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Perceptions of the Surgical Resident Satisfaction in the Operating Room in Emergency Department Educational Setting at Saudi Arabia 2024

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Abstract

Background:

Surgical residents are at high risk of sustaining sharp injuries. The educational experience in the operating room is widely regarded as the centerpiece of learning for surgical residents.1The educational environment encompasses the academic and social contexts that shape how trainees acquire, develop, and apply knowledge, and it influences motivation, psychological safety, and performance. The operating room is a uniquely complex learning environment in which education shaped by multiple interacting factors, including the supervising surgeon, to assess the operating room (OR) educational environment across surgical residency programs in Saudi Arabia and compare perceptions between junior and senior residents. While simulation-based training (SBT) is effective in educating healthcare professionals in medical emergencies, to organize primary care, and to provide definite treatment without unnecessary delays. This study investigated the Perceptions of the operating room educational setting by surgical residents' in emergency department at Saudi Arabia on trainees' learning outcomes and the costs of the training. Operating room experiences are especially important for surgical residents' learning

The aims of the study: To evaluated surgical residents' perceptions about the educational environment in the operating room and related elements at the emergency department at Saudi Arabia.

Methods: A cross-sectional study conducted in March to May 2024 among surgical residents to evaluate their perceptions of the operating room educational environment using the OREEM questionnaire. Descriptive statistics (mean, median, SD) used to summarize demographic data and OREEM scores. The student t-test and one-way analysis of variance (ANOVA) testing followed by post hoc tests used for comparison of quantitative data, with p-values < 0.05 considered significant.

Results: The mean total score was 138.8/200 (69%). The mean scores on the subscales were as follows: teaching and training 47.9/65.0 (73.7%); learning opportunities 34.5/55.0 (62.7%);

Conclusion: The Operating room educational environment in Saudi Arabia was generally satisfactory, with strong perceptions of atmosphere and support. Learning opportunities, particularly operative participation on elective lists and exposure to emergency cases, are key targets for improvement. Can serve as an audit framework to guide and evaluate educational interventions.

Keyword: Perceptions, operating room educational setting, surgical residents, emergency department

Introduction:

The educational experience in the operating room is widely regarded as the centerpiece of learning for surgical residents .[1] The educational environment encompasses the academic and social contexts that shape how trainees acquire, develop, apply knowledge, and it influences motivation, psychological safety, and performance .[2,3] The operating room is a uniquely complex learning environment in which education is shaped by multiple interacting factors, including the supervising surgeon [4]

In the operating room, surgical residents can learn the fundamentals of the surgical craft technical skills, knowledge, and confidence in a unique setting [5] Through an apprenticeship system, trainees learn surgical skills from consultants who serve as mentors to them as they rotate through their units over a certain amount of time[6] Knowledge and technical skills are imparted through a variety of instructional strategies, such as didactic lessons with feedback sessions and supervised exposure to graded operational experience [7]. Putting these principles into effect has always been the trainer's problem [8]

Satisfaction of trainees with their training program is one of the most important factors affecting its output. This has been shown in other health care training fields, and found to be an indicator of quality processes.[9] Health

care in Saudi Arabia enjoys wide support from many government sectors with multiple health care systems operating many hospitals with varying levels of care. [10]

The educational environment is a crucial component of the curriculum and is described as how instructors or students understand the medical milieu that underlies all aspects of education in an academic setting [11] The apprenticeship-style surgical residency programs require a great deal of hands-on training in the operating room, where technical skills and knowledge are refined through didactic sessions and supervised exposure [12]. But the translation of Since the learning environment is vulnerable to individual complexity, case nuances, and potential distractions, putting these educational principles into effective practice continues to be a tough challenge for trainers [13].

Surgical training in Saudi Arabia has gone through some phases of change involving the authority charged with monitoring the training programs. While it is understood that universities are responsible for training residents in many countries, currently the Saudi Commission for Health Specialties (a government organization) oversees all aspects of training. These include program design, training center accreditation, resident selection, the course and final exams, and also physician certification and licensing. The satisfaction of Saudi surgical residents with their training programs has not been assessed. [14] The optimization of the educational experience within the operating room is critical for surgical residents who invest over 10,000 h in clinical training, making it the basis of their professional development [(10)]. Mastery of surgical skills is essentially tied to sufficient practice and continued mentorship, positioning operative experience as a main predictor of satisfaction with surgical training [15] .Despite its recognized significance, studies reveal that a substantial percentage of surgical residents express dissatisfaction with their operative experiences, ranging from 65% to 85% Moreover, a systematic review indicates that the reduction in duty hours has led to a decline in trainees' operative experience, impacting their performance in certification exams [16]

