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Current status and barriers of ultrasonography utilization among general surgeons in Türkiye: Results of a nationwide survey

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ABSTRACT

Objective: Point-of-care ultrasonography is rapidly becoming a key tool in many medical fields. Although its value in surgical practice is well established, adoption among general surgeons in Türkiye still seems quite limited.

Material and Methods: We conducted a nationwide cross-sectional survey of practicing general surgeons and surgery residents in Türkiye. The questionnaire covered participants' background, ultrasound training history, current usage patterns, and views on future training.

Results: A total of 147 surgeons responded (44 residents, 77 specialists, and 26 academic faculty). Only 10.2% had received structured ultrasound training during residency, whereas 21.8% had attended a postgraduate course. More than three-quarters (75.5%) described their competence in ultrasound-guided procedures as low or non-existent. Self-reported competency was significantly higher among specialists and faculty than residents ($p<0.001$). Multivariable analysis showed that attending a postgraduate ultrasound course [adjusted odds ratio (aOR) 12.92, 95% confidence interval (CI) 4.66-35.83] and having access to a dedicated ultrasound device (aOR 4.39, 95% CI 1.36-14.16) were the strongest predictors of greater competency. Notably, more than 93% of participants reported a willingness to pay for ultrasound training courses. Our results highlight a significant gap between available training opportunities and what surgeons need. Although competency improves somewhat with experience and formal training, it remains low across all career stages.

Conclusion: There is an urgent need to integrate structured, hands-on ultrasonography training into general surgery residency programs in Türkiye and to expand accessible postgraduate options.

Keywords: Cancer, minimal invasive surgery, thyroid surgery

INTRODUCTION

Point-of-care ultrasonography (POCUS) has become an essential part of daily practice in many specialties. It helps clinicians make faster decisions, reduces reliance on radiology departments, and improves patient safety (1-3). Bedside ultrasound has become an important skill in surgical practice. It is especially valuable in trauma, emergency cases, and minimally invasive procedures, where rapid decision-making can directly affect patient care. (4,5).

Globally, many countries have already incorporated USG training into surgical curricula (6-8). However, the situation in Türkiye is different. Despite growing interest in procedures such as thyroid and breast biopsies, radiofrequency ablation, and perioperative guidance, most general surgeons still have very limited access to proper training and equipment (4,5,9). This study aimed to understand the current level of ultrasonography use, training backgrounds, and attitudes among general surgeons throughout the country.

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MATERIAL and METHODS

This was a nationwide cross-sectional survey targeting general surgeons and surgery residents in Türkiye. The study received ethical approval from the Institutional Review Board University of Health Sciences Türkiye, Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital (approval no: 2025/331, date: 24.09.2025). Written informed consent was not obtained, as the study was conducted as a survey-based research. We developed the questionnaire using Google forms and distributed it electronically via surgical mailing lists and professional networks, employing snowball sampling. Participants had one week to respond, followed by a reminder and three extra days.

The survey included 30 questions covering demographics, professional experience, USG training, device access, self-reported competency, and opinions about future education. Self-reported competency was measured on a five-point scale and subsequently grouped into low and moderate-to-high for analysis. The primary outcome was self-reported USG competency, assessed using a five-point ordinal scale: No experience, insufficient, moderate, sufficient, and very sufficient. For logistic regression analyses, this was dichotomized as low (no experience or insufficient) versus moderate-to-high (moderate, sufficient, or very sufficient). Secondary outcomes included frequency of ultrasonography use, access to USG devices, prior training or certification, and perceived barriers to adoption.

Statistical Analysis

Data were exported from Google forms into Microsoft Excel and analyzed using IBM SPSS v21.0. We used the chi-square, Fisher's exact, Kruskal-Wallis, and Mann-Whitney U tests where appropriate. Multivariable logistic regression was performed to identify independent predictors of higher competency. A p-value <0.05 was considered statistically significant.

