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Operating Room Educational Climate Scale for Surgical Specialty Residents: Scale Development and Validation

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ABSTRACT

AIM: To develop a scale in Turkish language for evaluating the surgical specialty residents' perceptions of educational climate in the operating room, with an emphasis on learning in the operating suite and planning the relevant change for improved and standardized training.

MATERIAL and METHODS: Three surgeons from different disciplines provided expert opinions and a focus group meeting was held on the necessity, scope, and specificity of the items. The 5-point Likert type draft scale consisted of 28 items including ten negative statements scored reversely and having total scores ranging between 28-140 points. There were 5 subscales: educational process, teamwork, communication, operating room infrastructure, and surgical skills education. For assessing the validity and reliability, 172 surgical specialty residents from three hospitals in different locations were asked to answer the paper-based scale items anonymously. Confirmatory factor analysis (CFA) was used to test validity, whereas Cronbach's alpha reliability coefficients were calculated for internal consistency.

RESULTS: CFA revealed a chi-square, standard deviation, chi-square/standard deviation, and a p-value of 783.73, 340, 2.27, and 0.001, respectively. Cronbach's alpha coefficient for educational process, teamwork, communication, operating room infrastructure, and surgical skills education subscales were calculated to be 0.61, 0.61, 0.63, 0.70, and 0.72, respectively. Cronbach's alpha coefficient for all items was 0.89. Results indicated acceptable construct validity and internal consistency of the scale.

CONCLUSION: The newly developed scale was proven as a reliable and valid measurement instrument that can be used within the Turkish health system setting for assessing and improving the educational climate in the operating room.

KEYWORDS: Resident, Operating room, Climate, Postgraduate, Education

INTRODUCTION

Residency programs in surgical specialties are among the most stringent education models within medical education (30). An important part of the surgical residency takes place in the operating room environment. However, penal actions against medical errors, decreased independent roles of the residents, demanding and complex technological advancements, and more emphasis on patient safety have recently led to challenges in residency training. Learning in the operating room has conventionally followed an opportunistic educational model rather than a model structured in line with the needs of residents (8). For an ideal learning environment with defined learning outcomes, education in the operating room should be standardized.

The operating room environment consists of complex interactions. Therefore, it is necessary to determine the factors influ-

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encing the education either positively or negatively. Previous data from Turkey (4,5,10) generally emphasized deficiencies in the implementation of education programs with priorities given to routine medical care during surgical specialty residencies. Uneven distribution of operating suite infrastructure such as surgical theatres, microscopes, endoscopes, etc. across the hospitals with residency programs is a concern, leading to educational inequalities and reduced standardization. Moreover, one of the most important deficiencies in surgical skill attainment has been reported as the lack of simulation training before performing a surgery in the operating room (13).

Evaluating the observational and interview-based behaviors can be useful in understanding the attitudes of residents. However, circumstances underlying these behaviors should be properly interpreted to tackle the potential educational challenges. One of the main methods to deal with these challenges is to take a snapshot of the current situation by use of proper and validated scales. Hence, a reliable and unbiased scale that evaluates the educational climate in the operating room can be used to reveal and then take steps to resolve the perceived problems. Most of the scales that are currently used have been developed for use in different cultural settings. Seelig initially developed a scale for this purpose in 1993 (25). Then, the *Postgraduate Hospital Educational Environment Measure* (PHEEM) was developed by Roff et al. for the assessment of postgraduate clinical education climate (22,28). *Surgical Theatre Educational Environment Measure* (STEEM) was developed in Scotland in 2004 by Cassar. STEEM consists of 4 subscales and 40 items questioning the perceptions of the surgeon, learning opportunities in the operating room, operating room atmosphere, and workload (2). However, in Turkey, there is no original scale that is specific to the surgical specialty residents in Turkey and questioning the operating room educational environment.

