY1	68.9 (14.8)	
PGY2	72.6 (11.0)	
PGY3	64.7 (18.1)	
PGY4	70.5 (13.4)	
PGY5	70.3 (16.1)	
Region		0.9569
Northeast	69.4 (11.4)	
Midwest	69.9 (17.4)	
South	70.7 (16.6)	
West	68.1 (15.8)	
Step 1		0.8309
<220	70.5 (20.2)	
221-235	65.3 (14.9)	
236-250	68.1 (16.1)	
251-265	71.3 (13.7)	
266+	68.4 (12.6)	
Step 2		0.9028
<220	76.7 (5.5)	
221-235	68.0 (20.0)	
236-250	68.9 (16.2)	
251-265	68.8 (13.6)	
266+	71.0 (16.9)	
Research year		0.9908
No	69.3 (15.0)	
Yes	69.4 (14.3)	
Non-MD degrees		0.9111
No	69.3 (15.0)	
Yes	69.6 (14.5)	
OITE		0.0571
0-25	70.5 (12.9)	
26-50	68.5 (14.9)	
51-75	73.2 (15.7)	
76-100	61.9 (12.7)	

*All scores are described as means and standard deviations. CIPS = Clance Imposter Phenomenon Scale, LGBTQ+ = lesbian, gay, bisexual, transgender, or queer identity, OITE = Orthopaedic In-Training Examination, and PGY = postgraduate year.

Imposter syndrome was first described in a population of "high achieving" women who continued to believe they were unintelligent and unsuccessful, despite stellar academic and professional performance[1]. A majority of ensuing research assessing gender differences in imposter syndrome susceptibility has supported this conclusion, with previous studies showing that female gender was a risk factor of imposter syndrome symptoms in medical students, residents, and faculty in several subspecialties[3,6,8,12,15,18]. Moreover, among surgical residents, female gender has been documented as an important predictive characteristic of increased imposter syndrome severity[3,12,15,18]. Our results are consistent with the literature, as we demonstrate that female orthopaedic surgery residents have a higher incidence of intense imposter syndrome compared with male residents and, after multivariable adjustment, female gender was identified as a risk factor of higher CIPS scores and significant or intense imposter syndrome. The lack of gender parity in orthopaedics is well established, and in current practice, recent estimates indicate that only 20% of orthopaedic surgery faculty are female[19]. Compared with male orthopaedic surgeons, female orthopaedic surgeons have reported increased occurrences of microaggressions, bullying, harassment, depression, anxiety, and burnout[20,21]. According to a 15-year analysis of the gender distribution of orthopaedic surgery residency programs, female residents represent only 15.4% of all residents, which is relatively low compared with neurosurgery (17.5%), plastic surgery (30.5%), and general surgery (41.3%)[22]. Given the increased prevalence of significant or intense imposter syndrome among female trainees in orthopaedics and the impact it can have on burnout and career outcomes, this phenomenon should be intentionally and systematically addressed.

Residents training at residency programs in the West had lower chances of developing significant or intense imposter syndrome. Future research is needed to elucidate any attributes inherent to applicants or training programs based on geographic location that may contribute to imposter syndrome. Although most of the self-reported academic characteristics were not correlated with the presence or level of imposter syndrome, lower scores on the OITE were associated with higher CIPS scores. This is contrary to a similar investigation in general surgery, which did not find any relationship between imposter syndrome and performance on the American Board of Surgery In-Training Examination[11]. Interestingly, while lower OITE percentiles were associated with increased imposter syndrome severity in our study, residents with lower OITE scores were not at increased risk of experiencing significant or intense imposter syndrome. One explanation for this could be a greater number of residents with moderate CIPS scores who have middle percentile OITE scores.

