Learning in Operation Theatre; Postgraduate Trainees' Perspective Using OREEM (Operation Theatre Educational Environment Measure) Survey

Ambreen Syed[1], Musawer Khan[2], Syed Nasir Shah[2], Imtiazuddin[2], Shoaib ur Rehman[2], Naeem ul Haq[2]
[1]Department of Institute of Health Professions Education and Research (IHPER), Khyber Medical University, Peshawar, [2]Mardan Medical Complex/Bacha Khan Medical College, Mardan, Pakistan.

ABSTRACT

Background: This study examines postgraduate surgical trainees' perceptions of the operating theatre learning environment using the OREEM survey to identify satisfaction areas and challenges such as biases, inadequate supervision, workload, and support, proposing potential improvements and solutions.

Methods: This prospective cross-sectional, single-institute study was conducted in Mardan Medical Complex, Mardan. The study was two months (March-April 2024), with a simple purposive sampling technique. Postgraduate FCPS trainees in surgical specialties were included in the study, while residents in non-FCPS programs were excluded. A validated "OREEM" questionnaire was distributed through Google Forms, and responses were recorded. The data was analyzed using Excel 2022 software.

Results: 71 residents participated in the study. 46 (64.8%) were male and 25 (35.2%) females. The mean age was 29±2. The OT learning environment was satisfactory, with the highest mean score for the "trainer and training" subscale and the lowest for "supervision, workload, and support" in the OREEM survey. A significant mean difference ($p < 0.05$) was noted between male and female responses regarding "anesthetist pressuring the trainer to perform surgery to shorten anesthesia time." Additionally, there was a significant difference in responses between senior (years 3-5) and junior (years 1-2) residents on five items about the number and variety of available surgical cases interventions.

Conclusion: The OT learning environment was satisfactory, but some areas need improvement. Biases appeared in senior vs. junior and male vs. female responses to the OREEM questionnaire. Suggested solutions addressed these issues.

Keywords: Surgical specialties, Operation Theatre, Learning Environment.

Corresponding Author:
Dr. Musawer Khan,
Neurosurgery Department,
Mardan Medical Complex/Bacha Khan Medical College,
Mardan, Pakistan.
Email; modestgaze@yahoo.com
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INTRODUCTION

The medical education environment encompasses teaching, learning, and training for undergraduates and postgraduates, focusing on workplace dynamics and personnel dedication to positively impact teachers and students[1]. Surgical resident acquires most of their operational theatre (OT) clinical skills[2]. Surgery requires a blend of theoretical knowledge and practical skills such as precision, flexibility, rapid movement, coordination, and efficient use of support[3].

The OT allows postgraduate surgical residents to develop technical, communication, practical experiences, and judgment skills[4]. The consultants facilitate the residents through an apprenticeship model, including supervised exposure to operative skills and knowledge-sharing sessions. The residents are required to incorporate the learnt behaviour into their clinical practice[5]. The operating room (OT) poses challenges like patient selection, positioning, surgical techniques, and teamwork. Common issues include surgery cancellations, resource availability, and temperature control. Managing these complexities demands diverse skills[6].

OT learning is multifactorial; thoughtfully planning content and its evaluation directly affects quality. Curriculum designers must address residents' needs and offer a structured, supportive training program[7,8]. The perception of residents about their educational environment is an essential indicator of learning outcomes[9]. The increase in "surgery turnover" and complex surgical procedures consistently pressurize the modern-day OR. Also, the consultants are more occupied with patient care. As a result, learning opportunities for surgical residents are under continuous threat[10]. Different evaluation tools are designed for various specialties and learning environments in clinical teachings, such as the Medical School Environment Inventory (MSEI), Dundee Ready Education Environment Measure (DREEM), and Anaesthetic Theatre Educational Environment Measure (ATEEM). Surgical Theatre Educational Environment Measure (STEEM) and Operating Room Educational Environment (OREEM) are two validated tools for evaluating the learning environment in the OR for postgraduate surgical trainees[11].

The Liaison Committee on Medical Education (LCME) and the Accreditation Council for Graduate Medical Education (ACGME) emphasize the importance of continuously evaluating the learning environment, particularly in the clinical setting. While developed countries have progressed in assessing and improving learning in operating rooms (ORs), underdeveloped countries must catch up in these concepts[12]. Studies were conducted in teaching hospitals in the country using validated tools, but further research is still needed. Post-graduate training needs to be systematically organised to include the operating room as a learning environment, and different hospitals and supervisors have varying perceptions of operating room learning[13]. Qualitative research is the optimum tool to document the experiences of surgical residents involved in the process[14].