RESULTS

Participant Characteristics

A total of 496 invitations were sent, and 147 participants (29.6%) completed the questionnaire. Baseline demographic and professional characteristics are summarized in Table 1. The sample was predominantly male (n=101, 68.7%). The most represented age group was 31-35 years (31.3%), and the majority of participants were in the early career stage. Residents constituted 29.9% (n=44), specialists 52.4% (n=77), and academic faculty 17.7% (n=26) of the sample. Most respondents had fewer than five years of post-graduation practice (59.2%), while 26.5% had ten or more years of experience. The largest institutional group consisted of training and research hospitals (43.5%), followed by university hospitals (21.8%), resulting in a combined academic affiliation of 65.3%. Participants represented 39 provinces, with the highest representation from İstanbul (25.2%), Ankara (11.6%), and İzmir (10.2%). A small number of respondents (n=4, 2.7%) practiced in Azerbaijan and were included as affiliates of relevant surgical associations.

USG Training, Certification, and Institutional Resources

Table 2 presents the survey findings on training, institutional resources, and attitudes. Only 15 respondents (10.2%) reported receiving structured USG training during residency, and 32

Table 1. Baseline demographic and professional characteristics of survey respondents (n=147)

Characteristic	n	%
Sex		
Male	101	68.7
Female	46	31.3
Age group (years)		
24-30	33	22.4
31-35	46	31.3
36-40	26	17.7
41-45	17	11.6
46-50	11	7.5
51-55	9	6.1
≥56	5	3.4
Professional level		
Resident	44	29.9
Specialist	77	52.4
Asst. Prof.	11	7.5
Assoc. Prof.	9	6.1
Professor	6	4.1
Years in practice		
0-5 years	87	59.2
5-10 years	21	14.3
≥10 years	39	26.5
Institution type		
University hospital	32	21.8
Training and research hospital	64	43.5
Secondary state hospital	26	17.7
Tertiary state hospital	12	8.2
Private hospital	10	6.8
Outpatient clinic	3	2.0
Geographic distribution (top 5 cities)		
İstanbul	37	25.2
Ankara	17	11.6
İzmir	15	10.2
Trabzon	10	6.8
Diyarbakır	5	3.4
Other provinces	63	42.9

Table 2. USG training, certification, institutional resources, and attitudes among respondents (n=147)			
Variable	**n (yes)**	**% (yes)**	**p***
Training & certification			
Structured residency USG training	15	10.2	<0.001
Postgraduate USG course attendance	32	21.8	<0.001
Simulation-based USG training	38	25.9	<0.001
Formal USG certification	26	17.7	<0.001
Institutional resources			
Dedicated USG device for general surgery	24	16.3	<0.001
Endocrinologist present at institution	118	80.3	<0.001
Radiologist present at institution	143	97.3	<0.001
Interventional radiologist present	113	76.9	<0.001
Ablation performed at institution	76	51.7	0.897
Attitudes & opinions			
USG training should be in surgery curriculum (ÇEP)	139	94.6	<0.001
Interventional USG should be in core program	140	95.2	<0.001
Biopsy & ablation within general surgery scope	136	92.5	<0.001
Surgeon input needed in ablation decisions	138	93.9	<0.001
Interventional procedures will replace surgery	96	65.3	<0.001
Field of general surgery will narrow	96	65.3	<0.001
Would still refer patients if capable (would NOT self-perform)	12	8.2	<0.001
Willing to attend paid USG training courses	137	93.2	<0.001

USG: Ultrasound, ÇEP: *Çekirdek eğitim programı* , *: A p-value of <0.05 was considered statistically significant.

(21.8%) had attended at least one postgraduate USG course. Simulation-based training was reported by 38 participants (25.9%), and formal USG certification was held by 26 participants (17.7%). Only 24 respondents (16.3%) reported access to a dedicated USG device for general surgical use. All binary training proportions were significantly below the neutral 50% threshold (all p<0.001, one-sample binomial test), confirming widespread underexposure.

