Sadiq S, Qureshi M, Lakhani M, Shah M, Ayub M
MedEdPublish
https://doi.org/10.15694/mep.2019.000131.1

Research article
Open Access

Poor Learning In Operation Theatres Causing Brain Drain

Sara Sadiq[1], Muhammad Fazal Hussain Qureshi[1], Mahira Lakhani[1], Muzna Shah[1], Muhammad Hassan Ayub[1]

Corresponding author: Mr Muhammad Fazal Hussain Qureshi fazalhqureshi22@gmail.com
Institution: 1. Ziauddin University
Categories: Educational Strategies, Learning Outcomes/Competency, Students/Trainees, Teaching and Learning, Postgraduate (including Speciality Training)

Received: 15/05/2019
Published: 12/06/2019

Abstract

Introduction: In interior Sindh, most of the hospitals including teaching hospitals of Hyderabad, Larkana, Sukkur and Nawabshah lack specialists so the attitude of available specialists as supervisors is important for learning in operation theatre like need good mentorship, observation and hands-on skills. Limited research has been conducted in Pakistan while none of the study has been done considering specifically the hospitals of interior Sindh.

Objective: To identify the perception of residents towards learning environment in surgical theatre of a medical school teaching hospital of interior Sindh.

Method: A cross-sectional study was conducted at Peoples Medical College, Nawabshah, from May 2018 to October 2018. STEEM questionnaire of 40 statements was used and was validated after pilot study. The participants’ responses were calculated using a five-point Likert scale. Randomized sampling technique was used. The reliability was assessed using Cronbach's alpha for the whole questionnaire. Mann-Whitney and the one-way analysis of variance (ANOVA) tests were used as nonparametric methods for comparative statistics for assessing gender differences. We also conducted the factor analysis by using a varimax rotation. Kaiser-Mayer-Olkin (KMO) and Bartlett's tests were applied.

Results: Of the 88 participants, 71.6% (n=63) were females and 28.4% (n=25) were males. Majority of participants 43% belong to gynaecology department. The reliability of the scale was 0.822, calculated using Cronbach alpha. The mean overall STEEM score was 108.81 whereas, mean score of males was 115.44 and females was 106.17 which shows there the difference between scores based on gender. Male perceived the educational environment more positive than females in each subscale.

Conclusion: Under current circumstances and condition of interior Sindh postgraduate trainees are deprived from good mentorship, observation and hands on skills due to lack and non-serious attitude of consultants/supervisors. The current study concluded that overall learning environment of operating theatre was perceived to be inadequate for learning.
Keywords: Medical education; Learning environment; operation theatre; postgraduates.

Introduction

The educational environment is an important measure, which has a large effect on the satisfaction, achievement, and success of medical education. Positive learning climates have been associated with improved learner's performance (Genn, 2001a; Genn, 2001b; Binsaleh et al., 2015). The practice and discipline of surgery is one that is complex and multifaceted, incorporating many key elements such as issue manipulation, sound clinical judgement, ever-present conscientiousness and leadership (Hu, Wattchow and de Fontgalland, 2018). Learning environment is an important factor in determining the outcomes of the curriculum, learning, student's achievement, satisfaction (Al-Qahtani and Al-Sheikh, 2012). A good learning environment should ideally include the physical, psychological, social and educational domains of a training programme which are thought to play a vital role in the professional and moral developments of the trainees (Soomro, Rehman and Hussain, 2017). Surgical trainees and surgeons thought that all competencies of surgery can be learnt and taught in the operating theatre so need constructive atmosphere for better outcomes (Kieu et al., 2015).

Looking over the health sector in Sindh, faces enormous challenges. In interior Sindh, most of the hospitals including teaching hospitals of Hyderabad, Larkana, Sukkur and Nawabshah lack specialists such as urologists, neuro-surgeons and paediatrics surgeon, radiologists, pathologists, orthopaedic surgeons, eye and ENT specialists, senior physicians and general surgeons. Beside these circumstances, the attitude of available specialists as supervisors is important for learning in operation theatre like need good mentorship, observation and hands-on skills (Paice, Heard and Moss, 2002; Imran, Haider and Bhatti, 2011).

Many studies have been carried out throughout the World but limited research has been conducted in Pakistan (Sheikh et al., 2017; Soomro, Rehman and Hussain, 2017; Kamran et al., 2018) while none of the study has been done considering specifically the hospitals of interior Sindh. Therefore, the primary objective of this study was to identify the perception of residents towards the learning environment in the surgical theatre of a medical school teaching hospital of interior Sindh.

