



Determinants of subspecialty training intention among general surgeons in Türkiye: A national survey

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ABSTRACT

Objective: This study aimed to evaluate, at a national level, the individual, professional, and institutional factors associated with the intention to pursue subspecialty training among general surgery residents and surgeons across a range of career stages in Türkiye.

Material and Methods: This descriptive cross-sectional survey was conducted online between December 10 and 25, 2025. The questionnaire, developed via Google forms, was distributed through professional email lists and national/regional WhatsApp groups. A total of 195 responses were received; after excluding five incomplete questionnaires, 190 participants were analyzed. Data were summarized using descriptive statistics. Group comparisons were performed using chi-square and Fisher's exact tests. Multivariable logistic regression analysis was used to identify independent predictors of subspecialty training intention. Statistical significance was set at $p < 0.05$.

Results: Among participants, 20.5% intended to pursue subspecialty training, 24.2% were undecided, and 55.3% did not. In bivariable comparisons (yes vs. no, undecided excluded), intention was associated with shorter professional experience (≤ 5 years; $p < 0.001$), workplace violence exposure ($p < 0.001$), higher monthly on-call burden ($p = 0.003$), absence of children ($p = 0.016$), and single marital status ($p = 0.035$). In multivariable analysis (Firth penalized logistic regression), professional experience ≤ 5 years (odds ratio 7.51) and workplace violence exposure (odds ratio 3.44) were the only independent predictors. Many participants reported negative perceptions regarding workload, on-call burden, and insufficient institutional support.

Conclusion: The intention to pursue subspecialty training among general surgeons in Türkiye is relatively low and is independently associated with shorter professional experience and exposure to workplace violence. Decision-making is shaped by both individual factors and working conditions, indicating a multidimensional process that should be considered in workforce planning and training policy.

Keywords: General surgery, subspecialty training intention, surgical education, workload, career planning

INTRODUCTION

Subspecialty preferences constitute a critical determinant for the balanced distribution of the surgical workforce and the sustainability of healthcare services (1). Nevertheless, national and international data remain limited regarding the factors that shape the decision-making processes of surgeons in the early stages of their careers when considering subspecialty training, as well as how working conditions and the educational environment influence this process (2).

Previous studies have reported that specialty and subspecialty choices are influenced by a wide range of factors, including personal interests, academic motivation, lifestyle expectations, mentorship, and perceived career opportunities (3,4). General surgery, however, presents unique dynamics that may further shape these decisions, given its demanding workload, prolonged training pathway, and challenges in maintaining work-life balance. In this context, structural factors such as workload and on-call intensity, together with institutional support mechanisms and mentorship structures, have been suggested as potential determinants influencing career orientation among surgical trainees and early-career surgeons (5-7).

A clear distinction should be drawn between the different pathways of advanced surgical training, as these terms are sometimes used interchangeably. In the Turkish context, formal subspecialty training refers to board-recognized programmes entered through the national Subspecialty Training Entrance Examination [Yan Dal Uzmanlık Sınavı, (YDUS)], which general surgeons may undertake after completing residency and obtaining specialist status; for general surgery, the principal formal subspecialties are surgical oncology and gastroenterological surgery, each comprising a structured,

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multi-year programme leading to a distinct national certification. This differs from fellowship training, which is typically shorter, may be pursued domestically or abroad, and does not necessarily confer a nationally recognized subspecialty qualification, and from academic career orientation, which reflects the pursuit of academic advancement and scholarly productivity independent of formal subspecialty status. In the present study, the intention to pursue subspecialty training refers specifically to formal, YDUS-based subspecialty certification.

In recent years, structural reforms within the Turkish healthcare system have introduced significant changes in the organization and delivery of healthcare services (8). These transformations may have important implications for surgical workforce planning and the orientation toward subspecialty training (9). However, comprehensive studies from Türkiye that examine the intention to pursue subspecialty training among general surgery residents and surgeons across a range of career stages in relation to workload, working conditions, exposure to workplace violence, malpractice concerns, academic motivation, and systemic or economic factors remain scarce (10,11). This lack of evidence represents an important gap in the literature, particularly in the context of surgical workforce planning.

Within this framework, it was hypothesized that the intention to pursue subspecialty training may be associated with demographic and family-related characteristics, workplace conditions, as well as academic experiences and mentorship exposure.

The aim of this study was to evaluate, at a national level, the individual, professional, and institutional factors influencing the intention to pursue subspecialty training among general surgery residents and surgeons across a range of career stages in Türkiye, and to analyze the variables associated with this career orientation.

MATERIAL and METHODS

Study Design and Participants

This study was designed as a descriptive, cross-sectional survey aimed at evaluating the individual, professional, and institutional factors influencing the intention to pursue subspecialty training among general surgery residents and general surgeons across a range of career stages in Türkiye. The study was conducted at the national level and participation was voluntary.