Previous studies have demonstrated that imposter syndrome can be mitigated through coaching programs or structured mentorship. In a randomized controlled trial of 101 female residents (82 nonsurgical specialties and 19 surgical specialties), participants in the intervention group underwent a 6-month group coaching program with substantial reductions

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TABLE III Demographics Associated With Significant or Intense Imposter Syndrome*

	None or Moderate IS	Significant or Intense IS	p
N	27	73	
Age, mean (SD)	30.59 (2.75)	30.59 (2.80)	0.9955
Female, n (%)	10 (37.0)	30 (41.1)	0.8903
LGBTQ+, n (%)	2 (7.4)	6 (8.2)	1.0000
Race/ethnicity, n (%)			0.3599
White	20 (71.4)	55 (70.5)	
Black or African American	3 (10.7)	5 (6.4)	
Hispanic or Latino	0 (0.0)	7 (9.0)	
Asian American or Pacific Islander	5 (17.9)	11 (14.1)	
Level of training, n (%)			0.1525
PGY1	6 (22.2)	19 (26.0)	
PGY2	1 (3.7)	13 (17.8)	
PGY3	8 (29.7)	9 (12.3)	
PGY4	6 (22.2)	19 (26.0)	
PGY5	6 (22.2)	13 (17.8)	
Region, n (%)			0.1701
Northeast	6 (22.2)	29 (39.7)	
Midwest	9 (33.4)	16 (21.9)	
South	2 (7.4)	11 (15.1)	
West	10 (37.0)	17 (23.3)	
Step 1, n (%)			0.1548
<220	1 (3.7)	3 (4.1)	
221-235	4 (14.8)	2 (2.7)	
236-250	12 (44.4)	28 (38.4)	
251-265	9 (33.4)	32 (43.8)	
266+	1 (3.7)	8 (11.0)	
Step 2, n (%)			0.3475
<220	0 (0.0)	3 (4.1)	
221-235	2 (7.4)	1 (1.4)	
236-250	9 (33.4)	19 (26.0)	
251-265	13 (48.1)	37 (50.7)	
266+	3 (11.1)	13 (17.8)	
Research year, n (%)	7 (25.9)	16 (21.9)	0.8766
Non-MD Degrees, n (%)	7 (25.9)	20 (27.4)	1.0000
OITE, n (%)			0.7617
0-25	5 (18.5)	16 (21.9)	
26-50	6 (22.2)	18 (24.7)	
51-75	9 (33.4)	27 (37.0)	
76-100	7 (25.9)	12 (16.4)	

*Continuous variables are described as means and standard deviations. Categorical variables are described as frequencies and percentages. IS = imposter syndrome, LGBTQ+ = lesbian, gay, bisexual, transgender, or queer identity, OITE = Orthopaedic In-Training Examination, and PGY = postgraduate year.

in imposter syndrome and emotional exhaustion symptoms compared with controls[23]. In orthopaedics, evidence shows that medical students highly value gender concordance with their mentor and underrepresented minorities value race/ethnicity concordance[24]. Considering the groups most severely affected by imposter syndrome in our study, improving mentorship programs that account for demographic characteristics may help alleviate imposter syndrome among orthopaedic surgery

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TABLE IV Analysis of Imposter Syndrome Severity, Stratified by Demographics