METHOD

This single-center prospective, cross-sectional study was conducted in a tertiary care teaching hospital, Mardan Medical Complex. The data was collected over two months, from 1st June to 31 July 2023. Ethical Approval was sought from the Institute of Health Professions Education & Research (IHPER) Ethics Board of Khyber Medical University (Ref No: 1-12/IHPER/MHPE/KMU/23-30). Postgraduate surgical residents doing Fellowship with the College of Physicians and Surgeons (CPSP) Pakistan in different surgical specialties were included in the study through simple purposive sampling. These residents are subjected to regular OT encounters and are involved in performing procedures in the OT. Postgraduate residents from non-surgical specialties like medical and allied specialties and radiology, etc., are excluded from the study. Also, surgical residents in the 2nd fellowship program were excluded after acquiring the 1st fellowship degree. Postgraduate residents enrolled in residency programs other than the CPSP residency program were excluded from the study.Data was collected through online Google Forms. The form consisted of the bio-data part and the OREEM questionnaire. OREEM consists of 40 questions (items) divided into four subsections (1-Trainer and training, 2-Learning opportunities, 3-Atmosphere in the OT and supervision, 4-workload and support). Each item is scored on a 5-point Likert scale (strongly disagree=1, disagree=2, uncertain=3, agree=4, strongly agree=5). The data was analyzed using Excel 2022 software.

RESULTS

A total of 71 residents belonging to different surgical specialties participated in the study. 46 (64.8%) were male and 25 (35.2%) were female. 41 (56%) trainees were junior (years1-2), and 30 (44%) were senior (years3-5). Chart 1 depicts further demographics.

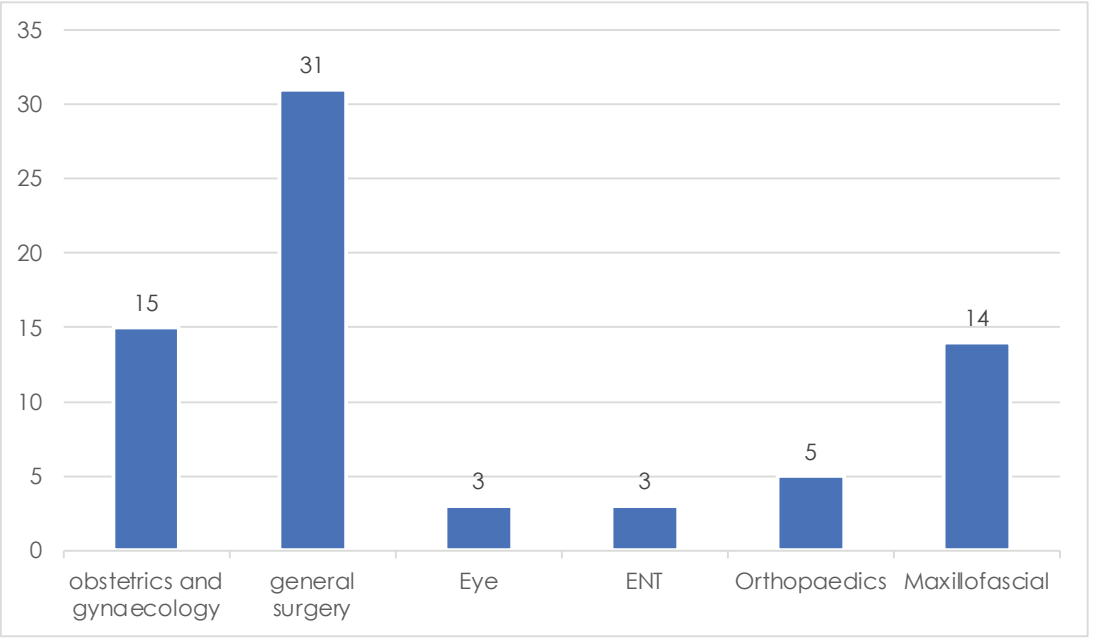

Fig:1 Number of trainees (total=71) from various surgical specialties participated in the study

The reliability Cronbach a for the whole OREEM inventory was 0.87. By reading through Table 1, it is evident that when male and female responses to the OREEM survey are compared, there is no statistically significant difference in all four sections. However, the mean score for male and female residents is below 3 in the supervision, workload, and support sections. In the junior (years 1 and 2) vs. senior residents (years 3, 4, and 5) comparison, there is a statistically significant (P value <0.05) difference in response to the learning opportunities section. The mean scores for the supervision, workload, and support section are again below 3 for both senior and junior residents' responses, though there is no statistically significant difference. Comparing the OREEM survey responses among different surgical specialties, there is no statistical difference among the specialties. The mean score is uniformly lowest in the supervision, workload, and support sections among all the specialties.