Methods

A cross-sectional study was conducted at Peoples Medical College, Nawabshah, from May 2018 to October 2018. We included all the surgical and allied trainees working in 8 different departments of PMC. We calculated our sample size by using Openepi calculator. We excluded all the registrars and senior registrars from the study to avoid observation bias due to their completion of trainings. A formal consent form was then formulated for the participants including their gender. The study was also approved by Ethical Review Committee of Ziauddin University.

A 40 item questionnaire called surgical theatre educational environment measure (STEEM) was used (Cassar, 2004). We assessed the practicality of using the STEEM questionnaire by conducting a pilot study, the results were promising on a small sample size of 20 with a global reliability within acceptable range. This validated the STEEM tool for our assessing learning environment. The participants' responses were calculated using a five-point Likert scale. These ranged from strongly agree (5), agree (4), uncertain (3), disagree (2) to strongly disagree (1). The minimum score was 40 and possible maximum score was 200. A score of at least 120 out of 200 was considered favourable. The value above 120 indicates a more satisfactory educational environment.

The STEEM questionnaire was divided into four subscales: trainees' perceptions of their trainer and training (questions 1-13); trainees' perceptions of learning opportunities (questions 14-24); 1. Trainees' perceptions of
atmosphere in the operating theatre (questions 25-32); and trainees’ perceptions of supervision, workload and support (questions 33-40). The questionnaires were distributed and collected from the participants after completion within a day. Randomized sampling technique was used.

The reliability was assessed using Cronbach's alpha for the whole questionnaire. Mann-Whitney and the one-way analysis of variance (ANOVA) tests were used as nonparametric methods for comparative statistics for assessing gender differences. There were 19 negative statements for which reverse coding were done when they were analysed. We also conducted the factor analysis by using a varimax rotation. Kaiser-Mayer-Olkin (KMO) and Bartlett's tests were applied. The data was analysed using SPSS 22. Confidence of interval was set to be 95% with 5% margin of error.

Results/Analysis

Of the 88 participants who completed the questionnaire, 71.6% (n=63) were females and 28.4% (n=25) were males. Doctors from different departments were included in the study, majority of participants 43% belong to gynaecology department followed by general Surgery (24%), eye (13%), Neurology (6%), Orthopaedics (6%), Urology (5%), Paediatrics (2%) followed by ENT (1%). Questionnaire consist of 40 statements which were marked by Likert Scale maximum score was 200 and minimum score was 40, score above 120 was considered to be favourable for learning. The mean overall STEEM score was 108.81 whereas, mean score of males was 115.44 and females was 106.17 which shows there the difference between scores based on gender. Mann-Whitney and one-way analysis of variance (ANOVA) test were used as non-parametric methods for comparative statics for assessing gender differences as shown in Table 1 and 4.

| SUBSCALES                                                      | Male | Female | p-Value |
|---------------------------------------------------------------|------|--------|---------|
| Trainees’ perception of their trainer and teacher (Q1-Q13)    | 25   | 63     | 0.300   |
| Trainees’ perception of learning opportunities (Q14-Q24)      | 25   | 63     | 0.034   |
| Trainees’ perception of atmosphere in the operating theatre (Q25-Q32) | 25   | 63     | 0.064   |
| Trainees’ perception of supervision, workload and support (Q33-Q40) | 25   | 63     | 0.237   |
| STEEM overall Global Score (Q1-Q40)                          | 25   | 63     | 0.045   |

The overall reliability of the scale was 0.822, calculated using Cronbach alpha. We also calculated the mean, standard deviation, confidence interval and reliability (Cronbach alpha) of each sub-scale and the whole scale as shown in Table 2.