Although the use of translated international scales/measures in evaluating the operating room climate may yield valuable information, certain limitations can be expected due to the structural dissimilarities of residency training in Turkey when compared to other settings, sociocultural differences, and infrastructure disparities. Therefore, the present study aimed to develop an authentic scale assessing the perceptions of residents on the learning environment in the operating room in the Turkish language. The novel scale is assumed to reveal probable deficiencies of educational activities in the operating room. This might enable future planning for an improved and standardized training of surgical specialty residents in Turkey.

MATERIAL and METHODS

Scale Development

Initially, a comprehensive literature review on previously developed scales on "operating room climate" was conducted restricted to publications in English and Turkish, and an item pool was constructed by one of the researchers (2, 22). Then, three specialists from different surgical branches at different institutions (HE, COK, MS) formulated the items by considering their experience and the circumstances of surgical specialty education in Turkey and they suggested the addition of eight more items. To increase the clarity and lucidity of the items, some corrections were also made at this point. Finally, the draft was evaluated by a focus group incorporating surgical specialty residents and educators from the aspects of necessity, scope, and originality of items with further corrections discussed and proposed.

After the final revisions, the draft scale consisted of 28 items including 10 negative statements scored reversely. To examine the content validity, opinions of 10 specialists from surgical branches were gathered. The preliminary application of the scale included 10 surgical specialty residents and the clarity of items was confirmed. No additional exploratory factor analysis was performed, since the item pool was developed by a comprehensive literature review including the previously developed scales on the topic.

The final scale was categorized into five subscales by the researches through consensus: (1) Educational process (6 items): Perceptions of residents on education given in the operating room environment, (2) Teamwork (6 items): Attitudes of operating room staff towards the residents, (3) Communication (3 items): Educators' communication skills, (4) Operating room infrastructure (5 items): Effects of operating room infrastructure on learning, and (5) Surgical skills education (8 items): Perception of residents on surgical skills being delivered in the operating room setting.

Items included a 5-point response Likert scale specifying the respondent's level of agreement: Strongly agree (5 points), agree (4 points), undecided/neutral (3 points), disagree (2 points), and strongly disagree (1 point). Ten items with negative statements were scored reversely. Total scale score (range: 28-140 points) and subscale scores were calculated by summing the scores of each item within the corresponding domain.

Scale Validation

The validation study was subject to local ethics committee approval (date: 07.24.2019 and no: 709). The universe of the study consisted of residents with a minimum of one year of experience attending training in a surgical specialty (general surgery, orthopedics, otolaryngology, obstetrics and gynecology, ophthalmology, cardiovascular surgery, plastic and reconstructive surgery, urology, neurosurgery, thoracic surgery, and pediatric surgery) from three tertiary academic hospitals located at different urban centers in southwestern Turkey (Antalya, Denizli, and Isparta). Residents from anesthesiology and reanimation departments were excluded due to possible response bias secondary to items questioning the anesthesiology team. Data were collected between September 2019 and January 2020. The minimum target sample size was calculated as 140 by multiplication of the number of items by a factor of five.

The participants were verbally informed about the anonymity and the objective of study. Paper-based scales and questionnaires asking respondents about sociodemographic and professional characteristics such as postgraduate year (PGY) status in residency without any specific identifiers

including name and surname were handled in sealed envelopes to decrease desirability bias. Participants were asked to answer questions mindfully in an out-of-hospital tranquil environment. Completed forms were collected in sealed envelopes within one week by a third party, usually an administrative staff. The collected questionnaire and scale forms were digitally recorded for further analysis.

Statistical Analyses

Data were presented as percentages and frequencies, mean ± standard deviation, and range. The Shapiro-Wilk test was used to test if item responses were normally distributed. Student's t-test was used to compare scores across gender and PGY status. Confirmatory Factor Analysis (CFA) was used to evaluate construct validity. Internal consistency was analyzed by calculating Cronbach's alpha reliability coefficients.