In addition to measuring resident satisfaction, evaluating the instructional environment in the operating room is crucial for guaranteeing the caliber of surgical residency programs [17] This assessment goes beyond personal opinions to include aspects like duties, patient safety, sterility, time management, and resource availability, all of which add to the overall educational experiences. The surgical team experiences conflict as a result of worries about these factors, highlighting the necessity of a comprehensive comprehension of the clinical learning environment [18]

Method

An analytical cross-sectional study was conducted from March to May 2024, the emergency department of Al Noor Hospital in Makkah, Saudi Arabia. Convenience sampling was used to select participants. The sample size was calculated based on a prior presumption that the level of perception of the learning environment was 50% since there has not been a published study in the past in Saudi Arabia surgical residency program with the desired precision of d = 0.05. The sample size was determined using the single-population proportion formula and adding a nonresponse rate of 10%. The final sample size calculated for this study was 94 residents, and given that the sample size is comparable to the total number of residents, all the surgery residents

Data Collection:

Data began by checking the data gathered for accuracy and completeness. Each completed questionnaire assigned unique code and entered into a computer using epi. Info version 3.5.1 and exported to SPSS version 24.00 for further analysis. A summary of the data presented using frequency distributions, graphs, and plots. Continuous variables described as mean and standard deviation and categorical variables as frequencies and percentages. Student's t-test and one-way ANOVA used as methods of inferential statistics to assess any significant differences based on gender and marital status, year of training, and training program. Spearman's correlation also calculated to find any association between the various subscales of the questionnaire and the global satisfaction score. The confidence interval was set to 95%, with a 5% margin of error.

A pilot study

Pilot study conducted on 5% of randomly selected residents to ascertain whether the questions and instructions sufficiently understood or required revision and additional instructions . Following these modifications, the questionnaire distributed to the study population. The principal investigator cleared questions raised by the residents regarding confusing or unclear statements. Additionally, all the collected data were reviewed and checked for completeness upon submission . Ethical Permission obtained from the Institutional Research. The study objectives and anticipated potential risks and benefits explained to the residents. Participants assured that their data and information would kept confidential and that they would not be shared outside the concerned bodies. To protect the confidentiality of information, names or other personal identifiers were not included in the questionnaires .

Results

Table (1) shows socio-demographic characteristics. 103 (79.8%) of the respondents, were male and 26 (20.2%) were female, with a mean age of 28.5 + 2 Years. The respondents were distributed across the levels of training from postgraduate years (PGY) 1 to 5. (PGY-I residents comprised 42(32.6%), PGY-2 residents, 28 (21.7%); PGY-3, 38(29.5%); PGY-4, 13(10.1%); and PGY-5, 8(6.2%).

Surgery residents from different departments were included in the study, and the majority of participants

53(41.1%) belonged to the general surgery department, followed by orthopedic surgery (19.4%), urology (9.3%), and neurosurgery (9.3%). Most of the residents were single (67.4%). **Table (1**)

The mean total score was 138.8/200 (69%). The mean scores on the subscales were as follows: teaching and training 47.9/65.0 (73.7%); learning opportunities 34.5/55.0 (62.7%); atmosphere 28.9/40.00 (72.4%); and workload/supervision/ support 27.5/40.0 (68.7%). Analysis of subscale scores showed that the operating room "teaching and training" subscale had the highest score, with a score of 73.7%. The lowest scoring subscale was 'learning opportunities' (62.7%).

The three highest scoring items were no. 6 "My preceptor's surgical skills were very good. (4.4+0.7)", no. 31 "I (do not) feel discriminated against in the operating room because of my race. (4.3+1.04)" and no. 30 "I (do not) feel discriminated in the operating room because of my sex. (4.3+1.07)". Moreover, the 7 items with "satisfactory" mean scores (mean item score > 4) were, "My attending has a pleasant personality," "I get along well with my attending," and

"I understand what my attending is trying to teach me," "My attending's surgical skills are very good," "I feel discriminated against in the operating room because of my sex," "I feel discriminated against in the operating room because of my race," and "I am(not) asked to perform operations alone that I do not feel competent at performing." The remaining questionnaire items were found to be less than satisfactory (mean item score <4), indicating the need for further investigation and improvement. The three lowest-ranked items were statements no. 27 "The nursing staff dislikes it when I operate as the operation takes longer. (2.4+1.0)", no. 19 "More senior residents or consultants take my opportunities to operate. (2.68+1.08)" And no. 20 "The number of emergency procedures was sufficient for me to gain the correct operative experience. (2.8+1.25)". These items should be prioritized in future program evaluations (**Tables 2, 3, 4 and 5**).