Table 1: Association between the Residents' Background Information and Operating Room Educational Environment Measure (OREEM) scores

Characteristics	Trainer & training	Leaning opportunities	Atmosphere in the operating room	Supervision, workload, support
Male	3.80	3.45	2.98	2.52
Female	3.81	3.56	3.04	2.58
P value	0.96	0.65	0.90	0.79

Level of training				
Junior (year 1-2)	3.84	3.59	3.0	2.57
Senior (Year 3-5)	3.83	3.14	3.09	2.55
P value	0.96	0.06	0.99	0.92
Program				
General surgery	3.84	3.5	3.0	2.57
Maxillofacial surgery	3.87	3.25	2.93	2.6
Gynaecology & Obstetrics	3.9	3.58	2.99	2.89
Orthopaedics	3.6	2.83	3.0	3.01
ENT	3.8	3.3	2.8	3.3
Eye	3.8	3.06	2.9	2.6
P value	0.9	0.6	0.5	0.6

By reading through Table 2, it is evident that In the trainer and training section, the item "giving enough time to practice surgical skills" for females and males has the lowest score; however, the difference is statistically non-significant. In the learning opportunities section, *the item "In this rotation, the types of operations performed are too complex for my level"* has the lowest score for both genders. However, all the individual items have no statistically significant difference among the responses of both genders. In the atmosphere in the operating room section, comparing male and female responses, there is a statistically significant difference ($p<0.05$) in the "*anaesthetic pressure on the trainer to reduce time*" item. Items related to Sexual and racial discrimination also have low scores for both genders, but there is no statistical difference between the two. No statistically significant difference exists between male and female responses in the supervision workload and support section. Most items in this section have mean scores less than 3, and "When I am in theatre, there is nobody to cover the ward" has the lowest score, with 1.94 and 2.13 for females and males, respectively.

Table 2: Association between the Residents' Gender and Experience for the Items of Operating Room Educational Environment Measure (OREEM) Inventory.

Residents' perception	Female Mean	Male Mean	P value	Junior (year 1-2) Mean	Senior (year 1-3) Mean	P value
Trainer & Training						
My trainer's personality is pleasant	4.08	4.08	0.90	4.08	4.08	0.9
I feel relaxed with my trainer	4.07	4.05	0.69	4.07	4.05	0.8
My trainer is energetic about teaching	3.95	3.94	0.81	3.95	3.94	0.9
My trainer takes interest in my advances	4.29	4.29	0.93	3.95	3.94	0.6
I understand my trainer's teaching well	4.45	4.42	0.92	4.29	4.29	0.7
My trainer's surgical skills are excellent	3.84	3.82	0.98	4.45	4.42	0.8
My trainer gives me time to practice surgical skills in theatre	2.63	2.63	0.87	3.84	3.82	0.5
When my performance is not good, my trainer immediately takes the instruments	3.64	3.63	0.58	2.63	2.63	0.4
My trainer discusses the surgical plane pre-operatively.	3.59	3.58	0.7	3.64	3.63	0.7
Preoperatively, my trainer discusses my role in the surgery	3.69	3.77	0.71	3.59	3.58	0.8
My trainer expects my surgical skills to be as good as his/hers	3.77	3.76	0.7	3.69	3.70	0.4
My trainer gives me feedback on my performance	3.69	3.67	0.65	3.77	3.77	0.5
My trainer provides constructive criticism	4.28	4.26	0.9	3.69	3.67	0.4