	None to Mild	Moderate	Significant	Intense	p
N	2	25	48	25	
Age, mean (SD)	30.50 (2.12)	30.60 (2.83)	30.33 (2.73)	31.08 (2.93)	0.7139
Female, n (%)	0 (0.0)	10 (40.0)	14 (29.2)	16 (64.0)	0.0215*
LGBTQ+, n (%)	0 (0.0)	2 (8.0)	3 (6.3)	3 (12.0)	0.8213
Race/ethnicity, n (%)					0.7412
White	2 (100.0)	18 (69.2)	34 (66.7)	21 (77.8)	
Black or African American	0 (0.0)	3 (11.5)	3 (5.9)	2 (7.4)	
Hispanic or Latino	0 (0.0)	0 (0.0)	5 (9.8)	2 (7.4)	
Asian American or Pacific Islander	0 (0.0)	5 (19.3)	9 (17.6)	2 (7.4)	
Level of training, n (%)					0.4582
PGY1	0 (0.0)	6 (24.0)	14 (29.2)	5 (20.0)	
PGY2	0 (0.0)	1 (4.0)	10 (20.8)	3 (12.0)	
PGY3	1 (50.0)	7 (28.0)	4 (8.3)	5 (20.0)	
PGY4	1 (50.0)	5 (20.0)	12 (25.0)	7 (28.0)	
PGY5	0 (0.0)	6 (24.0)	8 (16.7)	5 (20.0)	
Region, n (%)					0.0136*
Northeast	1 (50.0)	5 (20.0)	25 (52.0)	4 (16.0)	
Midwest	0 (0.0)	9 (36.0)	7 (14.6)	9 (36.0)	
South	1 (50.0)	1 (4.0)	7 (14.6)	4 (16.0)	
West	0 (0.0)	10 (40.0)	9 (18.8)	8 (32.0)	
Step 1, n (%)					0.3119
<220	0 (0.0)	1 (4.0)	2 (4.2)	1 (4.0)	
221-235	0 (0.0)	4 (16.0)	0 (0.0)	2 (8.0)	
236-250	2 (100.0)	10 (40.0)	19 (39.6)	9 (36.0)	
251-265	0 (0.0)	9 (36.0)	20 (41.6)	12 (48.0)	
266+	0 (0.0)	1 (4.0)	7 (14.6)	1 (4.0)	
Step 2, n (%)					0.6911
<220	0 (0.0)	0 (0.0)	2 (4.2)	1 (4.0)	
221-235	0 (0.0)	2 (8.0)	0 (0.0)	1 (4.0)	
236-250	0 (0.0)	9 (36.0)	12 (25.0)	7 (28.0)	
251-265	1 (50.0)	12 (48.0)	26 (54.1)	11 (44.0)	
266+	1 (50.0)	2 (8.0)	8 (16.7)	5 (20.0)	
Research year, n (%)	0 (0.0)	7 (28.0)	9 (18.8)	7 (28.0)	0.6165
Non-MD Degrees, n (%)	0 (0.0)	7 (28.0)	14 (29.2)	6 (24.0)	0.8059
OITE, n (%)					0.0578
0-25	0 (0.0)	5 (20.0)	13 (27.1)	3 (12.0)	
26-50	1 (50.0)	5 (20.0)	13 (27.1)	5 (20.0)	
51-75	0 (0.0)	9 (36.0)	11 (22.9)	16 (64.0)	
76-100	1 (50.0)	6 (24.0)	11 (22.9)	1 (4.0)	

*p < 0.05. Continuous variables are described as means and standard deviations. Categorical variables are described as frequencies and percentages. LGBTQ+ = lesbian, gay, bisexual, transgender, or queer identity, OITE = Orthopaedic In-Training Examination, and PGY = postgraduate year.

residents. Nevertheless, additional research is needed to test the efficacy of these interventions in reducing imposter syndrome.

There are several limitations to this study. First, the self-reported survey design used for data collection is inherently susceptible to survey bias and the Hawthorne effect. Moreover, compared with national norms reported from the latest ACGME data (2022-2023) on the demographic composition of orthopaedic surgery residency programs, our cohort had a higher proportion of