| Subscales                                                      | Mean  | SD    | CI             | Cronbach’s α |
|---------------------------------------------------------------|-------|-------|----------------|--------------|
| Trainees’ perception of their trainer and teacher (Q1-Q13)    | 32    | 9.091 | 30.18-34.03    | 0.849        |
| Trainees’ perception of learning opportunities (Q14-Q24)      | 30    | 3.457 | 28.98-30.45    | -0.298       |
Trainees’ perception of atmosphere in the operating theatre (Q25-Q32)  
Trainees’ perception of supervision, workload and support (Q33-Q40)  
STEEM overall Global Score (Q1-Q40)  
| Subscales                                                                 | Aberdeen Surgical trainees (Cassar, 2004) | STEEM Study of Birmingham (Nagraj, Wall and Jones, 2006) | STEEM Study of Liaquat National Hospital (Soomro, Rehman and Hussain, 2017) | Peoples Medical College (PMC), Nawabshah |
|--------------------------------------------------------------------------|-------------------------------------------|----------------------------------------------------------|---------------------------------------------------------------------------|------------------------------------------|
| Trainees’ perception of their trainer and teacher (Q1-Q13)               | Reliability: 0.84, Mean: 51               | Reliability: 0.84, Mean: 47                              | Reliability: 0.72, Mean: 48                                               | Reliability: 0.84, Mean: 32             |
| Trainees’ perception of learning opportunities (Q14-Q24)                 | Reliability: 0.59, Mean: 37               | Reliability: 0.54, Mean: 35                              | Reliability: 0.96, Mean: 37                                               | Reliability: -0.298, Mean: 30           |
| Trainees’ perception of atmosphere in the operating theatre (Q25-Q32)   | Reliability: 0.57, Mean: 30               | Reliability: 0.69, Mean: 29                              | Reliability: 0.96, Mean: 26                                               | Reliability: 0.53, Mean: 24             |
| Trainees’ perception of supervision, workload and support (Q33-Q40)     | Reliability: 0.57, Mean: 30               | Reliability: 0.65, Mean: 27                              | Reliability: 0.98, Mean: 25                                               | Reliability: 0.80, Mean: 23             |
| STEEM overall Global Score (Q1-Q40)                                     | Reliability: 0.88, Mean: 149              | Reliability: 0.86, Mean: 139                             | Reliability: 0.97, Mean: 136                                              | Reliability: 0.82, Mean: 109           |

There were 19 negative statements for which reverse coding were done when data was analysed. We also conducted factor analysis using a varimax rotation. Kaiser-Mayer-Olkin (KMO) and Bartlett’s test were applied, results of factor analysis at Eigen value set at 1 revealed 10 factors which showed 84.78% of the variance. The overall reliability and mean scores for Aberdeen surgical trainees, Birmingham Medical Students, Liaquat National Hospital trainees was compared to scores of one of the hospital of rural area of Sindh like People Medical College Nawabshah trainee as shown in Table 3.

Table 3. Comparison of reliability score of Aberdeen surgical trainees, Birmingham Medical Students, LNH trainees with PMC Nawabshah trainees.

The most highly rated statement was ‘The anaesthetists put pressure on my trainer to operate him/herself to reduce aesthetic time’ (3.84) and the lowest rated statement was ‘My trainer’s surgical skills are very good’. Looking over the gender variation, the most highly rated statement among men was ‘The nursing staff dislike it when I operate as the operation takes longer’ (3.72) and lowest rated was ‘My trainer’s surgical skills are very good’ (1.52), whereas the most highly rated statement among women was ‘The anaesthetists put pressure on my trainer to operate him/herself to reduce aesthetic time’ (3.90) and lowest rated was same as that among men (1.37). Male perceived the educational environment more positive than females in each subscale. There were seventeen statements with a statistically significant difference between genders (p<0.05), shown in table 4.