The study population consisted of general surgery residents actively working in Türkiye and general surgery specialists with varying durations of post-residency professional experience. Early-career specialists were defined as surgeons within the first five years following completion of residency training. In order to evaluate the potential influence of professional experience on the intention to pursue subspecialty training, surgeons

with longer professional experience were also included in the analyses.

The survey questionnaire was developed using the Google forms platform. The survey link was distributed through professional email lists of general surgeons as well as through national and regional WhatsApp groups. To facilitate broader dissemination and reach physicians working in different institutions, participants were also encouraged to share the survey link with their colleagues. Data collection was conducted between December 10, 2025, and December 25, 2025, following approval from the institutional ethics committee. The survey was administered anonymously, and the potential for duplicate responses was evaluated during the data cleaning phase. Possible repeated entries were assessed by comparing demographic and professional variables.

The sample was obtained using a non-probability convenience sampling method. The questionnaire was distributed electronically through WhatsApp, e-mail, and Google forms links to the target population, and data collection continued until the target of 190 complete responses was reached. A total of 195 participants completed the questionnaire; five questionnaires containing incomplete data were excluded, and the final analysis was conducted on 190 participants. No formal a priori power calculation was performed, which is acknowledged as a limitation. The study was conducted anonymously, and no personally identifiable information was collected.

Because the survey link was disseminated through an open, chain-distribution method, it was not possible to determine the exact number of physicians who were ultimately reached. Therefore, a precise response rate could not be calculated, and this may represent a potential source of selection bias.

Data Collection Instrument

The survey used in this study was developed by the researchers based on a review of the literature and in alignment with the objectives of the study. The questionnaire was reviewed by two senior general surgery specialists and one academic researcher. Following this review, a pilot application was conducted with 10 participants, and necessary revisions were made accordingly. Pilot participants were not included in the final analysis. The estimated completion time for the survey was approximately 12 minutes. The full survey instrument used in this study is provided in Supplementary Material.

The questionnaire was designed as a multidimensional instrument and consisted of the following sections:

1. Demographic and professional characteristics
2. Surgical and clinical workload
3. Intention to pursue subspecialty training and reasons for preference

4. Perceived workload and burnout
5. Academic profile and mentorship status
6. Subspecialty motivation scale
7. Institutional support and systemic barriers.

Likert-type items were evaluated using a five-point scale (1= strongly disagree, 5= strongly agree). Items assessing subspecialty motivation were evaluated as a multi-item subscale, and internal consistency was analyzed using Cronbach's alpha coefficient (Cronbach $\alpha=0.85$). This analysis was performed solely to assess item-level internal consistency within the current sample and was not intended as a scale development process or a comprehensive psychometric validation.

Variables

The primary dependent variable of the study was the participants' intention to pursue subspecialty training. In comparative analyses, this variable was categorized into two groups: "Yes" and "No." Participants who responded "Undecided" were excluded from these comparisons.

For both the bivariable comparisons and the multivariable logistic regression analysis, participants who responded "Undecided" were excluded, and the outcome was modeled as "Yes" versus "No." As a sensitivity analysis, the multivariable model was repeated with "Undecided" responses merged into the "No" group ($n=190$), which yielded consistent results.

The "Undecided" response was excluded from the primary analyses because it may represent a distinct stage within the career decision-making process rather than an absence of intention. The event modeled in the regression was the intention to pursue subspecialty training ("Yes").

The independent variables included the following:

- Demographic characteristics (age, sex, marital status, having children)
- Professional experience and position (professional experience was calculated as the total duration of residency training and post-residency practice)
- Working conditions (number of operations, number of on-call shifts, perceived workload)
- Exposure to workplace violence and malpractice-related experiences within the past 12 months
- Academic activity status and mentorship support
- Perceptions regarding the potential benefits of subspecialty training
- Evaluations of economic and systemic factors influencing career decisions.

Statistical Analysis

Descriptive statistics were presented as counts (n) and percentages (%) for categorical variables. Since no continuous variables were included in the analysis, measures of central tendency and dispersion were not calculated.

For descriptive presentation, Likert responses were displayed in three categories (1-2= disagree, 3= neutral, 4-5= agree). For all inferential comparisons, a single consistent dichotomy was applied throughout the main and supplementary tables [agree (4-5) versus not-agree (1-3)]. Categorical variables were compared using the Pearson chi-square (χ^2) test, with Fisher's exact test applied when any expected cell count was less than five.

Variables for the multivariable model were selected a priori on clinical and theoretical grounds and limited to four (professional experience, workplace violence exposure, having children, and previous academic activity) to maintain an adequate events-per-variable ratio (≈ 10). Attitudinal/perception items were excluded a priori because they are conceptually downstream of the outcome and risk reverse causation. Given the limited number of events ($n=39$), the model was estimated using Firth penalized logistic regression. Effect estimates [odds ratios (ORs) with 95% Wald confidence intervals (CIs)] were derived from the Firth model, whereas overall model-fit indices (McFadden's R^2 and the Akaike information criterion) were obtained from a parallel conventional maximum-likelihood logistic regression fitted to the same data and are reported as auxiliary diagnostics only. Model calibration was assessed with the Hosmer-Lemeshow test, computed on the corresponding conventional maximum-likelihood logistic model (6 groups, 4 degrees of freedom; $\chi^2=2.91$, $p=0.574$), and multicollinearity with the variance inflation factor (VIF) (all VIF <2.5). Results are reported as ORs with 95% CIs.