The reliability analysis was performed using Cronbach's alpha coefficient which was computed for the overall questionnaire and for each of the four subscales to measure the internal consistency of the Questionnaire. The Cronbach's alpha values were interpreted according to Richardson's suggestion. The Cronbach's alpha for the overall questionnaire was 0.865. The following were the Cronbach's alpha values for the factors indicated: "teaching and training" subscale 0.868; "supervision/ workload/support" subscale 0.770; "learning opportunities" subscale 0.684; "atmosphere'" atmosphere subscale 0.723. All Cronbach's alpha coefficients were considered to be within the acceptable to good range, except for learning opportunities. However, when our data was analyzed to exclude each question in turn, using the "alpha if item deleted", no significant improvement was seen with the removal

of any of the 40 questions. Spearman correlation was calculated for the overall score as well as subscales and found a strong positive correlation among all subscale scores and overall scores (p-value < 0.05 with r-value ranging from 0.56 to 0.8).

Factors associated with OREEM scale score Comparisons were made between gender, junior and senior level residents, marital status, and different departments. No significant difference was identified regarding the OR teaching perception according to marital status and the different departments in the one-way ANOVA analysis. In the two-sample t-test analysis for gender, a statistically significant difference ($t127 = 3.35$, $p < 0.001$) was shown in the "atmosphere" subscale score between females (26.3/40 or 65.7%) and males (29.6/40 or 74%). The average "atmosphere" subscale score for females was lower than the mean subscale score for males by 3.35. This was corroborated by item analysis that revealed responses to items 29, 30, and 31, which comprise part of the "atmosphere" subscale, differed

significantly between the two sexes. In addition, items 2 and 25 also were noted to contribute to the difference in overall scores.

Other items also were rated less favorably by female respondents including statement no. 6 "My consultant's surgical skills are very good. ($t127 = 2.95$, $p < 0.004$)", and no. 9 "Before the operation my consultant discusses what part of the procedure I will perform. ($t127 = 2.7$, $p < 0.008$)", whereas no. 8 "My consultant immediately takes the instruments away when I do not perform well. ($t127 = -2.07$, $p < 0.040$)" was rated more favorably by females. However, there was no statistically significant difference in the overall total score of the OREEM measure between males and females. The level of training affected the perception of the residents about the OR learning environment mainly regarding "learning opportunities" and "atmosphere." The mean score for "learning opportunities" for junior and senior residents was 33.4 + 6.4and 35.8 + 5.4, respectively ($p < 0.023$), while the mean score for "atmosphere" was 28.1 + 5.04 for juniors and 29.9 + 4.07 for seniors ($p < 0.028$). Six out of the 40 OREEM items (no. 3, 14, 17, 20, 26, and 27) were statistically different between junior and senior residents ($p < 0.05$). The overall OREEM mean score for junior and senior residents, however, was comparable with no significant difference (**Table 6**)

Table (1): Characteristics of surgical residents (n = 129)

Characteristics		**No. of participants**	
		No.	**%**
Sex	Male	103	79.8
	Female	26	20.2
Postgraduate	I	42	32.6
	II	28	21.7

Characteristics		No. of participants	
		No.	%
	III	38	29.5
	IV	13	10.1
	V	8	6.2
Marital status	Married	36	27.9
	Single	87	67.4
	Engaged	5	3.9
	Other	1	0.8
Training Program	General Surgery	53	41.1
	Pediatric surgery	5	3.9
	Urology surgery	12	9.3
	Neurosurgery	12	9.3
	Plastic surgery	7	5.4
	Orthopedics	25	19.4
	ENT	9	7.0
	Maxillofacial	6	4.7

Table (2): Responses to the OREEM survey Likert questions: Subscale teaching and training among surgical residents

Teaching and training	Mean score	+SD
My consultant has a pleasant personality.	4	0.8
I get on well with my consultant	4	0.7
My consultant is enthusiastic about teaching	3.94	0.8
My consultant has a genuine interest in my progress	3.78	0.9
I understand what my consultant is trying to teach me	4.17	0.8
My consultant's surgical skills are very good	4.42	0.7
My consultant gives me time to practice my surgical skills in theatre	3.74	1.0
My consultant immediately takes the instruments away when I do not perform well.	3.04	1.1
Before the operation, my consultant discusses the surgical technique planned.	3.32	1.1
Before the operation, my consultant discusses what part of the procedure, I will perform.	2.99	1.1
My consultant expects my surgical skills to be as good as his/ her.	3.12	1.2
My consultant gives me feedback on my performance.	3.51	1.0
My consultant's criticism is constructive.	3.81	0.9