Learning Opportunities						
In this rotation, the surgeries are complex for my level	2.68	2.63	0.87	3.8	2.45	0.5
The elective operating list optimum mix of surgeries for my level of training	3.84	3.78	0.81	3.48	3.6	0.45
There are far too many cases on the elective list to allow me to operate	3.6	3.1	0.11	4.36	2.54	0.002
I get enough opportunity to assist	4.24	4.28	0.83	3.82	4.	0.078
There are enough theatre sessions per week for me to gain the appropriate experience	3.68	3.7	0.89	3.46	3.20	0.028
Senior trainees take my opportunities to operate	3.5	3.45	0.66	4.08	3.45	0.976
The number of emergency cases is sufficient for me to gain the right operative experience	3.68	3.89	0.46	4.14	3.12	0.0006
The variety of emergency cases gives me the appropriate exposure	3.84	3.95	0.64	2.93	3.33	0.0009
My trainer doesn't let me operate in an emergency because he is in a rush	3.2	2.8	0.24	2.7	2.75	0.59
Restricted operating hours miss my opportunity to operate	2..76	2.69	0.82	4.0	2.66	0.90
I have the opportunity to develop the skills required at my stage	4.04	3.71	0.19	3.8	3.3	0.002
Atmosphere In the Operating Room						
The atmosphere in the theatre is pleasant	3.6	3.35	0.37	3.64	3.39	0.22
In theatre, I don't like being corrected in front of medical students, nurses, and Residents	3.08	2.58	0.16	2.77	2.62	0.65

The nursing staff dislikes it when I operate as the operation takes longer	3.36	3.56	0.56	3.42	3.48	0.84
The anaesthetists put pressure on my trainer to operate himself to reduce the anaesthetic time	2.72	3.56	0.01	3.33	3.11	0.53
The theatre staff are friendly	3.68	3.41	0.35	3.46	3.62	0.59
I feel gender discrimination in the theatre	1.88	1.84	0.91	2.02	1.59	0.19
I feel racial discrimination in theatre	1.68	1.47	0.45	1.71	1.40	0.3
I feel part of a team in theatre	4.2	4	0.43	4.13	4	0.54
Supervision, Workload and Support						
I am too busy doing other work than to go to the theatre	3	2.3	0.14	2.45	2.33	0.66
I am often too tired to get the most out of theatre teaching	3.05	2.82	0.96	2.84	2.69	0.61
I feel stressed in theatre which impacts my learning	2.27	2.39	0.88	2.39	2.45	0.84
I am asked to perform operations beyond my competency level	2.38	2.23	0.59	2.45	2.21	0.44
when I am in theatre, there is nobody to cover the ward	1.94	2.13	0.97	2.30	1.90	0.18
I get paged unnecessarily during operations	2.4	2.32	0.46	2.45	2.33	0.62
The level of supervision in theatre is adequate for my level	3.6	3.67	0.57	3.76	3.33	0.10
Theatre sessions are too long	2.3	2.4	0.88	2.67	2.27	0.12

In the trainer and training component, the score of the question "my trainer immediately takes the instruments away when I do not perform well" is low, with a mean value of 2.63 for both levels of training (seniors and juniors). In the learning opportunities component, there is a statistically significant difference (P<.05) between the responses of seniors and juniors to five items related to acquiring enough opportunities to develop their surgical skills in elective and emergency surgical procedures. There is no statistical difference

between the senior and junior responses in the atmosphere in the operating room component. However, the responses to items related to "feeling bad when corrected in front of nursing staff" and "racial and gender discrimination" have low scores (below 3) for both levels of training. In the supervision, workload, and support portion, there is no significant difference between the senior and junior levels of training. The responses to most of the items in this portion have mean values below 3 for both levels of training.

DISCUSSION

Since its introduction, the OREEM questionnaire has proven to be an efficient tool for estimating surgical residents' perceptions of their operating room educational environment. Studies have been conducted in Pakistan, and the questionnaire has already been validated[15, 16].A holistic view of the results from our survey indicates the overall highest score for the trainer and training component and the lowest for the supervision, workload and support section of the OREEM survey. In another study, the supervision, workload and support section had the highest subscale score, while learning opportunities had the lowest score[17].Residents' responses in the Trainer and Training section reveal a positive view of the residency program. The item "My trainer gives me time to practice surgical skills in theatre" received mixed feedback, with no disagreement about the practice time allocated. No significant differences exist between male and female responses or senior (years 3-5) and junior (years 1-2) residents. Feedback from residents across all surgical specialties shows comparable satisfaction with this section of the OREEM questionnaire.