The following coding rules were applied in the regression model. The modeled event was the intention to pursue subspecialty training ("Yes"); "Undecided" responses were excluded from the primary model and, in a sensitivity analysis, were merged into the "No" group. Predictors were dichotomized as follows: Professional experience (≤ 5 years vs. >5 years), workplace violence exposure (none/rarely vs. occasional/frequent/very frequent), having children (yes vs. no), and previous academic activity (≥ 1 completed scientific work vs. none). Descriptive and bivariable analyses were performed in Jamovi (version 2.6). Firth penalized logistic regression was performed in Python (version 3.12) using the *firthlogit* package (version 0.4.0); the parallel conventional maximum-likelihood logistic regression used for the auxiliary model-fit indices (McFadden R^2 and the Akaike information criterion) and the Hosmer-Lemeshow test was fitted in Python using the *statsmodels* package (version 0.14).

The Firth results were independently verified in R (version 4.4.2) using the logistf package (version 1.26.1). The full statistical code and output, together with a variable codebook defining all value labels and missing-value codes, are provided as Supplementary Material.

A p-value of <0.05 was considered statistically significant. The detailed distribution of the bivariate analyses is presented in Supplementary Table.

Ethical Approval

The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the relevant Institutional Ethics Committee of University of Health Sciences Türkiye, Ankara Etlik City Hospital (ethics committee no: AEHŞ-BADEK2-2025-635, date: 02.12.2025). Electronic informed consent was obtained from all participants at the beginning of the survey. The study was conducted anonymously, and no personal identifying data were collected.

RESULTS

Demographic and Professional Characteristics of the Participants

Analyses were performed on a total of 190 participants. The age distribution showed that the largest proportion of participants belonged to the 25-29 age group (35.8%), followed by the 30-34 age group (27.4%). Of the participants, 80.5% were male and 19.5% were female. Regarding marital status, 61.6% of the participants were married, and 40.5% reported having children.

In terms of professional position, 52.1% of the participants were general surgery residents, 21.1% were newly certified specialists, and 26.8% were senior specialists. When professional experience was examined, the largest single category consisted of participants with 11 years or more of professional experience (28.9%), followed by those with 6-10 years of experience (18.4%). Regarding institutional affiliation, the highest participation rates were from city hospitals (39.5%) and training and research hospitals (26.3%). The demographic and professional characteristics of the participants are presented in Table 1.

Working Conditions and Clinical Workload

It was reported that 75.8% of the participants had not experienced any malpractice-related legal process within the previous 12 months. When exposure to workplace violence during the same period was evaluated, 38.4% of the participants reported experiencing violence "rarely," 17.9% reported experiencing it "occasionally," and 6.4% reported experiencing it "frequently/very frequently."

Regarding the number of operations performed per week, 39.5% of the participants reported performing 0-5 operations, while 37.4% reported performing 6-10 operations. Perceived surgical

Table 1. Demographic and professional characteristics of the participants (n=190)

Characteristic	n (%)
Age group	
<24	1 (0.5)
25-29	68 (35.8)
30-34	52 (27.4)
35-39	24 (12.6)
40-44	20 (10.5)
≥45	25 (13.2)
Sex	
Male	153 (80.5)
Female	37 (19.5)
Marital status	
Single	73 (38.4)
Married	117 (61.6)
Having children	
No	113 (59.5)
Yes	77 (40.5)
Professional position	
Resident	99 (52.1)
Early-career specialist	40 (21.1)
Specialist	51 (26.8)
Professional experience (years)	
≤5	100 (52.6)
6-10	35 (18.4)
≥11	55 (28.9)
Institution type	
University hospital	11 (5.8)
Training & research hospital	50 (26.3)
City hospital	75 (39.5)
State hospital	41 (21.6)
Private hospital	13 (6.8)
Note: Data are presented as n (%). Percentages may not sum to 100 due to rounding.	

workload was most commonly reported as "low-moderate" (31.1%) and "moderate" (28.4%). When the daily number of outpatient visits was evaluated, 77.9% of the participants reported seeing 41 or more patients per day.

With respect to monthly on-call duties, the most commonly reported frequencies were 4-5 shifts per month (30.0%) and 6-7 shifts per month (22.1%). More than half of the participants (51.6%) evaluated their on-call workload as "very high." Regarding the use of post-call leave, 32.6% of the participants reported that they "always" used post-call leave, whereas 30.5% reported that they "never" used it.