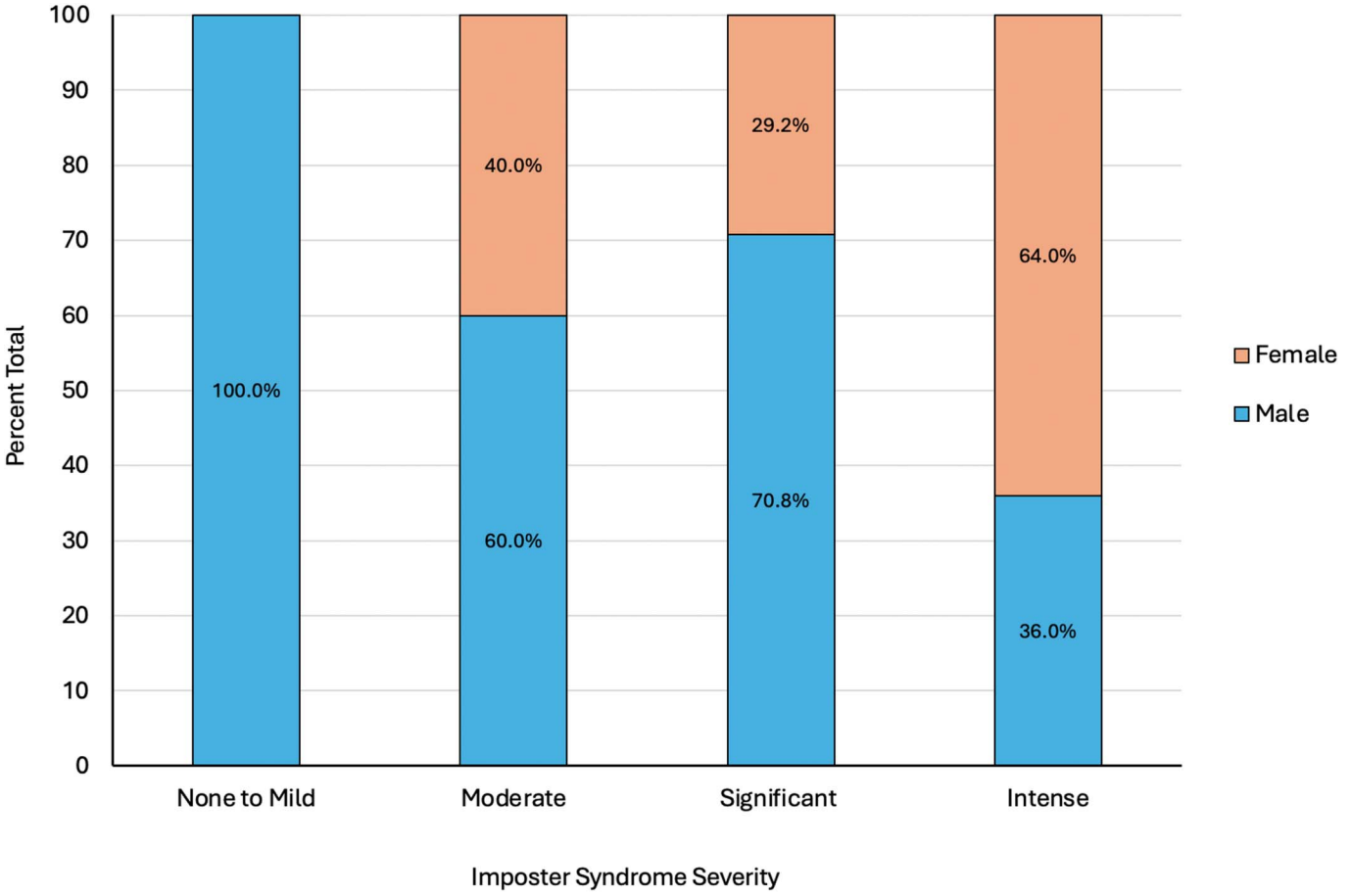

Fig. 2
Imposter syndrome severity stratified by self-reported gender.