Regarding institutional infrastructure, radiologists were present in 143 institutions (97.3%), interventional radiologists in 113 (76.9%), and endocrinologists in 118 (80.3%). Ablation was performed at 76 institutions (51.7%). Where performed, ablation was conducted primarily by radiologists (n=73, representing 96% of performing institutions). Thyroid biopsies were performed by radiologists in 92 cases (62.6%), by endocrinologists in 23 cases (15.6%), and by general surgeons in 7 cases (4.8%); they were not performed at 23 institutions (15.6%). Breast biopsies were most commonly performed by radiologists (76.2%), whereas general surgeons performed them in 14 institutions (9.5%).

Self-reported Competency

Self-reported competency in ultrasonography was generally low across the entire cohort (Figure 1). The majority of respondents indicated either no experience (n=76, 51.7%) or insufficient competency (n=35, 23.8%), resulting in a combined low competency rate of 75.5%. Only 26 participants (17.7%) reported moderate competency, 8 (5.4%) reported sufficient competency, and 2 (1.4%) reported very sufficient competency.

Competency by Professional Level

When data were stratified by professional level, self-reported competency showed a clear increasing trend with career seniority (Kruskal-Wallis H =26.36, p<0.001; Mann-Whitney U

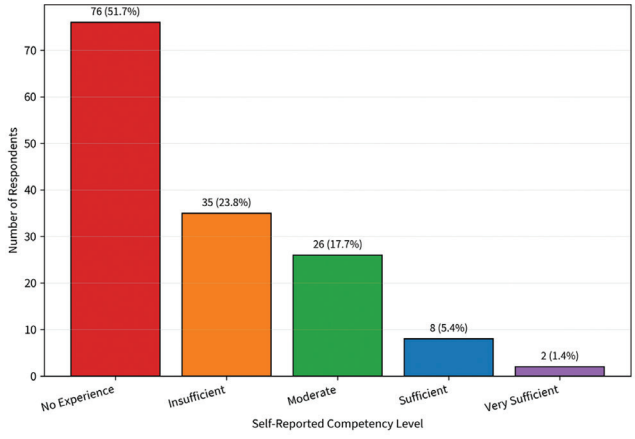

Figure 1. Distribution of self-reported USG competency among 147 general surgeons in Türkiye.

USG: Ultrasound.

test for residents versus specialists/faculty: p<0.001). Among residents, only one out of 44 (2.3%) reported moderate or higher competency. In comparison, 21 of 77 specialists (27.3%) and 14 of 26 academic faculty members (53.8%) reported moderate-to-high competency (Table 3 and Figure 2). Importantly, the problem was not limited to trainees. Even among specialists, 72.7% still described their competency as low or non-existent. This indicates that the deficiency persists across all stages of a surgical career and cannot be attributed solely to the inclusion of residents in the sample.

Multivariable Logistic Regression

In the multivariable logistic regression model, moderate-to-high self-reported USG competency (score ≥2) was used as the outcome variable. The model included the following predictors: structured residency training, attendance at postgraduate USG courses, access to a dedicated USG device, years in practice (categorized), and institution type (academic versus non-academic). For binary variables, the reference categories were the unexposed groups.

Postgraduate USG course attendance emerged as the strongest independent predictor of higher competency [an adjusted odds ratio (aOR) of 12.92, 95% confidence interval (CI) 4.66-35.83; p<0.001]. Access to a dedicated USG device was also significantly associated with better competency (aOR 4.39, 95% CI 1.36-14.16; p=0.013). Structured residency training showed a relatively large effect size (aOR 4.34, 95% CI 0.95-19.81), but it did not reach statistical significance (p=0.058). This is most likely due to the very small number of participants who received such training during residency (n=15). Neither years in practice nor institution type (academic vs. non-academic) was independently associated with self-reported competency (both p>0.05) (Table 4 and Figure 3).

Figure 2. Self-reported USG competency by professional level.