Intention to Pursue Subspecialty Training

Among the participants, 20.5% reported that they intended to pursue subspecialty training, 24.2% were undecided, and 55.3% reported no intention to pursue subspecialty training. Among those planning to pursue subspecialty training, the most frequently reported intended time frames were "within the first 12 months" (26.8%) and "within 1-3 years" (25.8%). The characteristics of participants regarding working conditions and their inclination toward subspecialty training are summarized in Table 2.

Perceived Workload and Emotional Exhaustion

Based on the Likert-scale evaluations, 60.0% of the participants agreed that their working conditions sometimes caused feelings of emotional exhaustion. In addition, 59.5% reported that their workload prevented them from allocating sufficient time to their personal lives, while 58.9% believed that the level of professional pressure and responsibility contributed to emotional exhaustion. Furthermore, 50.5% of the participants stated that the intensity of on-call duties and the overall work pace negatively affected their work-life balance.

Institutional Environment and Academic Support

A total of 44.2% of the participants agreed that their institutions did not encourage participation in academic activities. Moreover, 54.7% reported that adequate mentorship support was lacking within their institutions. The proportion of participants who believed that task distribution within the surgical department was not fair was 45.8%. In contrast, only 32.1% of the participants considered the institutional infrastructure to be adequate for surgical training. The Likert-scale results related to perceived workload and institutional environment are presented in Table 3A and Table 3B.

Comparative Analysis According to the Intention to Pursue Subspecialty Training

When participants who intended to pursue subspecialty training ($n=39$) were compared with those who did not ($n=105$), statistically significant differences were observed for absence of children ($p=0.016$), shorter professional experience (≤ 5 years; $p<0.001$), and single marital status ($p=0.035$). Single marital status was significant only in the bivariable comparison and was not among the four variables entered into the multivariable model. The intention to pursue subspecialty training was higher among participants with ≤ 5 years of professional experience (OR 6.39; 95% CI 2.74-14.90). Notably, resident position alone was not associated with intention (OR 1.01; $p=0.99$), indicating that the effect reflects the experience gradient rather than a simple resident-specialist distinction. Professional experience ≤ 5 years remained an independent predictor in the multivariable analysis (adjusted OR 7.51; 95% CI 1.90-29.62; $p=0.004$).

Table 2. Working conditions and subspecialty intention (n=190)

Characteristic	n (%)
International career plans	
No	103 (54.2)
Yes	38 (20.0)
Undecided	49 (25.8)
Malpractice experience (last 12 months)	
No	144 (75.8)
Ongoing	27 (14.2)
Resolved	13 (6.8)
Adverse outcome	6 (3.2)
Workplace violence exposure (last 12 months)	
None	71 (37.4)
Rarely	73 (38.4)
Occasionally	34 (17.9)
Frequently	6 (3.2)
Very frequently	6 (3.2)
Weekly surgical volume	
0-5	75 (39.5)
6-10	71 (37.4)
11-15	34 (17.9)
16-20	6 (3.2)
≥ 21	4 (2.1)
Daily outpatient volume	
0-10	18 (9.5)
11-20	8 (4.2)
21-30	12 (6.3)
31-40	4 (2.1)
≥ 41	148 (77.9)
Monthly on-call duties	
0-1	32 (16.8)
2-3	18 (9.5)
4-5	57 (30.0)
6-7	42 (22.1)
8-9	31 (16.3)
≥ 10	10 (5.3)
Post-call day-off frequency	
Never	58 (30.5)
Rarely	13 (6.8)
Sometimes	22 (11.6)
Usually	35 (18.4)
Always	62 (32.6)
Subspecialty intention	
No	105 (55.3)
Yes	39 (20.5)
Undecided	46 (24.2)
Note: Data are presented as n (%).	

Table 3A. Perceptions regarding workload and institutional environment (n=190)			
Characteristic	Disagree (1-2)	Neutral (3)	Agree (4-5)
Workload and emotional impact			
Workload negatively affects motivation	46 (24.2)	53 (27.9)	91 (47.9)
Work schedule disrupts work-life balance	48 (25.3)	46 (24.2)	96 (50.5)
Working conditions cause burnout	35 (18.4)	41 (21.6)	114 (60.0)
Stress causes concern about future	52 (27.4)	45 (23.7)	93 (48.9)
Insufficient time for personal life	31 (16.3)	46 (24.2)	113 (59.5)
Physical conditions increase workload	38 (20.0)	49 (25.8)	103 (54.2)
Professional pressure causes fatigue	28 (14.7)	50 (26.3)	112 (58.9)
Institutional environment			
Academic participation encouraged	84 (44.2)	48 (25.3)	58 (30.5)
Meetings and courses supported	85 (44.7)	47 (24.7)	58 (30.6)
Institution contributes to career	84 (44.2)	53 (27.9)	53 (27.9)
Adequate mentorship available	104 (54.7)	47 (24.7)	39 (20.5)
Task distribution is fair	87 (45.8)	48 (25.3)	55 (28.9)
Teamwork is adequate	68 (35.8)	45 (23.7)	77 (40.5)
Institutional competition negative	88 (46.3)	51 (26.8)	51 (26.9)
Infrastructure adequate for training	78 (41.1)	51 (26.8)	61 (32.1)
Note : Data are presented as n (%). Likert responses were collapsed into three categories (1-2= disagree, 3= neutral, 4-5= agree) to ensure adequate expected cell counts for categorical comparisons.			