female residents (40% vs. 20.3%) and a lower proportion of male residents (60% vs. 79.7%)[25]. Racial demographics were similar, with 70.8% White (vs. 67.7%), 15.1% Asian (vs. 13.3%), 7.5% Black (vs. 5.2%), and 6.6% Hispanic (vs. 7.4%). Since our survey sample is representative of orthopaedic surgery residents at 7 academic residency programs, these demographic differences, particularly the overrepresentation of female residents, may affect the generalizability of our findings to other programs across the country. The culture, environment, and expectations at academic institutions may differ from those at community-based programs. Furthermore, our finding that imposter syndrome severity differed based on region could be a result of specific cultural differences at the programs included in this survey study, which are not necessarily generalizable to the regions they represent. Because of our response rate of 34.7%, the sample size of some subgroups may have been too small to identify statistical differences between groups. In addition, while the CIPS is considered the gold standard for measuring imposter syndrome, the scale's sensitivity and specificity remain undefined. As a result, increased imposter syndrome scores could have been attributed to other confounding factors. Finally, since our study solely relied on self-reported perceptions, we cannot distinguish between cases in which a respondent's feelings of imposter syndrome were due to perceived or actual lack of competence. Future studies would benefit from sampling a larger, more randomized cohort of residents to improve the generalizability of findings and validate subjective perceptions of imposter syndrome with average resident competence. Despite these limitations, this is the first study to delineate the prevalence of imposter syndrome and risk factors for its development among orthopaedic surgery trainees.

Conclusions

Imposter syndrome is highly prevalent among orthopaedic surgery residents, with significant or intense symptoms affecting 73% of those surveyed. Female gender and lower OITE scores were associated with increased imposter syndrome severity, while training at an orthopaedic surgery residency program in the West was associated with decreased imposter syndrome. Additional research is needed to identify effective interventions to address imposter syndrome and minimize its effects on individuals' careers. Implementing focused initiatives to address imposter syndrome may help alleviate burnout and promote both career fulfillment and professional growth.

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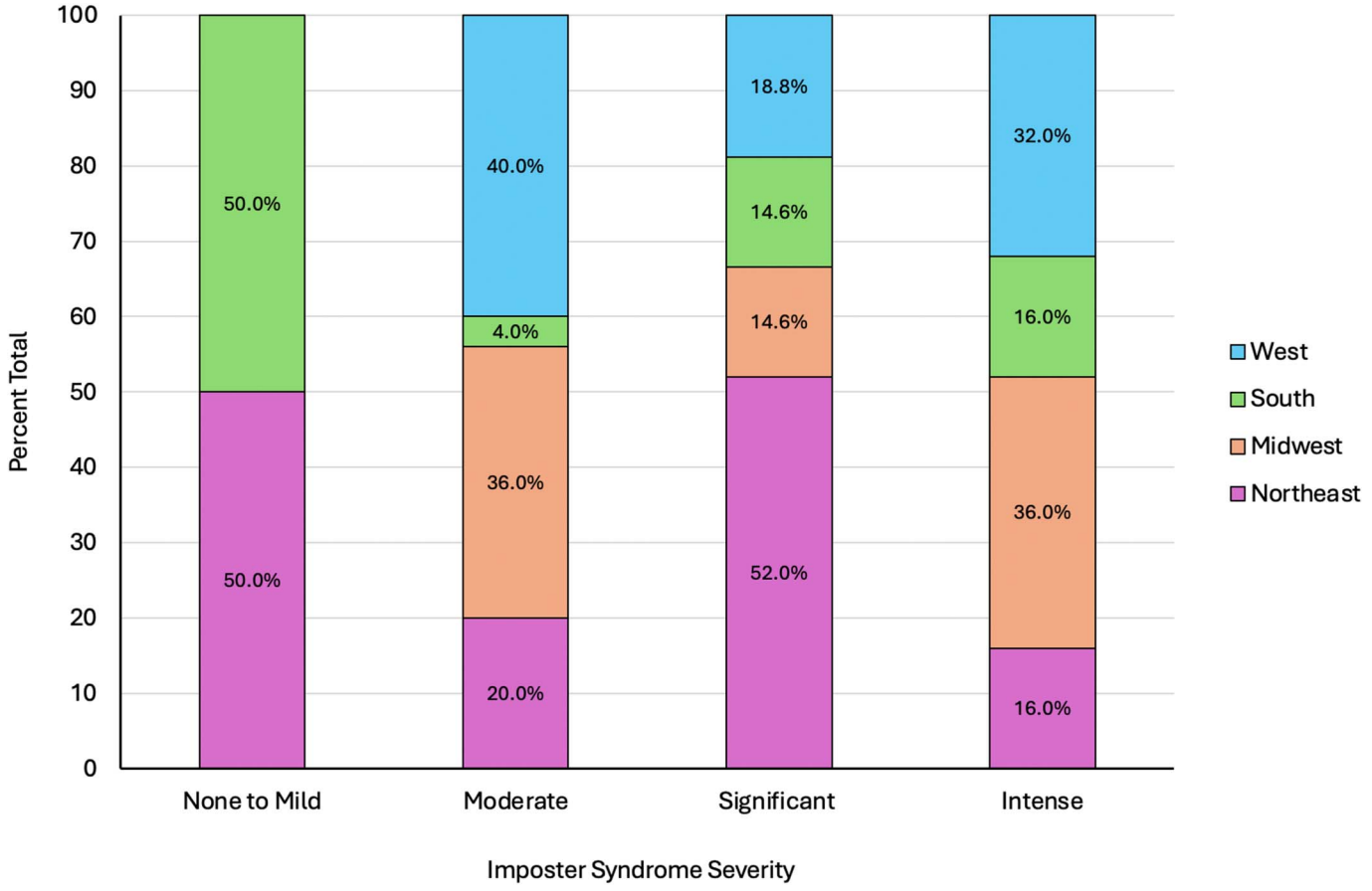

