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Assessment of Clinical Anesthesia Learning Environment and Faculty Supervision in Mansoura University Hospitals, Egypt: A Cross-sectional Analytical Study

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Abstract

Background:

The learning environment - that learners perceive - has its characteristic pressures, tensions, rewards, and conformity-demanding factors and has a significant impact on students' learning and academic success especially in clinical setting with high stakes such as anesthesia postgraduate training.

Aim:

This study aims to evaluate the educational environment in clinical anesthesia settings in Mansoura University hospitals using Anesthesia Theater Education Environment Measure [ATEEM] and assess Faculty supervision by Faculty Supervision Evaluation questionnaire [FAS]; as well assessing the effects of gender; year of residency on both.

Methods:

A cross-sectional analytical study in Anesthesia Department at Mansoura University Hospitals, printed copies of ATEEM and FAS questionnaires were distributed to postgraduate anesthesia residents.

Results:

This study revealed that the total ATEEM score was 146/160, the overall perception of the quality of the supervision by FAS questionnaire was 33.07 ± 6.51 , female scores than male, both questionnaires' scores were significantly lower among female residents and those of early years. A strong positive significant correlation between ATEEM and FAS score were observed.

Conclusions:

This indicates that the residents had good perceptions of their training and supervisors, learning opportunities and supervision being provided to them. Efforts toward adjusting workload should be carefully considered.

Keywords:

ATEEM, Faculty Supervision Evaluation Questionnaires Anesthesia, Operating room, Clinical Educational Environment

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Background:

The American Medical Association [AMA] defines the learning environment as “A social system that includes the learner and his external relationships such as the individuals with whom the learner interacts, the setting[s] and purpose[s] of the interaction, and the formal and informal rules/policies/norms governing the interaction. The learning environment of a teaching hospital consists of three parts: the physical, affective, and intellectual environment[1]. The affective domain includes the "characteristic pressures, tensions, rewards, and conformity-demanding factors" learners perceive[2]. It relates to how trainees perceive the characteristics of their learning environment and thus, to how motivated they are to engage in all aspects of a formal training curriculum. Environment measures give information about the quality of an educational program, clear guidance on changes that may be considered, and the ability to monitor the extent to which changes have been achieved[3].

This affects students' learning and academic success as a hidden curriculum. The learning environment affects the standard of medical education, as it influences learner engagement and behaviour[4]. After graduation, the preparation for medical education becomes complicated because of the presence of many authoritative settings, various objectives, socializing influences, and conflicts between providing services and personal and professional development. Most postgraduate training is "on the job" in the workplace instead of specific, permanent facility such as a college [5].

As learning occurs in a high-stakes environment such as the operating room, anesthesia postgraduate training is complicated. Effective information transmission, skill advancement, and affective domain growth depend on the educational environment. Assessing the learning environment focuses on the effectiveness of a curriculum and guides for necessary changes [6]. In the Anesthesia Department, residents must submit their resignations at the Faculty of Medicine, Mansoura University and deaths occurs during work all over the world. The anesthesia specialty has serious implications for patients' health. Therefore, the training and educational environment for postgraduates is crucial and must be followed up to reduce the risk to patients [7].

Anesthesia Theater Education Environment Measure [ATEEM] questionnaire is a reliable, validated inventory for measuring the perceived educational environment of theatre teaching and learning in anesthesia[8]. Several studies used the ATEEM tool developed by Holt & Roff, 2004 to assess the anesthesia environment with its original development in the UK as Zeb et al., [9] in Pakistan, Koohpayehzadeh et al., [10] in Iran and Khan et al., [11] in South Africa, in Thailand by Vongspanich et al., [12], and in Ethiopia by Wubshet et al., [13]

In Brazil, de Oliveira Filho et al.,[14] developed and validated a 9-item questionnaire, the Faculty Supervision Evaluation Questionnaire [FAS], which evaluated the supervision provided by anesthesia faculty in the operating room. Dexter

et al., [15] studied anesthesiology residents' and nurse anesthetists' perceptions of effective clinical faculty supervision using the same de Oliveira Filho questions.