A strong positive association was identified between exposure to workplace violence within the past 12 months and the intention to pursue subspecialty training (OR 5.57; 95% CI 2.39-12.96; $p<0.001$), which remained independently significant in the multivariable analysis (adjusted OR 3.44; 95% CI 1.37-8.63; $p=0.009$). A higher monthly on-call burden was also significantly associated with intention (Pearson χ^2 , $p=0.003$).

Previous academic activity was not associated with a higher intention to pursue subspecialty training; on the contrary, it was less frequent among those intending subspecialty training (56.4% vs. 80.0%; OR 0.32; $p=0.004$), an association that did not persist after adjustment for professional experience. At the bivariable level, the belief that subspecialty training would contribute to academic development ($p<0.001$) and the expectation of increased income ($p<0.001$) were associated with intention; these attitudinal items were not entered into the multivariable model.

Table 3B. Perceived benefits and systemic factors influencing subspecialty intention (n=190)			
Characteristic	Disagree (1-2)	Neutral (3)	Agree (4-5)
Perceived benefits of subspecialty			
Subspecialty benefits academic career	68 (35.8)	44 (23.2)	78 (41.0)
Subspecialty necessary for development	82 (43.1)	47 (24.7)	61 (32.1)
Research interest strengthens intention	94 (49.4)	49 (25.8)	47 (24.7)
Mentorship influences decision	84 (44.2)	62 (32.6)	44 (23.2)
Subspecialty provides skills	49 (25.8)	47 (24.7)	94 (49.5)
Subspecialty increases satisfaction	40 (21.1)	40 (21.1)	110 (57.9)
Improves working conditions	79 (41.6)	51 (26.8)	60 (31.6)
Workload more controllable	72 (37.9)	53 (27.9)	65 (34.2)
Income will increase	72 (37.9)	44 (23.2)	74 (38.9)
Economic and systemic factors			
Economic motivation influential	74 (38.9)	50 (26.3)	66 (34.7)
Payment system influential	66 (34.7)	60 (31.6)	64 (33.7)
International opportunities influential	79 (41.6)	55 (28.9)	56 (29.5)
International validity important	56 (29.5)	53 (27.9)	81 (42.6)
Exam process is barrier	65 (34.2)	61 (32.1)	64 (33.7)
Relocation difficult	48 (25.3)	41 (21.6)	101 (52.1)
Training costs influential	66 (34.7)	58 (30.5)	66 (34.7)
Living costs important barrier	59 (31.1)	42 (22.1)	89 (46.9)
Note: Data are presented as n (%). Likert responses were collapsed into three categories (1-2= disagree, 3= neutral, 4-5= agree) to ensure adequate expected cell counts for categorical comparisons.			

At the bivariable level, the perception that international opportunities are influential was also associated with intention ($p<0.001$), whereas the perception that the current payment system is discouraging was not ($p=0.135$). These attitudinal associations are presented in Supplementary Table and were not entered into the multivariable model.

The results of the multivariable logistic regression analysis are presented in Table 4.

DISCUSSION

In this study, the intention to pursue subspecialty training among general surgeons in Türkiye was relatively limited, with a substantial proportion of participants remaining undecided. After adjustment, the intention was independently associated with shorter professional experience and exposure to workplace violence, indicating that career stage and the psychosocial working environment, rather than attitudinal expectations, are central to this decision (2,12).

Table 4. Multivariable logistic regression of factors associated with the intention to pursue subspecialty training (yes vs. no; n=144)

Variable	Adjusted OR (95% CI) ¹	p-value
Professional experience ≤5 years	7.51 (1.90-29.62)	0.004
Workplace violence exposure (occasional/frequent)	3.44 (1.37-8.63)	0.009
No children	0.43 (0.11-1.67)	0.220
Previous academic activity	0.72 (0.28-1.81)	0.481

Reference categories: subspecialty intention = No; professional experience >5 years; no workplace violence (none/rarely); has children; no previous academic activity.