Fig. 3

Imposter syndrome severity stratified by geographic location of institution.

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TABLE V Risk Factors of Significant or Intense Imposter Syndrome*

Parameter	Odds Ratio (95% CI)	p
Age (+1 yr)	0.96 (0.69-1.33)	0.8107
Female (ref: male)	5.64 (1.04-30.63)	0.0452*
LGBTQ + identity	2.45 (0.18-32.45)	0.4971
Race/ethnicity (ref: White)		
Black or African American	0.23 (0.01-4.20)	0.3209
Hispanic or Latino	1.16e08 (0.00-Inf)	0.9937
Asian American or Pacific Islander	1.26 (0.21-7.69)	0.8038
Level of training (ref: PGY1)		
PGY2	13.06 (0.67-255.57)	0.0903
PGY3	0.17 (0.02-1.47)	0.1077
PGY4	2.66 (0.26-26.83)	0.4076
PGY5	1.90 (0.18-20.46)	0.5951
Region (ref: Northeast)		
Midwest	0.20 (0.04-1.10)	0.0636
South	0.89 (0.06-12.79)	0.9342
West	0.13 (0.02-0.90)	0.0388*
Step 1 (ref: 266+)		
251-265	1.33 (0.09-20.68)	0.8388
236-250	0.55 (0.03-10.25)	0.6908
221-235	0.15 (0.00-6.74)	0.3274
<220	0.33 (0.00-35.63)	0.6458
Step 2 (ref: 266+)		
251-265	0.67 (0.09-5.20)	0.7010
236-250	0.41 (0.04-4.47)	0.4613
221-235	0.05 (0.00-2.25)	0.1203
<220	1.87e07 (0.00-Inf)	0.9959
Research year	1.13 (0.23-5.47)	0.8800
Non-MD Degrees	1.19 (0.25-5.52)	0.8281
OITE (ref: 76-100)		
51-75	4.58 (0.62-3.41)	0.1375
26-50	5.11 (0.51-5.12)	0.1653
0-25	4.80 (0.46-5.06)	0.1916

*p < 0.05. LGBTQ+ = lesbian, gay, bisexual, transgender, or queer identity, OITE = Orthopaedic In-Training Examination, and PGY = postgraduate year.