Table 4. Mean and standard deviation for Individual Statements of the STEEM with statistical differences between the Perceptions of Male and Female Students.
|   | Statement                                                                 | Male (Mean ± SD) | Female (Mean ± SD) | p-value |
|---|--------------------------------------------------------------------------|------------------|-------------------|---------|
| 1 | My trainer has a pleasant personality.                                   | 2.08 ±1.306      | 1.73 ±0.919       | 0.002   |
| 2 | I get on well with my trainer.                                           | 2.39 ±1.281      | 2.19 ±1.075       | 0.074   |
| 3 | My trainer is enthusiastic about teaching.                               | 2.28 ±1.304      | 3 ±1.658          | 0.013   |
| 4 | My trainer has a genuine interest in my progress.                        | 2.48 ±1.330      | 3.16 ±1.491       | 0.004   |
| 5 | I understand what my trainer is trying to teach me.                      | 2.41 ±1.353      | 2.92 ±1.525       | 0.026   |
| 6 | My trainer's surgical skills are very good.                              | 1.41 ±0.672      | 1.52 ±0.510       | 0.047   |
| 7 | My trainer gives me time to practice surgical skills in theatre.         | 2.25 ±0.875      | 1.68 ±0.476       | 0.000   |
| 8 | My trainer immediately takes the instruments away when I do not perform well.* | 2.65 ±1.083      | 3.36 ±1.075       | 0.000   |
| 9 | Before the operation my trainer discusses the surgical technique planned. | 2.39 ±1.159      | 2 ±0.707          | 0.167   |
|10 | Before the operation my trainer discusses what parts of the procedure I will perform. | 2.41 ±1.090      | 2.04 ±0.676       | 0.095   |
|11 | My trainer expects my surgical skills to be as good as his/hers.*         | 3.73 ±1.014      | 3.60 ±0.866       | 0.325   |
|12 | My trainer gives me feedback on my performance.                          | 2.86 ±1.302      | 3.04 ±1.744       | 0.675   |
|13 | My trainer's criticism is constructive.                                  | 2.77 ±1.302      | 3.28 ±1.429       | 0.044   |
|   | Question                                                                 | Male          | Female        | P  |
|---|--------------------------------------------------------------------------|---------------|---------------|----|
| 14| On this unit the type of operations are too complex for my level.*        | 3.44 ±1.355   | 3.68 ±1.189   | 0.023 |
| 15| The elective operating list has the right case mix to suit my training.  | 2.36 ±0.899   | 2.29 ±0.888   | 0.124 |
| 16| There are far too many cases on the elective list to give me the opportunity to operate.* | 2.82 ±1.199   | 2.84 ±1.066   | 0.746 |
| 17| I get enough opportunity to assist.                                      | 2.56 ±1.355   | 2.32 ±1.189   | 0.023 |
| 18| There are enough theatre sessions per week for me to gain the appropriate experience. | 2.81 ±1.445   | 2.75 ±1.379   | 0.559 |
| 19| More senior trainees take my opportunities to operate.*                  | 3.08 ±1.042   | 3.16 ±1.573   | 0.205 |
| 20| The number of emergency procedures is sufficient for me to gain the appropriate experience. | 2.70 ±1.146   | 2.65 ±1.124   | 0.439 |
| 21| The variety of emergency cases gives me the appropriate exposure.        | 2.22 ±0.964   | 2.02 ±1.050   | 0.017 |
| 22| My trainer is in too much of a rush during emergency cases to let me operate.* | 2.40 ±1.000   | 2.46 ±0.895   | 0.209 |
| 23| I miss out on operative experience because of restrictions on working hours.* | 3.05 ±1.212   | 3.03 ±1.332   | 0.924 |
| 24| I have the opportunity to develop the skills required at my stage.       | 2.28 ±1.212   | 1.98 ±0.975   | 0.001 |
| 25| The atmosphere in theatre is pleasant.                                   | 2.57 ±1.276   | 2.27 ±1.125   | 0.001 |
|   | Statement                                                                 | Male Mean ± SD | Female Mean ± SD | p-Value |
|---|---------------------------------------------------------------------------|----------------|------------------|---------|
| 26| In theatre I don't like being corrected in front of medical students, nurses and residents.* | 3.40 ±1.067     | 3.33 ±1.150       | 0.456   |
|   |                                                                           | Male 3.56 ±0.821| Female 3.49 ±1.480|         |
| 27| The nursing staff dislike it when I operate as the operation takes longer.* | 3.56 ±1.355     | 3.49 ±1.480       | 0.927   |
|   |                                                                           | Male 3.72 ±0.980| Female 3.49 ±1.480|         |
| 28| The anaesthetists put pressure on my trainer to operate him/herself to reduce aesthetic time.* | 3.84 ±1.123     | 3.90 ±1.266       | 0.071   |
|   |                                                                           | Male 3.68 ±0.627| Female 3.90 ±1.266|         |
| 29| The theatre staff are friendly.                                           | 2.57 ±1.153     | 2.32 ±1.119       | 0.001   |
|   |                                                                           | Male 3.20 ±1.000| Female 2.32 ±1.119|         |
| 30| I feel discriminated against in theatre because of my gender.*            | 2.83 ±1.366     | 3.05 ±1.337       | 0.011   |
|   |                                                                           | Male 2.28 ±1.308| Female 3.05 ±1.337|         |
| 31| I feel discriminated against in theatre because of my race.*              | 2.39 ±1.033     | 2.52 ±0.965       | 0.017   |
|   |                                                                           | Male 2.04 ±1.136| Female 2.52 ±0.965|         |
| 32| I feel part of a team in theatre.                                         | 2.59 ±1.310     | 2.41 ±1.213       | 0.070   |
|   |                                                                           | Male 3.04 ±1.457| Female 2.41 ±1.213|         |
| 33| I am too busy doing other work to go to theatre I am often too tired to get the most out of theatre teaching.* | 3.09 ±1.002     | 3.05 ±1.054       | 0.515   |
|   |                                                                           | Male 3.20 ±0.866| Female 3.05 ±1.054|         |
| 34| I am often too tired to get the most out of theatre teaching.*            | 2.88 ±1.239     | 2.90 ±1.279       | 0.699   |
|   |                                                                           | Male 2.80 ±1.155| Female 2.90 ±1.279|         |
| 35| I am so stressed in theatre that I do not learn as much as I could.*      | 2.88 ±1.239     | 2.90 ±1.279       | 0.699   |
|   |                                                                           | Male 2.80 ±1.155| Female 2.90 ±1.279|         |
| 36| I am asked to perform operations alone that I do not feel competent.*     | 2.84 ±1.173     | 2.97 ±1.191       | 0.063   |
|   |                                                                           | Male 2.52 ±1.085| Female 2.97 ±1.191|         |
| 37| When I am in theatre, there is nobody to cover the ward.*                 | 2.90 ±1.348     | 2.78 ±1.385       | 0.116   |
|   |                                                                           | Male 3.20 ±1.225| Female 2.78 ±1.385|         |
I get bleeped during operations (e.g. resolving ward issues during OT hours)*