¹: Odds ratios (ORs) and 95% Wald confidence intervals (CIs) were obtained using Firth penalized logistic regression (event = Yes; 39 events, 4 predictors; events-per-variable ≈9.8). Model-fit indices (McFadden R²=0.190; AIC =146.2) and the Hosmer-Lemeshow test (6 groups, 4 degrees of freedom; $\chi^2=2.91$, p=0.574) were obtained from a parallel conventional maximum-likelihood logistic regression fitted to the same data and are reported as auxiliary diagnostics only. Variance inflation factors: Professional experience ≤5 years =2.20, Workplace violence exposure =1.14, No children =1.98, Previous academic activity =1.27 (all <2.5). Sensitivity analysis (experience + violence only; events-per-variable ≈19.5): professional experience ≤5 years OR 4.60 (1.93-10.97), p<0.001; workplace violence OR 3.60 (1.47-8.84), p=0.005. A further sensitivity analysis merging "undecided" into the "No" group (n=190) yielded consistent results.

The participant profile, predominantly consisting of younger physicians and males, reflects the demographic characteristics of general surgery as a field that remains concentrated in the early career stage and continues to be male-dominated. This observation is consistent with international literature reporting persistent gender disparities in surgical representation (13,14). In the present study, no significant association was found between gender and the intention to pursue subspecialty training. However, the male predominance of the sample suggests that gender alone may not be a decisive factor in subspecialty career orientation. This finding may also be interpreted in light of studies suggesting that both gender and generational factors can influence career preferences in surgery (15,16).

The higher intention among participants with ≤5 years of professional experience suggests that career planning often takes shape during the early stages of professional development, consistent with reports that subspecialty plans emerge early in residency (17). Because professional experience was defined as total residency plus post-residency duration, the ≤5-year group (n=100) largely overlaps the resident group (n=99); however, resident status alone was not associated with intention, suggesting the effect tracks the experience gradient rather than a simple resident-specialist distinction. The finding that not having children was associated with higher intention suggests that increasing family responsibilities may limit decisions toward further specialization, given concerns about work-life balance and the prolonged duration of training (2,18,19), whereas single

marital status showed only a bivariable association and was not among the multivariable predictors. However, the association with the absence of children did not persist in the multivariable analysis (adjusted OR 0.43; 95% CI 0.11-1.67); similarly, the inverse crude association with previous academic activity was attenuated after adjustment. These attenuations should be interpreted with caution and most likely reflect the interrelationships among career stage, family status, and previous academic activity rather than independent effects, and no definitive causal mechanism can be inferred from these cross-sectional data.

Workplace violence exposure emerged as an independent predictor of subspecialty intention, and on-call workload showed a significant bivariable association, suggesting that the psychosocial environment of the clinical setting may influence career orientation. Exposure to workplace violence may shape decision-making through its impact on perceived safety and psychological stress (20,21), and the widespread perception of excessive workload and high professional responsibility supports this interpretation (22-24). Previous studies have consistently linked long working hours and high clinical responsibility in surgery to adverse psychosocial outcomes (25,26); consideration of these working conditions appears essential for the sustainability of surgical training.

In contrast to some previous reports, previous academic activity was not positively associated with the intention to pursue subspecialty training in our sample; if anything, it was more common among non-intenders, and this association did not persist after adjustment for professional experience. This pattern most likely reflects confounding by career stage, as more senior surgeons tend to have accumulated more academic output while being less inclined toward subspecialty training, rather than an independent effect of academic engagement. A considerable proportion of participants also reported insufficient institutional encouragement for academic activity and inadequate mentorship support, which may shape the broader educational environment in which these decisions are made (27-30).

At the bivariable level, attitudinal expectations, particularly the belief that subspecialty training contributes to academic advancement and to increased income, were associated with intention, consistent with literature emphasizing both intrinsic and extrinsic motivations in specialty choice (31-33). These items were not entered into the multivariable model because they are conceptually downstream of the decision itself. The persistently low overall intention and the substantial proportion of undecided participants suggest that such expectations alone are insufficient to drive subspecialty decisions, which instead emerge from the interaction of career stage, working conditions, and broader institutional context.

The perception that subspecialty training may increase opportunities to work abroad was also strongly associated with the intention to pursue subspecialty training. This finding suggests that subspecialty preferences may not be shaped solely by national career expectations, but may also be influenced by the perceived availability of international career opportunities (34,35). For surgeons in the early stages of their careers, the expectation of acquiring a subspecialty qualification with global relevance may represent an important motivational factor for pursuing advanced training. Indeed, previous studies have reported that the motivation to pursue fellowship training and the search for advanced educational opportunities can significantly influence surgical career trajectories (2,12).

Study Limitations

A strength of this study is the collection of national-level data and the comprehensive evaluation of multiple factors. Several limitations should be acknowledged. The cross-sectional design precludes causal inference. The convenience and open chain-distribution online sampling strategy may have introduced selection and response bias and limits representativeness; because the number of physicians reached could not be determined, a precise response rate could not be calculated. Perceptions of workload and emotional exhaustion were assessed with study-specific Likert items rather than a validated instrument such as the Maslach Burnout Inventory, so these findings should not be interpreted as measures of burnout. Collapsing Likert responses may have caused information loss and reduced power. Finally, with 39 events and four predictors (events-per-variable ≈ 10), the multivariable model has limited power; Firth penalized regression was used to mitigate small-sample bias, and a parsimonious sensitivity model yielded consistent results.