TABLE VI Risk Factors for Increased CIPS Scores

Parameter	Estimate (95% CI)	p
Intercept	43.27 (−1.66 to 88.20)	0.0589
Age	0.36 (−1.28 to 2.00)	0.6616
Female (ref: male)	8.72 (1.41 to 16.04)	0.0201*
LGBTQ+ identity	10.31 (−2.49 to 23.11)	0.1126
Race/ethnicity (ref: White)		
Black or African American	−6.55 (−22.51 to 9.40)	0.4157
Hispanic or Latino	13.92 (−0.36 to 28.20)	0.0559
Asian American or Pacific Islander	0.67 (−9.24 to 10.58)	0.8930
Level of training (ref: PGY1)		
PGY2	7.18 (−4.81 to 19.16)	0.2367
PGY3	−7.41 (−18.35 to 3.53)	0.1814
PGY4	4.10 (−7.42 to 15.62)	0.4802
PGY5	6.48 (−6.25 to 19.22)	0.3138
Region (ref: Northeast)		
Midwest	−1.68 (−9.91 to 6.54)	0.6844
South	−2.41 (−13.36 to 8.53)	0.6618
West	−8.69 (−18.03 to 0.65)	0.0678
Step 1 (ref: 266+)		
251-265	8.15 (−4.04 to 20.33)	0.1868
236-250	2.30 (−10.74 to 15.34)	0.7260
221-235	6.40 (−13.00 to 25.79)	0.5129
<220	7.27 (−16.77 to 31.31)	0.5487
Step 2 (ref: 266+)		
251-265	−2.59 (−12.57 to 7.39)	0.6068
236-250	−3.58 (−15.42 to 8.25)	0.5481
221-235	−0.18 (−21.40 to 21.04)	0.9865
<220	−3.66 (−29.20 to 21.88)	0.7758
Research year	0.84 (−7.27 to 8.96)	0.8362
Non-MD Degrees	−2.05 (−10.26 to 6.17)	0.6212
OITE (ref: 76-100)		
51-75	12.73 (2.79 to 22.67)	0.0128*
26-50	8.40 (−2.79 to 19.59)	0.1389
0-25	11.92 (0.29 to 23.54)	0.0446*

*p < 0.05. CIPS = Clance Imposter Phenomenon Scale, LGBTQ+ = lesbian, gay, bisexual, transgender, or queer identity, OITE = Orthopaedic In-Training Examination, and PGY = postgraduate year.

Appendix

eA Supporting material provided by the author is posted with the online version of this article as a data supplement at jbjs.org (http://links.lww.com/JBJSOA/A788). This content has not been copyedited or verified. ■

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References

1. Clance PR, Imes SA. The imposter phenomenon in high achieving women: dynamics and therapeutic intervention. Psychother Theor Res Pract. 1978;15(3):241-7.

2. Shanafelt TD, Dyrbye LN, Sinsky C, Trockel M, Makowski MS, Tutty M, Wang H, Carlasare LE, West CP. Imposter phenomenon in US physicians relative to the US working population. Mayo Clin Proc. 2022;97(11):1981-93.

3. Liu RQ, Davidson J, Van Hooren TA, Van Koughnett JAM, Jones S, Ott MC. Impostorism and anxiety contribute to burnout among resident physicians. Med Teach. 2022;44(7):758-64.

4. Leach PK, Nygaard RM, Chipman JG, Brunsvold ME, Marek AP. Impostor phenomenon and burnout in general surgeons and general surgery residents. J Surg Educ. 2019;76(1):99-106.

5. Ogunyemi D, Lee T, Ma M, Osuma A, Eghbali M, Bouri N. Improving wellness: defeating Impostor syndrome in medical education using an interactive reflective workshop. PLoS One. 2022;17(8):e0272496.

6. Gottlieb M, Chung A, Battaglioli N, Sebok-Syer SS, Kalantari A. Impostor syndrome among physicians and physicians in training: a scoping review. Med Educ. 2020;54(2):116-24.

7. Villwock JA, Sobin LB, Koester LA, Harris TM. Impostor syndrome and burnout among American medical students: a pilot study. Int J Med Educ. 2016;7:364-9.

8. Thomas M, Bigatti S. Perfectionism, impostor phenomenon, and mental health in medicine: a literature review. Int J Med Educ. 2020;11:201-13.

9. Regan PA, Shumaker K, Kirby JS. Impostor syndrome in United States dermatology residents. J Am Acad Dermatol. 2020;83(2):631-3.