In Egypt, few research studies have been conducted on assessing the effectiveness of the learning environment on students' achievement in complex learning environments such as the operating room's time- and clinically-sensitive situations such as anesthesia. Research has been conducted on stress and burnout among anesthesiologists before and after COVID-19[16,17]. In addition, El-Masry et al., [16] reported anesthesiologist-Surgeon Conflicts at the Workplace could affect learning environment and learning in the operating room. Shams and El-Masry [18] showed the effect of gender in the anesthesia specialty and its pros and cons. Evaluation of postgraduate training is important so that necessary adjustments can be performed. The quality of anesthesiology teaching in our country has not been explored. In addition, no research has been carried out on evaluating the educational environment in anesthesia in Egypt to assess their perceptions about their learning environment and to look for deficits in the training program.

Theoretical or Conceptual Framework:

The fundamental theory on which this research was based is the social learning theory where students learn more easily as they participate collaboratively in selected groups which outperform individualistic learning in improving engagement, enhancing quality, and producing positive interpersonal outcomes. Encouraging clinical instructors to exert efforts to enhance role modeling and teach time management and self-control skills; supported by social relationships with peers, teachers, and families in terms of connectivism, and constructivism to enhance learning and cognitive growth[19]. In addition, Shabani et al., [20] discussed Vygotsky's zone of proximal development [ZPD] which is the difference between what a learner can do without help and what they can do with guidance and encouragement from a skilled partner. They describe the current or actual developmental level of the learner and the next level that will reach through mediating semiotic and environmental tools and peer facilitation. Research Questions: Do Anesthesia residents perceive the clinical learning environment positively in Mansoura University hospitals; and whether gender, year of residency, and faculty supervision affect their learning perception?

Thus, this study aims to evaluate the educational environment in clinical anesthesia settings in Mansoura University hospitals using ATEEM to assess faculty supervision by FAS, and the effects of gender and the year of residency.



Material and Methods:

I. Study Design: A cross-sectional analytical study in the Anesthesia Department at Mansoura University Hospitals, between April 1, 2023, and the end of October 2023.

Printed copies of the ATEEM and FAS questionnaires with consent forms were distributed to postgraduate anesthesia residents during a face-to-face session and both questionnaires were explained. Participants were asked to indicate their agreement by using a 5-point scale. Completed questionnaires were collected later.

II. Study Group: A Census sample from all postgraduate anesthesia residents from all Mansoura University Hospitals was included in the study [Fifty residents, 30 males and 20 females]. They were recruited from different training years to allow studying the effect of experience acquired from residency years on their perception of their learning environment. Residents who did not accept to participate and all questionnaires that were not completed will be excluded from the study.

III. Study Tools: were applied to postgraduate anesthesia residents:

1. Anesthesia Theater Education Environment Measure [ATEEM] questionnaire [Appendix 1].

Respondents were required to indicate whether they Strongly Agree [SA], Agree [A], Unsure [U], Disagree [D], or Strongly Disagree [SD] with the items listed in the questionnaire as each applies to their perceptions in their present position at their hospital. This allows for a scoring system on a scale of 0–4 with a possible maximum score of 160 and a minimum score of 0 with the following subscales:

Autonomy 8x4 = 32 max, items 5, 10, 15, 20, 25, 29, 33, 36, the perceptions of Atmosphere: 10x4 =40 max, items 4, 9, 14, 19, 24, 28, 32, 35, 38, 40; Workload/Supervision/ Support: 7x4 = 28 max, items 3, 8, 13, 18, 23, 27, 31. In addition, the Perception of teachers and teaching: 5x4 = 20 max, items 2, 7, 12, 17, 22; Learning opportunities and orientation to learning 10x4 = 40 max, items 1, 6, 11, 16, 21, 26, 30, 34, 37, 39.[8]