RESULTS

A total of 172 sealed envelopes were returned (response rate, 98.8%). Of the respondents, 23.8% (n=41) and 76.2% (n=131) identified themselves as female and male, respectively. The mean age (±SD) was 29.1 ± 2.9 years (range, 25-44 years). Table 1 summarizes the residency program distribution of the participants, revealing that 25% were obstetrics and gynecology residents (Table I). Mean (±SD) duration of residency was 20.1 ± 7.9 months (range, 12-30 months) with 91 (52.9%) and 81 (47.1%) in PGY 2 (12-24 months) and PGY >2 (more than 24 months) of their residency, respectively. While 51.2% (n=88) of respondents stated they had a structured formal curriculum in their residency training program, only 32 (18.6%) reported attendance at an orientation program before working in the operating room. The residents were supervised during surgery by either a trainer or a senior resident depending on the case (62.2%, n=107), only by a senior resident (24.4%, n=42), and only by a trainer (13.4%, n=23).

Table I: Residency Program Distributions of Respondents (n=172)

Residency program	Number	Percentage (%)
Obstetrics and gynecology	43	25.0
General surgery	31	18.0
Orthopedics	26	15.1
Otolaryngology	16	9.3
Ophthalmology	16	9.3
Plastic and reconstructive surgery	14	8.1
Urology	12	7.0
Neurosurgery	5	2.9
Cardiovascular surgery	5	2.9
Thoracic surgery	2	1.2
Pediatric surgery	2	1.2

Distribution of answers to the scale items and mean item scores are given in Table II. Item 3 (*before practicing operations on patients, I have the opportunity to work in the laboratory such as simulation, cadaver dissection, etc.*) had the lowest mean score (1.58 ± 1.04) followed by item 4 (*the work setting in the operating room prioritizes healthcare delivery rather than surgical teaching*) with a mean reversed score of 2.03 ± 1.11. The highest scores (3.95 ± 0.94 and 3.87 ± 0.99, respectively) were obtained with item 12 (*I can easily get support from a trainer or senior resident at any time I am operating*) and item 26 (*I can follow the postoperative outcomes of patients in the ward or outpatient clinics*), as shown in Table II.

The total mean (±SD) score of the respondents was 84.49 ± 17.96 (range, 36-132). The educational process, teamwork, communication, infrastructure, and surgical skills experience subscales had mean (±SD) score of 16.19 ± 5.10 (range: 6-28), 20.12 ± 4.00 (range: 10-30), 9.62 ± 2.88 (range: 3-15), 14.28 ± 4.05 (range: 5-25), and 24.22 ± 5.71 (range: 8-36), respectively. When subscale scores were denoted per item by dividing the mean subscale score by the number of items in the corresponding subscale, the educational process had the lowest mean (±SD) score per item (2.70 ± 0.85) followed by infrastructure (2.85 ± 0.81), surgical skills experience (3.03 ± 0.71), communication (3.20 ± 0.96), or teamwork (3.36 ± 0.67) in increasing order.

Comparisons of scale scores across the genders and years of residency are summarized in Table III. Male residents had significantly higher mean scores from the communication and operating room infrastructure subscales when compared to the female residents (Table III). Increasing residency duration (over 24 months) was associated with significantly decreased subscale scores except for the surgical skills experience domain (Table III). Hence, female gender, and residency more than 24 months were generally related to worse perceptions of operating room educational climate in the current settings.

CFA assessing the construct validity revealed that the relative chi-square (X^2/SD) value of the scale consisting of 28 items and 5 factors was statistically significant (X^2 = 783.73, SD=340, p=0.001, and X^2/SD=2.27). The fit index values of the model were as follows: Root mean square error of approximation (RMSEA) = 0.087, comparative fit index (CFI) = 0.92, increasing fit index (IFI) = 0.92, and non-normed fit index (NNFI) = 0.91. For factor analyses, IFI and CFI values >0.90 and NNFI value >0.95 have been suggested to indicate a good fit (9,24). When the fit index values of CFA results were examined as a whole, the scale was assumed to have construct validity.