|   | Description | Male Mean ± Standard Deviation | Female Mean ± Standard Deviation | t-value |
|---|-------------|--------------------------------|----------------------------------|---------|
| 38 | I get bleeped during operations (e.g. resolving ward issues during OT hours)* | 2.90 ± 1.348 | 2.78 ± 1.385 | 0.116 |
| 39 | The level of supervision in theatre is adequate for my level. | 3.03 ± 1.343 | 2.95 ± 1.300 | 0.244 |
| 40 | Theatre sessions are too long.* | 2.74 ± 1.077 | 2.59 ± 1.102 | 0.021 |

* Statements for which reverse coding were done.

Discussion

Surgeons and medical students are involved in a continuous dynamic of observing each other’s behaviour. Surgeons have to consider the needs of different learners in theatres and decide how to distribute valuable teaching time and opportunities for involvement in the team (Patricia Lyon, 2004). The operating theatre is a challenging place to learn and develop skills, good committed surgical educators in theatres are always acknowledged and rewarded (Patricia MA Lyon, 2003).

We compared reliability scores of overall questions which was found to be 0.82 which was more than Aberdeen and Birmingham study. Our study appeared to be successful in showing that the STEEM questionnaire is a reliable, dependable and practical tool for evaluating the operating theatre learning environment of postgraduate surgical trainees in PMC Nawabshah. The mean overall STEEM score was 108.81. This score indicates that current learning environment is not suitable for learning. The mean score of males was 115.44 and that of females was 106.17. Overall male trainees rated the environment as more positive than their female counterparts. The scores were compared with the students of Birmingham study and Aberdeen study which showed mean score of 149 and 139 respectively which indicates the suitable learning environment and there was no discrimination based on gender but on the other hand it was also compared with mean score of Liaquat National Hospital Karachi trainees that was 136 which is suggestive of positive learning environment but there was discrimination based on gender and male rated the learning environment better than their female counterparts (Cassar, 2004; Nagraj, Wall and Jones, 2006; Soomro, Rehman and Hussain, 2017). Difference between the results of our studies compared to others can be due to the poor facilities, management, lack of professionalism and gender discrimination in interior Sindh like Nawabshah.

Data was also analysed on the basis of its sub-scales for better understanding of reason for non-favourable learning environment. The trainees’ perception of their trainer and teacher (Q1-13) has an average rating of below the midpoint. However, Q11 is an exception where the average rating is above the midpoint (3.73). This suggests that trainees are satisfied with the teaching skills of their trainers and but find it difficult to live up to the unrealistic expectation of the trainer regarding their surgical skills. A study published in Journal of surgical education emphasized on the fact that faculty should be aware that there may be discrepancies between their perception of residents’ learning needs and residents’ expressed learning needs, needs assessments may help to identify such discrepancies and clarify the best options for addressing the learning needs of residents (Pugh et al., 2007), our study also supports this and adjustments in resident work load, behaviour of seniors and staff, genuine interest in teaching and learning and development of surgical skills laboratories can play a critical role in residents’ learning needs.