Faculty Supervision Evaluation Questionnaire: a reliable measurement instrument of faculty supervision that was developed by de Oliveira et al , [14] based on the grounded theory. It provides dependable measures with adequate face and content validities, internal consistency, and unidimensional factor structure [Appendix 1]. It includes 9 items in the form of Feedback: provides constructive feedback [“the instructor provides me timely, informal, non-threatening comments on my performance and shows me ways to improve”]; Availability: is available for help/consultation;

Stimulus: fosters patient-based learning; Professionalism: demonstrates professional behavior. In addition, Presence: is present during critical phases of the anesthetic [“the instructor is promptly available to help me solve problems with patients and procedures”]; Planning: participates/helps in perianesthesia planning; Safety: implements/fosters safety procedures/measures; Interpersonal: demonstrates high interpersonal skills; Opportunity: gives opportunity to perform/fosters resident autonomy. Items are rated as 1: never, 2: rarely, 3: fair, 4: frequently, or 5: Always.

IV. Studied Parameters

- 1- Descriptive analysis of sociodemographic data, ATEEM and FAS.
- 2- Analytical correlation study was conducted between dependent variables [ATEEM and FAS], and independent variables [gender, duration of experience].
- 3- Comparisons were conducted between questionnaire items and independent variables subgroups [gender: males and females], [duration of experience: < 12 months, >12 - <24, >24 - <36, >36].
- 4- Linear regression analysis was conducted between ATEEM and FAS items to investigate the relationship between the two variables.

V. Ethical Considerations

Approval of the Institutional Research Board [IRB] at the Faculty of Medicine, Mansoura University was obtained at the beginning of the study [R23.03.2094 R1].

Informed written consent from all postgraduate anesthesia residents to participate in the study with a full right to withdraw was obtained with assurance of confidentiality and anonymity of the data.

VI. Statistical Analysis

Data were analyzed using the Statistical Package of Social Science [SPSS] program for Windows [Standard version 26]. The normality of data was first tested with a one-sample Kolmogorov-Smirnov test.

Qualitative data were described using numbers and percentages. Continuous variables were presented as mean \pm standard deviation [SD] for distributed data. Test groups were compared with an independent t-test while the ANOVA test was used to compare more than two groups. Pearson correlation was used to correlate continuous data. The results are considered significant when $p < 0.05$. If the unpaired t-test is significant, you must calculate the effect size using Cohen's-d test.



Results:

This study was conducted to evaluate the educational environment in clinical anesthesia settings in Mansoura University hospitals using ATEEM to assess Faculty supervision by FAS and assess the effects of gender and the years of resident.

In this study, 50 residents were included with 100% responses to questionnaires. The percentage of male participants was higher than that of females [60%]. In addition, those who spent one year in the residency program were higher than older ones [72%] [Table 1]

Table [1]: Anesthesia residents' characteristics in Mansoura University hospitals [n.=50].

Participants' characteristics	The studied group [n=50] n. [%]
Gender	
Male	30 [60.0%]
Female	20 [40.0%]
Duration of Experience	
< 12 months	25 [50.0%]
>12 - <24	11 [22.0%]
>24 - <36	8 [16.0%]
>36	6 [12.0%]

n: number.

Table [2] shows that the total average score of ATEEM is 146.20±17.87 with the highest scores being perceptions of

atmosphere [37.34±4.78], learning opportunities [35.79±6.04], and autonomy [30.72±2.77].

Table [2]: Means and standard deviation of Anesthetic Theatre Education Environment Measure [ATEEM] items among anesthesia residents in Mansoura University hospitals [n.=50]

ATEEM domains	The studied group [mean ± SD]
Autonomy	30.72±2.77
Perceptions of atmosphere	37.34±4.78
Workload/Supervision/Support	23.30±4.23
Perception of Teachers and Teaching	19.02±2.91
Learning opportunities and orientation to learning	35.79±6.04
Total ATEEM	146.20±17.87

ATEEM: Anesthetic Theatre Education Environment Measure; S.D. standard deviation.