On the other hand, the inclusion of participants with varying levels of professional seniority enabled the evaluation of the potential influence of professional experience on the intention to pursue subspecialty training and contributed to the interpretation of findings within the context of different career stages.

This study provides up-to-date national-level data regarding factors that may be associated with the intention to pursue subspecialty training among general surgery residents and surgeons across a range of career stages in Türkiye. The findings suggest that decisions regarding subspecialty training may be influenced by experiences during the training process as well as by institutional structures. However, the cross-sectional design of the study does not allow causal inference. Future studies employing multivariable and prospective research designs may provide a more detailed understanding of the determinants of

subspecialty training orientation and contribute to the evidence-based development of surgical education policies.

CONCLUSION

The intention to pursue subspecialty training among general surgeons in Türkiye can be understood as a multidimensional career choice that, after adjustment, is independently associated with shorter professional experience and exposure to workplace violence. While various individual and attitudinal factors show bivariable associations, working conditions and career stage appear central to the decision. These findings highlight the importance of addressing career planning early in surgical training and of improving working conditions and institutional support.

Ethics

Ethics Committee Approval: The study was conducted in accordance with the principles of the Declaration of Helsinki. Ethical approval was obtained from the relevant Institutional Ethics Committee of University of Health Sciences Türkiye, Ankara Etlik City Hospital (ethics committee no: AEHŞ-BADEK2-2025-635, date: 02.12.2025).

Informed Consent: Electronic informed consent was obtained from all participants at the beginning of the survey. The study was conducted anonymously, and no personal identifying data were collected.

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Footnotes

Author Contributions

Concept - B.B., S.D., F.Y.; Design - B.B., S.D., F.Y.; Data Collection or Processing - B.B., M.S.S., S.D., U.B.; Analysis or Interpretation - M.S.S., F.Y., Ş.B.; Literature Search - B.B., U.B., F.Y.; Writing - B.B., M.S.S., S.D., Ş.B.

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Supplementary Table Link: <https://d2v96fxpocvxx.cloudfront.net/6548c443-00ef-4a8c-a306-c0848f02b51f/content-images/e32b25be-322c-4de4-a97e-ef25b52f21bf.pdf>

REFERENCES

1. Karadakis R, Chan DC, Landon BE, Keating NL, Manz C, Onnela JP, et al. Subspecialization of surgical specialties in the US. *JAMA Health Forum.* 2025;6:e253192.
2. McClintock NC, Gray KE, Neville AL, Kaji AH, Wolfe MM, Calhoun KE, et al. Factors associated with general surgery residents' decisions regarding fellowship and subspecialty stratified by burnout and quality of life. *Am J Surg.* 2019;218:1090-1095.