A supportive atmosphere has been found to be a key element in achieving a sense of psychological safety and thus
an important element in manifesting the existence of participatory practices in the workplace, in our setup sub-scale labelled ‘Trainees’ perception of the atmosphere in the operating theatre’ (Q25-32) gives the impression that OT environment is not suitable for learning. The nursing staff and anaesthetists prefer that the trainer complete the surgery, as trainees take longer. This results in trainees not getting sufficient practice to improve their skills. Trainees also feel that there is a gender bias (Collin, Paloniemi and Mecklin, 2010). Trainees’ perception of supervision, workload and support (Q33-40) is rather bleak. They feel overwhelmed due to the workload. Low support provided to them along with high expectations of their performance, results in less people opting for surgery (Wålinder et al., 2018).

In our study, we identified that with the Eigen value set at 1, there were only 10 components factors, which covered 85% of the variance. This will help in modifying the STEEM questionnaires in a more comprehensive and better manner. This study was limited to the surgical trainees of Peoples Medical College, Nawabshah, Pakistan. Hence no generalization can be made on basis of our study, we recommend to get a more appropriate picture of the condition in interior region of Pakistan, and studies of this type should be carried out at a larger scale including all major cities.

**Conclusion**

Under current circumstances and condition of interior Sindh postgraduate trainees are deprived from good mentorship, observation and hands on skills due to lack and non-serious attitude of consultants/supervisors. The current study concluded that overall learning environment of operating theatre was perceived to be inadequate for learning.

**Take Home Messages**

- Under current circumstances and condition of interior Sindh postgraduate trainees are deprived from good mentorship, observation and hands on skills due to lack and non-serious attitude of consultants/supervisors.
- The current study concluded that overall learning environment of operating theatre was perceived to be inadequate for learning.

**Notes On Contributors**

Dr Sara Sadiq: Conceptualized and designed this study; developed and designed the tools for the acquisition of the quantitative data and analysis and interpretation; drafted the manuscript and performed critical revisions of the manuscript; provided final approval of the version to be published. She is currently working as Assistant Professor in Department of Physiology.

Muhammad Fazal Hussain Qureshi: Conceptualized and designed this study; developed and designed the tools for the acquisition of the quantitative data and analysis and interpretation; drafted the manuscript and performed critical revisions of the manuscript; provided final approval of the version to be published. He is a third year MBBS student in Ziauddin University.

Mahira Lakhani: Conceptualized and designed this study; developed and designed the tools for the acquisition of the quantitative data and analysis and interpretation; drafted the manuscript and performed critical revisions of the manuscript; provided final approval of the version to be published. She is a third year MBBS student in Ziauddin University.

Muzna Shah: Conceptualized and designed this study; developed and designed the tools for the acquisition of the
quantitative data and analysis and interpretation; drafted the manuscript and performed critical revisions of the manuscript; provided final approval of the version to be published. She is a third year MBBS student in Ziauddin University.

Muhammad Hassan Ayub: Conceptualized and designed this study; developed and designed the tools for the acquisition of the quantitative data and analysis and interpretation; drafted the manuscript and performed critical revisions of the manuscript; provided final approval of the version to be published. He is a third year MBBS student in Ziauddin University.

Acknowledgements

None.

Bibliography/References

Al-Qahtani, M. F. and Al-Sheikh, M. (2012) 'Assessment of educational environment of surgical theatre at a teaching hospital of a Saudi university: using surgical theatre educational environment measures', *Oman Medical Journal*, 27(3), p. 217, https://doi.org/10.5001/omj.2012.49

Binsaleh, S., Babaer, A., Alkhayal, A. and Madbouly, K. (2015) 'Evaluation of the learning environment of urology residency training using the postgraduate hospital educational environment measure inventory', *Advances in Medical Education and Practice*, 6, p. 271, https://doi.org/10.2147/AMEP.S81133

Cassar, K. (2004) 'Development of an instrument to measure the surgical operating theatre learning environment as perceived by basic surgical trainees', *Medical Teacher*, 26(3), pp. 260-264, https://doi.org/10.1080/0142159042000191975