Cronbach's alpha coefficient was 0.89 for the overall scale. For the subscales, Cronbach's alpha coefficient was calculated as 0.61, 0.61, 0.63, 0.70, and 0.72 for educational process, teamwork, communication, operating room infrastructure, and surgical skills education, respectively.

DISCUSSION

The results of the present multicenter study incorporating residents from 11 different surgical branches confirmed the validity and reliability of the newly developed scale for

Table II: Distributions of responses and mean scores for items in the validation study of the Operating Room Educational Climate Scale for Surgical Specialty Residents (n=172)

Subscale	Item	1**	2	3	4	5	Mean score ± SD
Educational process	1. Trainers are enthusiastic on surgical teaching	12.2 (21)	19.8 (34)	25.6 (44)	23.3 (40)	19.2 (33)	3.17 ± 1.29
	2. Before the operation, trainers discuss with me what I will be doing during surgery	19.2 (33)	19.2 (33)	25.6 (44)	25.6 (44)	10.5 (18)	3.11 ± 1.27
	3. I have the opportunity to work in laboratory (such as simulation, cadaver dissection, etc.) before practicing operations on patients	68.6 (118)	16.3 (28)	7.0 (12)	4.7 (8)	3.5 (6)	1.58 ± 1.04
	4. The work setting in operating room prioritizes the healthcare delivery rather than surgical teaching*	2.9 (5)	8.7 (15)	19.2 (33)	26.7 (46)	42.4 (73)	2.03 ± 1.11
	5. Surgical skill training I receive in the operating room is sufficient	9.3 (16)	13.4 (23)	33.7 (58)	31.4 (54)	12.2 (21)	3.23 ± 1.12
	6. A resident can successfully perform all surgeries in the core curriculum after graduation	6.4 (11)	18.0 (31)	30.2 (52)	32.6 (56)	12.8 (22)	3.77 ± 1.24
Teamwork	7. Senior residents hinder my opportunities to operate*	26.2 (45)	33.1 (57)	23.3 (40)	11.6 (20)	5.8 (10)	3.62 ± 1.16
	8. Operating room staff are well-mannered to me	7.6 (13)	7.0 (12)	17.4 (30)	48.2 (83)	19.8 (34)	3.65 ± 1.1
	9. I feel myself as part of the team in the operating room	5.8 (10)	5.2 (9)	19.8 (34)	46.5 (80)	22.7 (39)	3.75 ± 1.05
	10. Nurses are uncomfortable with me during surgery when the operation takes longer*	9.3 (16)	17.4 (30)	19.2 (33)	27.3 (47)	26.7 (46)	2.55 ± 1.30
	11. The anesthesia team puts pressure for expediting the duration of surgery, while I am operating*	8.1 (14)	19.8 (34)	23.8 (41)	26.2 (45)	22.1 (38)	2.65 ± 1.24
	12. I can easily get support from a trainer or senior resident at any time I am operating	2.3 (4)	4.2 (7)	20.3 (35)	42.4 (73)	30.8 (53)	3.95 ± 0.94
Communication	13. Trainers regularly give feedback in the operating room	18.0 (31)	31.4 (54)	20.9 (36)	18 (31)	11.6 (20)	2.74 ± 1.27
	14. Operation notes I have written are regularly supervised by trainers or senior residents	14.0 (24)	19.8 (34)	20.9 (36)	32.0 (55)	13.4 (23)	3.11 ± 1.27
	15. There is discrimination (gender, ethnic, etc.) in the operating room*	37.8 (65)	25.0 (43)	19.2 (33)	12.2 (21)	5.8 (10)	3.77 ± 1.24
Operating room infrastructure	16. The operating room incoroporates sufficient equipment (such as surgical sets, microscope, endoscope, monitor, etc.) for residency training	18.6 (32)	11.0 (19)	27.9 (48)	30.8 (53)	11.6 (20)	3.06 ± 1.28
	17. The infrastructure of the operating room such as lounge, heating cooling utilities, and eating area is sufficient	33.7 (58)	26.7 (46)	18.0 (31)	15.7 (27)	5.8 (10)	2.33 ± 1.25
	18. I know how to deal with occupational accidents in an operating room	17.4 (30)	22.7 (39)	35.5 (61)	19.8 (34)	4.7 (8)	2.71 ± 1.11
	19. The operating room is stressful such that it deters my learning*	15.1 (26)	33.1 (57)	25.0 (43)	19.8 (34)	7.0 (12)	3.30 ± 1.15
	20. Personal protective equipment (safety gloves, N95 mask, etc.) for operating room staff is adequate	16.3 (28)	18.6 (32)	32.0 (55)	27.3 (47)	5.8 (10)	2.88 ±1.16