Table (3): Responses to the OREEM survey questions: Subscale learning opportunities among surgical residents

Learning opportunities	Mean score	+SD
The type of operations performed on this rotation is too complex for my level.	3.39	1.1
The elective operating list has the right case mix to suit my training.	3.55	1.1
There are too few cases on the elective list to give me the opportunity to operate.	3.17	1.1
I get enough opportunities to assist.	3.18	1.1
There are enough operating theatre sessions per week for me to gain the appropriate experience.	2.89	1.1
More senior residents or consultants take my opportunities to operate.	2.68	1.1
The number of emergency procedures is sufficient for me to gain the right operative experience.	2.79	1.2
The variety of emergency cases gives me the appropriate exposure.	3.04	1.2
My consultant is in too much of a rush during emergency cases to let me operate.	3.41	0.9
I miss out on the operative experience because of restrictions on working hours.	3.30	1.1

Learning opportunities	Mean score	+SD
I have the opportunity to develop the skills required at my stage.	3.08	1.1

Table (4): Responses to the OREEM survey questions: Subscale operating room atmosphere among surgical residents

Operating room atmosphere	Mean score	+SD
The atmosphere in the operating theatre is pleasant.	3.66	1.0
In the operating theatre, I don't like being corrected in front of medical students, nurses, and residents.	3.96	0.9
The nursing staff dislikes it when I operate as the operation takes longer.	2.36	1.0
The anesthetists put pressure on my consultant to operate himself to reduce anesthetist time.	2.74	1.1
The staff in the operating theatre is friendly.	3.66	0.9
I feel discriminated against in theatre because of my sex.	4.26	1.1
I feel discriminated against in theatre because of my race.	4.31	1.0
I feel part of a team in theatre.	3.98	0.9

Table (5): Responses to the OREEM survey questions: Subscale workload/supervision/ support among surgical residents

Subscale workload/supervision/support	Mean score	+SD
I am too busy doing other work to go to the theatre	3.26	1.1
I am often too tired to get the most out of theatre teaching.	3.19	1.0
I am so stressed in the operating theatre that I do not learn as much as I should.	3.26	1.1
I am asked to perform operations alone that I do not feel competent.	4.10	0.9
When I am in the theatre, there is nobody to cover the ward	3.72	1.1
I get called during operations.	3.25	1.2
The level of supervision in theatre is adequate for my level.	3.54	1.0
The operative cases are too long.	3.16	1.2

Table (6): Association between the residents' background information and Operating Room Educational Environment Measure (OREEM) scores among surgical residents

Characteristics	Operating Room Educational Environment Measure [a]				Overall
	Trainer & Training	Learning Opportunities	Atmosphere in the OR	Supervision, Workload and Support	
Gender					
Female	3.56+ 0.66	3.16 + 0.51	3.28 + 0.60	3.52 + 0.76	3.39 + 0.38
Male	3.7+ 0.57	3.12 + 0.56	3.70 + 0.56	3.41 + 0.67	3.49 + 0.42
p-value*	0.238	0.788	**0.001***	0.46	0.27
Level of training					
Junior residents	3.7 + 0.57	3.03 + 0.58	3.5 + 0.63	3.49 + 0.64	3.45 + 0.44
Senior residents	3.6+0.61	3.26 + 0.48	3.74 + 0.51	3.36 + 0.74	3.5 + 0.39
p-value*	0.399	**0.023***	**0.028***	0.309	0.478
Department					
General surgery	3.66+0.54	2.85+0.48	3.57+0.58	3.63+0.55	3.41+0.40
Pediatric surgery	3.83+0.85	3.58+0.51	3.83+0.53	3.48+0.38	3.69+0.56
Urology	3.75+0.44	2.92+0.39	3.94+0.48	3.59+0.48	3.53+0.32
Plastic surgery	3.27+0.75	3.22+0.27	3.39+0.61	3.01+0.67	3.23+0.39
Orthopedics	4.04+0.43	3.47+0.51	3.74+0.53	3.48+0.83	3.71+0.41
Neurosurgery	3.39+0.56	3.31+0.53	3.53+0.40	**2.73+0.73**	3.26+0.39
ENT	3.31+0.87	3.28+0.68	3.91+0.63	3.61+0.38	3.48+0.51
Maxillofacial	3.77+0.23	3.64+0.36	2.75+0.55	2.81+0.89	3.34+0.07
Department **p-value***	0.186	0.119	0.001	0.052	0.169

Bold and italic ones are statistically significant.