10. Sullivan JB, Ryba NL. Prevalence of impostor phenomenon and assessment of well-being in pharmacy residents. Am J Health Syst Pharm. 2020;77(9):690-6.

11. Bhama AR, Ritz EM, Anand RJ, Auyang ED, Lipman J, Greenberg JA, Kapadia MR. Imposter syndrome in surgical trainees: clance imposter phenomenon scale assessment in general surgery residents. J Am Coll Surg. 2021;233(5):633-8.

12. Zaed I, Bongetta D, Della Pepa GM, Zoia C, Somma T, Zoli M, Raffa G, Menna G. The prevalence of imposter syndrome among young neurosurgeons and residents in neurosurgery: a multicentric study. Neurosurg Focus. 2022;53(2):E9.

13. Medline A, Grissom H, Guissé NF, Kravets V, Hobson S, Samora JB, Schenker M. From self-efficacy to imposter syndrome: the intrapersonal traits of surgeons. J Am Acad Orthop Surg Glob Res Rev. 2022;6(4):e22.00051.

14. Lin E, Crijns TJ, Ring D, Jayakumar P, and The Science of Variation Group. Imposter syndrome among surgeons is associated with intolerance of uncertainty and lower confidence in problem solving. Clin Orthop Relat Res. 2023;481(4):664-71.

15. Sergesketter AR, Butler PD, Gosman AA, Leis A, Baynosa RC, Momeni A, Greives MR, Sears ED, Park JE, Butterworth JA, Janis JE, Rezak K, Patel A. Defining the incidence of the impostor phenomenon in academic plastic surgery: a multi-institutional survey study. Plast Reconstr Surg. 2024;153(5):1022e-1031e.

16. Dyrbye LN, West CP, Satele D, Boone S, Tan L, Sloan J, Shanafelt TD. Burnout among U.S. medical students, residents, and early career physicians relative to the general U.S. population. Acad Med. 2014;89(3):443-51.

17. Legassie J, Zibrowski EM, Goldszmidt MA. Measuring resident well-being: impostorism and burnout syndrome in residency. J Gen Intern Med. 2008;23(7):1090-4.

18. Narayanamoorthy S, McLaren R, Pendam R, Minkoff H. Are women residents of surgical specialties at a higher risk of developing imposter syndrome? Am J Surg. 2024;227:48-51.

19. Harrington MA, Rankin EA, Ladd AL, Mason BS. The orthopaedic workforce is not as diverse as the population it serves: where are the minorities and the women? AOA critical issues symposium. J Bone Joint Surg Am. 2019;101(8):e31.

20. Ahmed M, Hamilton LC. Current challenges for women in orthopaedics. Bone Joint Open. 2021;2(10):893-9.

21. Rodarte P, Kammire MS, Israel H, Poon SC, Cannada LK. The other side of conflict: examining the challenges of female orthopaedic surgeons in the workplace. Am J Surg. 2023;225(1):46-52.

22. Van Heest AE, Agel J, Samora JB. A 15-year report on the uneven distribution of women in orthopaedic surgery residency training programs in the United States. JB JS Open Access. 2021;6(2):e20.00157.

23. Fainstad T, Mann A, Suresh K, Shah P, Dieujuste N, Thurmon K, Jones CD. Effect of a novel online group-coaching program to reduce burnout in female resident physicians: a randomized clinical trial. JAMA Netw Open. 2022;5(5):e2210752.

24. Winfrey SR, Parameswaran P, Gerull KM, LaPorte D, Cipriano CA. Effective mentorship of women and underrepresented minorities in orthopaedic surgery: a mixed-methods investigation. JB JS Open Access. 2022;7(4):e22.00053.

25. Accreditation Council for Graduate Medical Education. ACGME data resource book, academic year 2022-2023; 2023. Available at: https://www.acgme.org/about/publications-and-resources/graduate-medical-education-data-resource-book/. Accessed September 5, 2024.