Collin, K., Paloniemi, S. and Mecklin, J. P. (2010) 'Promoting inter‐professional teamwork and learning–the case of a surgical operating theatre', *Journal of Education and Work*, 23(1), pp. 43-63, https://doi.org/10.1080/13639080903495160

Genn, J. (2001a) 'AMEE Medical Education Guide No. 23 (Part 1): Curriculum, environment, climate, quality and change in medical education–a unifying perspective', *Medical Teacher*, 23(4), pp. 337-344, https://doi.org/10.1080/01421590120063330

Genn, J. (2001b) 'AMEE Medical Education Guide No. 23 (Part 2): Curriculum, environment, climate, quality and change in medical education–a unifying perspective', *Medical Teacher*, 23(5), pp. 445-454, https://doi.org/10.1080/01421590120075661

Hu, M., Wattchow, D. and de Fontgalland, D. (2018) 'From ancient to avant-garde: a review of traditional and modern multimodal approaches to surgical anatomy education', *ANZ Journal of Surgery*, 88(3), pp. 146-151, https://doi.org/10.1111/ans.14189

Imran, N., Haider, I. I. and Bhatti, M. R. (2011) 'Unhappy doctors in Pakistan: What are the causes and what can be done?', *Pakistan Journal of Medical Sciences*, 27, No 2.
Kamran, R., Al-Eraky, M., Izhaar, F. and Anjum, K. M. (2018) 'Educational Environment; Medical Students' Perceptions of the Educational Environment in the Surgical Theatre', *The Professional Medical Journal*, 25(08), pp. 1270-1276, https://doi.org/10.29309/TPMJ/18.4506

Kieu, V., Stroud, L., Huang, P., Smith, M., *et al*. (2015) 'The operating theatre as classroom: a qualitative study of learning and teaching surgical competencies', *Education for Health*, 28(1), p. 22, https://doi.org/10.4103/1357-6283.161845

Lyon, P. (2004) 'A model of teaching and learning in the operating theatre', *Medical Education*, 38(12), pp. 1278-1287, https://doi.org/10.1111/j.1365-2929.2004.02020.x

Lyon, P. M. (2003) 'Making the most of learning in the operating theatre: student strategies and curricular initiatives', *Medical Education*, 37(8), pp. 680-688, https://doi.org/10.1046/j.1365-2923.2003.01583.x

Nagraj, S., Wall, D. and Jones, E. (2006) 'Can STEEM be used to measure the educational environment within the operating theatre for undergraduate medical students?', *Medical Teacher*, 28(7), pp. 642-647, https://doi.org/10.1080/01421590600922875

Paice, E., Heard, S. and Moss, F. (2002) 'How important are role models in making good doctors?', *BMJ: British Medical Journal*, 325(7366), p. 707, https://doi.org/10.1136/bmj.325.7366.707

Pugh, C. M., DaRosa, D. A., Glenn, D. and Bell Jr, R. H. (2007) 'A comparison of faculty and resident perception of resident learning needs in the operating room', *Journal of Surgical Education*, 64(5), pp. 250-255, https://doi.org/10.1016/j.jsurg.2007.07.007

Sheikh, S., Kumari, B., Obaid, M. and Khalid, N. (2017) 'Assessment of postgraduate educational environment in public and private hospitals of Karachi', *Journal of Pakistan Medical Association*, 67, pp. 171-77.

Soomro, S. H., Rehman, S. S. U. and Hussain, F. (2017) 'Perception of educational environment in the operating theatre by surgical residents, a single-centre prospective study', *JPMA*, 67(1864).

Wålinder, R., Runeson-Broberg, R., Arakelian, E., Nordqvist, T., *et al*. (2018) 'A supportive climate and low strain promote well-being and sustainable working life in the operation theatre', *Upsala Journal of Medical Sciences*, 123(3), pp. 183-190, https://doi.org/10.1080/03009734.2018.1483451

### Appendices

None.

### Declarations

*The author has declared that there are no conflicts of interest.*

*This has been published under Creative Commons "CC BY 4.0" ([https://creativecommons.org/licenses/by-sa/4.0/](https://creativecommons.org/licenses/by-sa/4.0/))
Ethics Statement

Approved by Ethical Review Committee of Ziauddin University. Reference Number: 04200SSOT.

External Funding

This paper has not had any External Funding