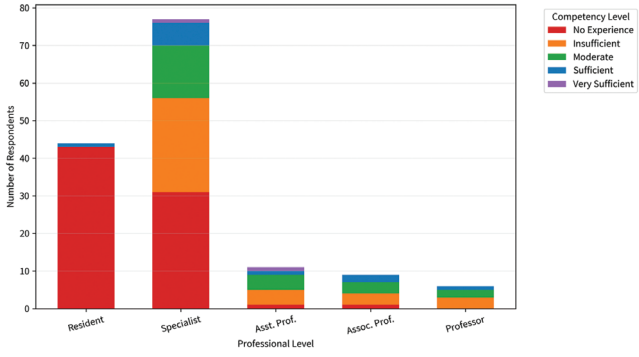

Figure 2. Self-reported USG competency by professional level. Low competency was present across all career stages, though significantly higher rates of moderate-to-high competency were observed among academic faculty (Kruskal-Wallis p<0.001).

USG: Ultrasound.

Attitudes and Willingness

Despite the low levels of training and competency observed in the study, participants demonstrated markedly positive attitudes toward integrating ultrasonography into surgical practice. An overwhelming majority supported the inclusion of USG training in the general surgery core curriculum (94.6%) and agreed that interventional USG procedures should be part of the standard training program (95.2%). Similarly, 92.5% believed that performing biopsies and ablation procedures should fall within the scope of general surgical practice. Nearly all respondents (93.9%) emphasized the importance of surgeon involvement in decision-making for ablation therapies. Importantly, 93.2% of participants stated that they would be willing to attend paid USG training courses. This high level of motivation highlights a strong professional demand that is not met by current educational opportunities (Figure 4). When asked about the future of the specialty, 65.3% of surgeons believed that interventional procedures would eventually replace some traditional surgical treatments, and a similar proportion anticipated a gradual narrowing of the scope of general surgery. The current referral burden was also evident: when ablation or biopsy services were not available at their institutions, only 8.2% reported they would prefer to refer patients even if they themselves were technically capable of performing the procedures (Table 4).

DISCUSSION

The findings of this nationwide survey indicate that ultrasonography remains significantly underutilized in general

Table 3. Self-reported USG competency distribution by professional level

Professional level	No Exp. n (%)	Insuff. n (%)	Moderate n (%)	Sufficient n (%)	V.Suff. n (%)	p†
Resident (n=44)	43 (97.7)	0 (0)	0 (0)	1 (2.3)	0 (0)	
Specialist (n=77)	31 (40.3)	25 (32.5)	14 (18.2)	6 (7.8)	1 (1.3)	
Asst. Prof. (n=11)	1 (9.1)	4 (36.4)	4 (36.4)	1 (9.1)	1 (9.1)	**<0.001**
Assoc. Prof. (n=9)	1 (11.1)	3 (33.3)	3 (33.3)	2 (22.2)	0 (0)	
Professor (n=6)	0 (0)	3 (50.0)	2 (33.3)	1 (16.7)	0 (0)	
Total (n=147)	**76 (51.7)**	**35 (23.8)**	**26 (17.7)**	**8 (5.4)**	**2 (1.4)**	

†: A p-value of <0.05 was considered statistically significant, USG: Ultrasound.

surgical practice in Türkiye (6,7,10). This appears to stem primarily from inadequate training opportunities during residency and limited institutional support. Notably, the deficiency is not confined to early-career surgeons; rather, it represents a widespread structural issue that affects surgeons at all stages of their professional lives.

Three main findings stand out from our data. First, formal ultrasonography training is rarely incorporated into general surgery residency programs or continuing medical education programs. Second, self-reported competency remains low overall, although it improves modestly with greater experience and exposure to training. Third, there is a strong and consistent interest among surgeons in acquiring these skills, underscoring that current educational resources fail to meet surgeons' professional needs and expectations.