Learning opportunities received satisfactory responses from residents. Expressly, seniors affirm that they benefit from juniors' skills. However, responses about the complexities of available surgeries and missed emergency opportunities show uncertainty among residents. A statistically significant difference ($p<0.05$) exists between seniors' and juniors' reactions to learning opportunities, with five items demonstrating notable discrepancies in their responses. Seniors expressed less satisfaction regarding the complexity of surgical experiences and available skills development opportunities. They also showed less concern about the quantity and variety of electives and emergency cases needed to gain essential operative experience.

On the other hand, the juniors felt disadvantaged compared to seniors regarding the variety of exposure to emergency surgical procedures. Studies conducted in developed countries like the USA, Australia, Canada, etc., indicate junior residents have lower scores than seniors regarding the educational atmosphere in OT9, [18,19]. The issues related to seniors and juniors can be addressed systematically. Seniors can be assigned the role of mentors to teach juniors, hence not only improving the educational environment of the OT but also reducing the bias among both[20].

Regarding the atmosphere in the OT, the residents' response is positive on some items, like they feel part of the surgical team, and the environment is pleasant overall. Also, they think that the theatre staff is friendly. There are some areas where the residents show their concerns, such as the nursing staff dislikes when the operation by residents takes longer. Also, the anaesthetist puts pressure on the trainer to operate himself to reduce the anaesthetic time. The residents also agree that an atmosphere of racial and gender discrimination exists in the operation theatre. While in our study, both genders feel racial and sex discrimination, and there exists no statistically significant difference among the response of both genders, in other studies conducted in the Kingdom of Saudi Arabia and Pakistan, there is a gender difference in the perception of atmosphere in OR[10,21]. No statistically significant difference exists in overall OT atmosphere responses between genders or senior and junior residents, nor among surgical specialties. However, a significant difference arises in reactions to the item about anaesthetist pressure to reduce anaesthetic time. Female residents express uncertainty, while males agree. This finding is crucial as it represents the only significant gender difference in the OREEM survey ($P=0.01$), highlighting a bias towards female residents requiring attention from regulatory bodies training. In the OREEM survey's last section on supervision, workload, and support, residents express satisfaction with OT training. However, they disagree about the adequacy of theatre supervision. No significant differences are found between genders or between senior and junior residents. Additionally, responses show no significant variation among surgical specialties. Comparing responses to individual items in the supervision, workload, and support section reveals most fall into the unsure category cases.

Patient care is directly proportional to the quality of the educational environment. Patient outcomes can be significantly improved by enhancing the trainees' standard of clinical learning[20,22-24]. OT is a challenging environment for clinical training due to its least structured and studied nature[20,25]. Residents and the trainer must be on the same page to improve OT education. There should be effective 2-way communication between the two and effective goal setting and discussions[20,26]. A surgical trainee is a future surgeon who is expected to perform surgeries independently and without supervision; therefore, the educational environment in the OT is the decision-maker in improving the patient outcome. Effective feedback from the trainer is sine

qua non for an ideal OT environment. It's not only the trainer who needs to be satisfied with his feedback and training; trainee satisfaction is also crucial. A trainee may find the trainer's guidance and mentorship unsatisfactory if the trainer thinks otherwise[27,28]. Therefore, proper supervisor training in teaching skills should be mandatory at the bedside, OPD, and OT. The study offers insights into Pakistan's surgical residency but has limitations as a single-center analysis. Results should be cautiously applied nationwide. Further evaluation is needed to assess learning outcomes, as residents' perceptions evolve with training. Qualitative studies can deepen the understanding of residents' experiences in the operating theatre.

CONCLUSION

The overall learning environment in OT can be considered satisfactory. However, particular areas were identified where there is room for maximum improvement. Certain biases were recognized, and solutions were presented to minimize those. This single-centre study can be cautiously generalized to the surgical training program in the whole province or the country.

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None

CONFLICTS OF INTEREST

None

ETHICAL APPROVAL

Ethical Approval was sought from the Institute of Health Professions Education & Research (IHPER) Ethics Board of Khyber Medical University (Ref No: 1-12/IHPER/MHPE/KMU/23-30).

AUTHOR CONTRIBUTIONS

AS: Study design and methodology, **MK:** Paper writing, **SUR:** Data collection and calculations, **IU:** Analysis of data and interpretation of results, **NUH:** Literature review and referencing, **SNS:** Editing and quality insurer

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