Table II: Cont.

Subscale	Item	1**	2	3	4	5	Mean score ± SD
Surgical skills experience	21. There generally are cases fitting my level of experience in the surgical operating list	19.8 (34)	25.6 (44)	18.6 (32)	29.1 (50)	7.0 (12)	2.78 ± 1.25
	22. The number of residents is either too high or too low such that it hinders my training*	11.0 (19)	32.0 (55)	26.7 (46)	20.9 (36)	9.3 (16)	3.14 ± 1.15
	23. I have very limited opportunities for working in the operating room due to my duties in the ward or outpatient clinics*	11.0 (19)	25.0 (43)	18.0 (31)	24.4 (42)	21.5 (37)	2.79 ± 1.33
	24. Operating room sessions are too long*	5.2 (9)	21.5 (37)	27.3 (47)	23.3 (40)	22.7 (39)	2.63 ± 1.20
	25. My workload in the operating room fits my level	11.6 (20)	15.7 (27)	23.8 (41)	40.7 (70)	8.1 (14)	3.18 ± 1.15
	26. I can follow the postoperative outcomes of patients in the ward or outpatient clinics	3.5 (6)	7.0 (12)	14.0 (24)	50.0 (86)	25.5 (44)	3.87 ± 0.99
	27. I get enough opportunity to operate	17.4 (30)	21.5 (37)	25.6 (44)	25.6 (44)	9.9 (17)	2.89 ± 1.25
	28. Operating room training is extremely exhausting for the residents*	12.8 (22)	23.3 (40)	24.4 (42)	22.7 (39)	16.9 (29)	2.92 ±1.28

*Values are percentages with numbers of residents in parentheses. * Items with negative statements were scored reversely. **The 5-point response Likert scale scores include 1 point (strongly disagree), 2 points (disagree), 3 points (undecided / neutral), 4 points (agree), and 5 points (strongly agree). SD, standard deviation.*

Table III: Comparisons of Subscale and Total Scale Scores Across Genders and Year of Residency

	Female (n=41)	Male (n=131)	p values for gender comparisons	PGY 2 (n=91)	PGY >2 (n=81)	p values for PGY comparisons
Educational process	15.12 ± 4.39	16.52 ± 5.27	0.126	17.22 ± 5.22	15.02 ± 4.72	0.005*
Teamwork	20.19 ± 3.30	20.19 ± 4.21	0.995	20.96 ± 3.74	19.33 ± 4.13	0.008*
Communication	8.07 ± 2.75	10.09 ± 2.75	0.0001*	10.34 ± 2.86	8.80 ± 2.68	0.0001*
Operating room infrastructure	13.12 ± 3.78	14.64 ± 4.08	0.036*	14.93 ± 4.07	13.54 ± 3.92	0.024*
Surgical skills experience	23.44 ± 4.53	24.46 ± 6.03	0.248	24.77 ± 5. 59	23.60 ± 5.82	0.183
Total scale	79.95 ± 15.54	85.92 ± 18.48	0.044*	88.22 ± 17.60	80.31 ± 17.54	0.004*