Internationally, structured USG training has become well established in many surgical programs (6,11). In Germany, certified USG modules are mandatory for board certification. In the United Kingdom, the Royal College of Surgeons actively supports structured POCUS training for both trainees and consultants. In North America, the American College of Surgeons offers dedicated "USG for surgeons" courses that combine simulation, supervised practice, and competency-based evaluation (2,3,9).

In contrast, our study shows that fewer than one in ten general surgeons in Türkiye received formal USG training during residency, a proportion that remains considerably below international standards (12-14).

A particularly important finding of this study is that low ultrasonography competency was not confined to residents. Even among specialists with more than ten years of experience, the majority reported limited or no proficiency in USG. This indicates that the problem goes well beyond the early stages of training and instead points to a systemic lack of structured training opportunities at all levels of surgical practice (15).

We observed a clear gradient in competency according to academic rank: approximately 50% of academic faculty reported moderate-to-high competency, compared with 27% of specialists and only 2% of residents. This difference most likely reflects self-selection; surgeons who pursue academic careers may have had greater exposure to ultrasonography through research projects or institutional protocols.

Our multivariable regression analysis showed that attendance at postgraduate USG courses was the strongest independent predictor of higher levels of self-reported competency (aOR 12.92, 95% CI 4.66-35.83). Access to a dedicated USG device was also independently associated with greater competency (aOR

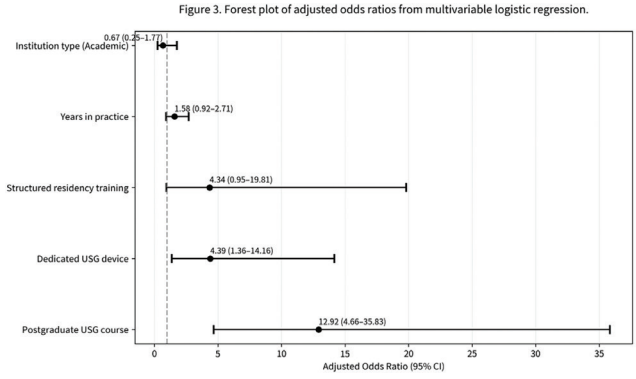

Figure 3. Forest plot of adjusted odds ratios from multivariable logistic regression. postgraduate USG course attendance and dedicated device access were independently associated with higher self-reported competency.

USG: Ultrasound, CI: Confidence interval.

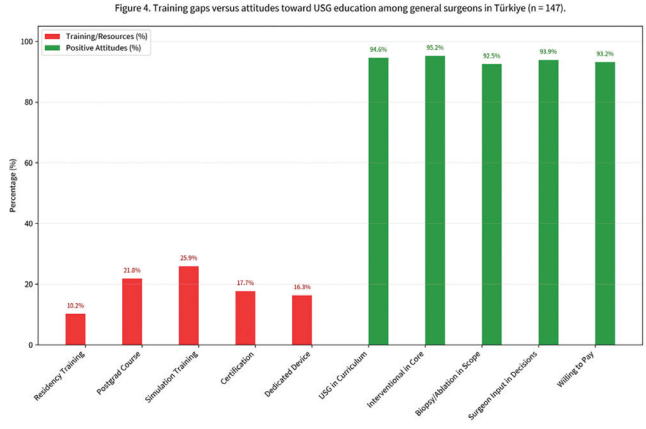

Figure 4. Training gaps versus attitudes toward USG education among general surgeons in Türkiye (n=147).

USG: Ultrasound.

Table 4. Independent predictors of moderate-to-high self-reported USG competency—multivariable logistic regression (n=147)

Predictor variable	aOR	95% CI	p
Postgraduate USG course attendance (Ref: No postgraduate training)	**12.92**	4.66-35.83	**<0.001**
Dedicated USG device access (Ref: No dedicated device)	**4.39**	1.36-14.16	**0.013**
Structured residency USG training (Ref: No residency training)	4.34	0.95-19.81	0.058
Years in practice (grouped: 0-5/5-10/≥10)	1.58	0.92-2.71	0.101
Institution type (academic vs. non-academic)	0.67	0.25-1.77	0.419

USG: Ultrasound, CI: Confidence interval, aOR: Adjusted odds ratio.