3. Yang Y, Li J, Wu X, Wang J, Li W, Zhu Y, et al. Factors influencing subspecialty choice among medical students: a systematic review and meta-analysis. *BMJ Open*. 2019;9:e022097.
4. AlHabsi G, AlGhaithi A, AlWeshahi Y, Jahwari A. Influential factors in the selection of subspecialty fellowship training among surgical trainees in Oman. *Oman Med J*. 2024;39:e626.
5. Gates RS, Kemp MT, Evans J, Liesman D, Pumiglia L, Matusko N, et al. The demands of surgery residency: more than just duty hours? *J Surg Res*. 2023;290:293-303.
6. McCord JH, McDonald R, Sippel RS, Levenson G, Mahvi DM, Weber SM. Surgical career choices: the vital impact of mentoring. *J Surg Res*. 2009;155:136-141.
7. Antiel RM, Reed DA, Van Arendonk KJ, Wightman SC, Hall DE, Porterfield JR, et al. Effects of duty hour restrictions on core competencies, education, quality of life, and burnout among general surgery interns. *JAMA Surg*. 2013;148:448-455.
8. Atun R, Aydın S, Chakraborty S, Sümer S, Aran M, Gürol I, et al. Universal health coverage in Turkey: enhancement of equity. *Lancet*. 2013;382:65-99.
9. Yastı AÇ, Uçar AD, Kendirci M. General surgery specialism in Turkey: work power currently, continuity at quality and quantity. *Turk J Surg*. 2020;36:82-95.
10. Tolu S, Rezvani A, Gürçan Atıcı A, Şendur ÖF, Kuran B, Ataman Ş, et al. Factors influencing subspecialty training and career choices: a national survey of physical and rehabilitation medicine residents. *Arch Rheumatol*. 2019;34:26-33.
11. Yıldız MS, Khan MM. Factors affecting the choice of medical specialties in Türkiye: an analysis based on cross-sectional survey of medical graduates. *BMC Med Educ*. 2024;24:373.
12. Klingensmith ME, Cogbill TH, Luchette F, Biester T, Samonte K, Jones A, et al. Factors influencing the decision of surgery residency graduates to pursue general surgery practice versus fellowship. *Ann Surg*. 2015;262:449-455.
13. Abelson JS, Chartrand G, Moo TA, Moore M, Yeo H. The climb to break the glass ceiling in surgery: trends in women progressing from medical school to surgical training and academic leadership from 1994 to 2015. *Am J Surg*. 2016;212:566-572.
14. Bernardi K, Lyons NB, Huang L, Holihan JL, Olavarria OA, Loo MM, et al. Gender disparity among surgical peer-reviewed literature. *J Surg Res*. 2020;248:117-122.
15. Peel JK, Schlachta CM, Alkhamesi NA. A systematic review of the factors affecting choice of surgery as a career. *Can J Surg*. 2018;61:58-67.
16. Sanfey HA, Saalwachter-Schulman AR, Nyhof-Young JM, Eidelson B, Mann BD. Influences on medical student career choice: gender or generation? *Arch Surg*. 2006;141:1086-1094.
17. Cui CL, Murillo A, Muca A, Hier ZE, Burton E, Richmond R, et al. Early career focus among general surgery residents pursuing vascular surgery fellowship: a multi-institutional study from the US ROPE Consortium. *Am Surg*. 2026;92:1592-1598.
18. Sullivan MC, Yeo H, Roman SA, Bell RH Jr, Sosa JA. Striving for work-life balance: effect of marriage and children on the experience of US general surgery residents. *Ann Surg*. 2013;257:571-576.
19. Seidenstein AH, Savage CH, Cha MJ, Aiyer AA, LaPorte DM. The impact of surgical training on residents' relationships and life choices. *J Surg Educ*. 2024;81:1383-1393.
20. Phillips JP. Workplace violence against health care workers in the United States. *N Engl J Med*. 2016;374:1661-1669.
21. Hu YY, Ellis RJ, Hewitt DB, Yang AD, Cheung EO, Moskowitz JT, et al. Discrimination, abuse, harassment, and burnout in surgical residency training. *N Engl J Med*. 2019;381:1741-1752.
22. Shanafelt TD, Balch CM, Bechamps GJ, Russell T, Dyrbye L, Satele D, et al. Burnout and career satisfaction among American surgeons. *Ann Surg*. 2009;250:463-471.
23. Dyrbye LN, Varkey P, Boone SL, Satele DV, Sloan JA, Shanafelt TD. Physician satisfaction and burnout at different career stages. *Mayo Clin Proc*. 2013;88:1358-1367.
24. Kinslow K, Sutherland M, McKenney M, Elkbuli A. Reported burnout among US general surgery residents: a survey of the association of program directors in surgery members. *Ann Med Surg (Lond)*. 2020;60:14-19.
25. Elmore LC, Jeffe DB, Jin L, Awad MM, Turnbull IR. National survey of burnout among US general surgery residents. *J Am Coll Surg*. 2016;223:440-451.
26. Celik SU, Aslan A, Coskun E, Coban BN, Haner Z, Kart S, et al. Prevalence and associated factors for burnout among attending general surgeons: a national cross-sectional survey. *BMC Health Serv Res*. 2021;21:39.
27. Sambunjak D, Straus SE, Marusić A. Mentoring in academic medicine: a systematic review. *JAMA*. 2006;296:1103-1115.
28. Bourke L, Conway C, Abdalla ME. Mentorship in surgical training: a systematic scoping review. *BMC Med Educ*. 2025;25:373.
29. Butler BA, Johnson D, Christian RA, Bigach SD, Beal MD, Peabody TD. Factors influencing subspecialty choice of orthopedic residents. *Iowa Orthop J*. 2020;40:19-23.
30. Thomas D, Oldfield T, Bamford H. Unpacking mentorship: a review of its role in contemporary postgraduate surgical education. *Cureus*. 2025;17:e99455.
31. Borges NJ, Navarro AM, Grover A, Hoban JD. How, when, and why do physicians choose careers in academic medicine? *Acad Med*. 2010;85:680-686.
32. Donaghue JF, Denson DJ, Carroll MC, Smith JE, Rosenkranz KM. Fellowship training after general surgery residency: does it pay? *J Surg Educ*. 2025;82:103734.
33. Okkan M, Çaltın İ, Saygılı AT, Yıldırım G, Bağır M. Challenges and influencing factors in hand surgery subspecialty training: a nationwide survey of orthopedic, plastic, and hand surgery residents in Türkiye. *Acta Orthop Traumatol Turc*. 2025;59:141-145.
34. Reynolds IS, McKenna NP, Mathis KL, Perry WR. International surgical fellowships in the USA: the pathway to success. *Ir J Med Sci*. 2025;194:1113-1116.
35. Kıvratma HG, Yavuz B, Çağ MC, Tükel E, Onat E, Aşar G, et al. Exploring the perspectives and challenges of general surgery residents in Türkiye: insights from a survey on surgical training. *Turk J Surg*. 2025;41:121-129.