*Data are given as mean and standard deviations. PGY 2, residents at post graduate year 2 (12-24 months) and PGY >2, residents at post graduate year 2 or more (>24 months). *Denotes statistically significant difference with student's t-test.*

the assessment of the perceived educational climate in the operating room. Therefore, the present instrument may provide information on the perception of surgical training in the operating room by the residents. Even though the scale was primarily developed for use in the Turkish healthcare setting, a validation in other settings both in Turkey and in other countries will be required as a future perspective.

Resident wellness, particularly in surgical branches, is an important concern in postgraduate medical education. Resident education and wellness need to be optimized through the learning environment by identifying and addressing the suboptimal aspects of the learning environment and training residents in resilience skills (11). Residents with performance problems also lead to challenging and complex issues for all of the involved parties including other residents, health care providers, and program directors (29). Hence, resident wellness and performance problems particularly in surgical settings such as the operating room environment should be explicitly disclosed. In fact, as Williams et al. stated "effective and targeted remediation methods to address the problems of residents is dependent on being able to diagnose their nature." (29).

Program directors and institutions (i.e. policymakers) should then be able to define the nature of problems in the operating room environment regarding the resident training. Regular application of appropriately designed instruments such as validated scales can provide valuable information for the directors of individual programs within this context. It is

also essential to gather information for acknowledging the changing nature of growing problems and disputes in the operating room environment so that prompt actions can be taken when required. Therefore, we suggest program directors and medical educators to utilize Operating Room Educational Climate Scale for Surgical Specialty Residents routinely such as once every 6-12 months to evaluate and then take steps for improving the educational climate in the operating room.

Although the questionnaires and scales can be viewed as practical and cost-effective screening tools for pinpointing suboptimal aspects of the learning environment in the operating room, their main limitation is the quantitative nature of collected data. Therefore, additional qualitative data will generally be required to analyze thoroughly the perspectives of those involved. Mixed-method designs combine elements of qualitative and quantitative research approaches. A sequential design uses quantitative and qualitative phases consecutively. To our knowledge, there are few sequential mixed-method studies on the learning climate within the operating room. In a recent study (19), a newly developed questionnaire (the Operating Theater Educational Climate Test, OTECT) was initially used to evaluate the perceptions of anesthesia residents, surgical residents, and student registered nurse anesthetists followed by focus groups meetings to explore factors influencing their learning climate. The authors concluded that the high stakes nature of the operating room inhibited learning at most as it affected both trainees and supervisors. In our setting, the high stakes nature of the environment was partially reflected by a low mean score from the item on the higher priority of healthcare delivery over teaching. Further studies with the mixed-methods sequential explanatory design are warranted to explore the learning environment and complex interactions in the operating room. We suggest that our newly developed scale is eligible for the use during the quantitative phase of mixed-methods designs as an initial screening tool before the collection of qualitative data.

There are certain difficulties with testing the reliability of instruments such as attitude scales, as there is constant change in human attitudes and perceptions of events leading to quite different responses given following a certain period. Therefore, the implementation of the test-retest procedure for assessing the reliability may be limited. Cronbach's alpha values are informative on internal consistency; nevertheless, how one understands internal consistency within a specific context should be defined (27). In our design, Cronbach's alpha values were used in testing the correlations across items and, more specifically, whether the item statements are adequately worded so that the subscales would reliably measure resident perceptions in similar settings.