4.39, 95% CI 1.36-14.16). Notably, access to equipment alone was insufficient. Many surgeons who had a dedicated device still reported low confidence.

In contrast, structured residency training showed a large effect estimate (aOR 4.34, 95% CI 0.95-19.81) but did not reach statistical significance (p=0.058); this is most likely because very few participants (n=15) had received such training. Taken together, these results highlight that formal educational exposure, rather than the mere availability of equipment, is the key factor in developing and maintaining competency.

The procedural landscape revealed by this survey also deserves attention. Thyroid and breast biopsies, as well as ablation procedures, are currently performed almost exclusively by radiologists and endocrinologists, with general surgeons playing a very limited role. In 15.6% of institutions, thyroid biopsy is not performed at all, meaning patients must be referred elsewhere. This creates a significant logistical and clinical burden. Importantly, most respondents indicated that they would prefer to perform these procedures themselves if they had the necessary skills. This strong referral dependency, together with the surgeons' clear willingness to acquire USG skills, supports the need for targeted training programs.

Ultrasonography training is especially relevant for minimally invasive management of thyroid and breast pathology, ablative therapies (such as radiofrequency and microwave ablation), intraoperative tumor margin assessment, and emergency bedside evaluation (e.g., FAST protocol). As surgical care continues to shift toward image-guided and organ-preserving approaches, general surgeons who lack proficiency in ultrasonography may gradually be excluded from important aspects of patient care. Notably, 65.3% of participants anticipated a narrowing of the scope of general surgery due to these developments, although only a minority expressed concern about this trend.

Study Limitations

Several limitations of this study should be acknowledged. Selection bias may have occurred because the survey was distributed electronically and participation was voluntary. Surgeons who were already interested in ultrasonography were probably more likely to respond, which may have influenced our findings.

Second, competency was measured by self-report rather than objective assessment. Self-reported skill levels are subject to bias and may not accurately reflect true proficiency. This is particularly relevant for residents, who reported the lowest competency levels and likely had the lowest actual skills. Third, the questionnaire was not based on a previously validated tool for assessing USG competency.

Fourth, although the survey reached surgeons across the country, the non-probability sampling method limits the generalizability of the results. Finally, some subgroups were small (for example, only six professors), which reduced the precision of the findings in those categories.

CONCLUSION

This nationwide survey shows that self-reported competency in ultrasonography among general surgeons in Türkiye is low, and that formal training opportunities remain limited. The fact that this gap exists across all career stages—from residents to experienced specialists and academic faculty—suggests that the problem is systemic rather than individual.

Given the strong interest expressed by surgeons in acquiring these skills and the growing importance of image-guided procedures in modern surgical practice, there is a clear need to integrate structured ultrasonography training into general surgery residency programs. In addition, expanding accessible, practical, hands-on postgraduate courses would be an important step toward closing the current competency gap among practicing surgeons.

Ethics

Ethics Committee Approval: The study received ethical approval from the Institutional Review Board University of Health Sciences Türkiye, Sancaktepe Şehit Prof. Dr. İlhan Varank Training and Research Hospital (approval no: 2025/331, date: 24.09.2025).

Informed Consent: Written informed consent was not obtained, as the study was conducted as a survey-based research.

Footnotes

Author Contributions

Concept - U.U.Ş.; Design - U.U.Ş.; Data Collection or Processing - U.U.Ş., M.Ç.C., M.T., B.G., O.A., K.C.; Analysis or Interpretation - U.U.Ş., S.A., K.C.; Literature Search - U.U.Ş., M.T., B.G., A.G., O.A.; Writing - U.U.Ş., K.C.

Conflict of Interest: One of the authors of this article (A.G.) is a member of the Editorial Board of this journal. He was completely blinded to the peer review process of the article. No conflict of interest was declared by the authors.

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