[a] Values reported are mean and standard deviation (SD).

* Student t-test was used for “Gender” and “Level of training,” whiles a 1-way ANOVA test was used for “department.”

Discussion

The educational environment has a big impact on how things are taught and learned. The merits and shortcomings of the surgical residency program's operation room instruction can be assessed using OREEM. It has been utilized in several researches to evaluate the residents' educational environment. To evaluate the OR educational environment of the postgraduate surgical residency programs, we used the OREEM measure for the first time since the programs' establishment. The population of surgical trainees was young, with an average age of 28.5 + 2.1 years. Nigeria, the Netherlands, and the United States are among the nations with similar compositions. [19]

In contrast to the number of female medical school graduates, our surgical training was noteworthy for having a male gender majority of 79.8%. In a similar vein, women made up to 22% of surgical trainees in the US and 28% in the Netherlands [20]. More thorough qualitative research will be necessary to identify the precise obstacles. Overall, the educational environment was found to be satisfactory based on the OREEM mean score of 69% in this study even though it has been argued that any score below 80% in the nonparametric scale of the Likert scale is less than satisfactory. [21]

A study conducted among Saudi Arabian urology residents revealed a similar total inventory score of 67.95% [34]. Another study from Nigeria that included 33 surgery residents reported one of the lowest scores of 69.74 . On the other hand, higher scores have been reported from the studies done in the UK and Canada with OREEM scores of 79.16% and 74.4% respectively [35]. More favorable overall scores have been observed when comparing our results to research from other departments, such as pediatrics, obstetrics and gynecology, and intensive care training [36]. Another study has also revealed that there is a concerning difference in how consulting surgeons and surgical residents see the instructional environment in the operating room [22]

Analysis of subscale scores showed the subscale of operating room “teaching and training” had the highest score with a score of 73.7% and the lowest scoring subscale was “Learning opportunities” at 62.7% which is reflected in 3 of the lowest scored items (no. s 27, 19 and 20). Similarly, the original study conducted for the validation of the questionnaire among Scottish basic trainees indicated that the highest rated subscale was “teaching and training” and the lowest subscale score for the Scottish trainees was “learning opportunities” [33]. Other studies have also reported similarly positive scores for the “teaching and training” subscale. However, the “learning opportunities” subscale has been positively reported in other studies with mean scores of 72.6% and 76.21% [23]

The overall score did not indicate any differences between junior and senior residents in their perception of the operating room educational environment similar to the studies conducted by Canadian general surgery residents [24]

However, on the subscale of “learning opportunities,” and “atmosphere” junior residents scored lower than senior residents; this difference was statistically significant (p-value < 0.05). There are mixed results regarding the difference in perceptions between senior and junior residents with some studies reporting no statistically significant differences regarding the total measure score or any of its subscales' scores and others the reverse [22]. This could be explained by the fact that juniors typically observe and help more in the operating room, while seniors typically perform the majority of surgical procedures with assistance, have a more supervisory role in the ward, and carry out administrative tasks like scheduling. Junior residents also scored worse on five survey questions ($p < 0.05$), including those relating to opportunities afforded to trainees to ‘scrub in’ and practice their skills, the operative case-mix, and pressure placed on trainees to ‘hurry up. This has been similarly reflected in the comments section by several residents.

The Cronbach α was high at 0.865 for the 40 statements. This high reliability of the OREEM questionnaire is comparable to other studies [22] and supports the fact that the OREEM questionnaire has a high internal consistency when administered among various groups of residents in different environments. The Cronbach α also was high at 0.868 for the teaching and training domain, and it was good at 0.770 for “supervision/ workload/support” perception and at 0.684 for “learning opportunities” domains, which are comparable to those reported by others. Our results showed that the OREEM's content internal consistency is acceptable and valid to distinguish between various influences that contribute to the educational environment in the operating room and indicate that the separate items/subscales of this questionnaire appear to consistently measure the construct of the educational environment in the OR. When our data were analyzed to exclude each question in turn, using the “alpha if item deleted”, no significant improvement was seen with the removal of any of the 40 questions.

Conclusion

The residents' opinions of their training and supervisors, the learning possibilities in the operating room, the environment in the operating room, and the supervision they received were all deemed favorable by the overall OREEM score, which was determined to be 69% (138/200). The subscales measuring "teaching and training" and "learning opportunities" in the operating room had the greatest and lowest scores, respectively. Furthermore, we found that while training level had an impact on the "learning opportunities" and "atmosphere" domains, gender mostly influenced residents' perceptions of the OR learning environment with reference to the "atmosphere" scale.

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