When subscales were pooled, the overall value of Cronbach's alpha was found to be 0.89 in the current analysis with lower values for subsidiary subscales. Cronbach's alpha coefficients of STEEM, Medical School Learning Environment Survey, and Dundee Ready Education Environment Measure were reported to be 0.88, 0.89, and 0.91, respectively (2,7,21). Alpha is known to partially correlate positively with the number of items in a scale. Therefore, a high value may be associated with redundancy on a scale: Do some items question similar concepts reflecting shared variance within the subsidiary subscales? As experts in the field involved routinely with residency training in the surgical settings, we re-evaluated each scale item for necessity and possible redundancy following internal consistency analyses. There seemed to be no distinctly interrelated items that required omission. Although the term "face validity" has been severely criticized and suggested as an illegitimate type of validity evidence (23), it is worthwhile to ascertain that the items of each domain in a scale are sensible, appropriate, and relevant based on the judgments of researchers and health care professionals (3). Therefore, the current scale had acceptable internal consistency, when the expected dimensionally of the measurement aim (perceived operating room environment), the total number of scale items, and face validity were additionally considered. However, measurement instruments in medical education are not static, since human beings and environmental factors are in constant change. The current scale can be continuously evaluated and revised accordingly to meet future demands.

Relatively low Cronbach's alpha values of the subscales can be speculated to be associated with low internal consistency. However, the 0.70 cutoff values for the alpha have been reported to be arbitrary as a sufficient measure of reliability (27). Some authors have suggested that the lowest threshold for reliability should be 0.60 (18). Moreover, the alpha values depend on the number of items and it is an expected finding that subscale alpha values are relatively low, particularly when there are several subsidiary subscales. For example, subscales of STEEM were found to have Cronbach's alpha coefficients ranging between 0.569 and 0.842 (2). Similarly, alpha values of 0.61 to 0.63 calculated for the subscales with 3-6 items in the current instrument were sufficient from our perspective.

The operating room environment may be stressful due to the high stakes nature and hierarchy (26). Ensuring the harmony between healthcare professionals in the operating room is an important factor for proper teamwork within a safety culture. Simulation-based operating room training can play an important role in learning, teamwork, and preventing adverse outcomes, although the transferability of skills from the laboratory to the live operating setting need to be consistently demonstrated (1,16,20). In our validation study, the lowest score was obtained from the item on the adequacy of simulated surgical training. Residency programs in Turkey should be encouraged to use simulated laboratories to train surgical trainees outside the operating room.

Discrimination, abuse, or insufficient role modeling are associated with a negative learning environment (6). In our study, 18% of respondents agreed or strongly agreed that there was some sort of discrimination in the operating room. Although this figure is relatively low, it is of some concern. Interestingly, female residents had worse perceptions of the infrastructure of the operating room and had lower scores from the communication subscale, which includes the item that questions discrimination. Although discrimination against

women training in surgery has been subjectively pronounced for a long time, recent robust data indicate a widespread problem. In a multicenter study from the United States, evaluations of operative autonomy using a mobile application revealed a significant bias against female thoracic surgery residents (15). The gender-based difference in the granted autonomy was confirmed in general surgery residents with the greatest discrepancy in the fourth year of training (14). Another pilot study on 23 general surgery residents from Canada used a 40-item inventory adapted from STEEM. Female residents were found to perceive a less favorable educational environment compared to males. Junior residents defined as PGY 1-3 also scored lower in the subscale 'workload/ supervision/support domain than senior residents (12). The latter finding is in contrast with our data that revealed worse perceptions of the learning environment by senior residents. A possible explanation is decreased satisfaction with the educational setting as the level of training increases due to perceptions of self-inadequacy and unreadiness to practice independently at graduation. Specific planning in surgical training may be required to improve the transition of residents to independent surgery practice (17). The association across the level of training and learning experiences of residents in the operation room warrants further investigation.

CONCLUSION

The Operating Room Educational Climate Scale for Surgical Specialty Residents was developed and proved to be a valid and reliable measurement instrument that can be used for assessing and improving the current status of resident training in surgical specialties. Validation of the instrument in other settings should be carried out. Further research can focus on use of the present scale prior to qualitative data collection in mixed-methods designs.

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