In table [3] the residents rated supervision as below expectations in 14 [28.0%] evaluations, fulfilling expectations in 20 [40.0%], and exceeding expectations in 16 [32.0%]. The

highest FAS item valued was a presence during critical phases of the anesthetic [4.14±0.96] and the lowest was planning, including participation/assistance in perianesthesia planning [3.30±1.1].

Table [3]: Means and standard deviation of Faculty Anesthesia Supervision Evaluation [FAS] items among anesthesia residents in Mansoura University hospitals [n.=50]

FAS domains	Mean ± SD	Below expectations n. [%]	Meets expectations n. [%]	Exceeds expectations n. [%]
Feedback	3.58±1.03	11 [22.0%]	11 [22.0%]	28 [56.0%]
Availability	3.88±1.13	10 [20.0%]	7 [14.0%]	33 [66.0%]
Stimulus	3.42±0.96	10 [20.0%]	13 [26.0%]	27 [54.0%]
Professionalism	3.49±1.1	12 [24.0%]	11 [22.0%]	27 [54.0%]
Presence	4.14±0.96	5 [10.0%]	7 [14.0%]	38 [76.0%]
Planning	3.30±1.1	17 [34.0%]	7 [14.0%]	26 [52.0%]
Safety	3.74±1.02	8 [16.0%]	10 [20.0%]	32 [64.0%]
Interpersonal	3.81±1.03	10 [20.0%]	4 [8.0%]	36 [72.0%]
Opportunity	3.72±1.14	11 [22.0%]	5 [10.0%]	34 [68.0%]
Total FAS	33.07 ± 6.51	-	-	-

FAS: Faculty Anesthesia Supervision Evaluation; SD: standard deviation; n: number.



Table [4] shows that females have significantly lower scores than males in all items of the ATEEM questionnaire [P

≤0.001], whereas, significantly lower female scores were found only in Interpersonal and Opportunity individual items and the average total FAS score.

Table [4]: Comparison between ATEEM, FAS items score among anesthesia residents in Mansoura University hospitals and their gender[n.=50]

	Gender		P value	t
	Male Mean ± SD	Female Mean ± SD		
ATEEM domains				
Autonomy	32.03±2.23	28.67±2.25*	≤0.001	6.08
Perceptions of atmosphere	38.55±4.91	35.60±4.09*	0.032	2.21
Workload Support	24.77±3.35	21.10±4.52*	0.002	3.29
Perception of Teachers and Teaching	20.20±2.44	17.25±2.69*	≤0.001	4.02
Learning opportunities and orientation to learning	38.78±3.91	31.60±6.08*	≤0.001	4.98
Total ATEEM	154.57± 13.74	133.17± 15.81*	≤0.001	4.85
FAS score				
Feedback	2.33± 0.88	2.35± 0.74	0.945	0.069
Availability	2.60± 0.77	2.32± 0.82	0.226	1.23
Stimulus	2.43± 0.77	2.20± 0.83	0.316	1.013
Professionalism	2.37± 0.85	2.20± 0.83	0.497	0.684
Presence	2.77± 0.62	2.50± 0.68	0.163	1.418
Planning	2.30± 0.87	2.00± 0.97	0.262	1.134
Safety	2.47±0.81	2.50± 0.68	0.881	0.150
Interpersonal	2.77± 0.62	2.15± 0.93*	0.007	2.80
Opportunity	2.73± 0.63	2.05± 0.94*	0.004	3.05
Total FAS	34.69± 6.33	30.43± 6.07*	0.038	2.15

ATEEM: Anesthetic Theatre Education Environment Measure, SFE: Faculty Supervision Evaluation; SD: standard deviation; t: independent t test. P is significant if < 0.05. * Significant to the male group.

Table [5] shows that residents who spent a shorter duration in their residency have significantly lower scores than those who spent longer durations in the total average score and three individual items of the ATEEM questionnaire [Workload

Support, Perception of teachers & teaching, and learning opportunities; P ≤0.001]. In addition, significantly lower FAS scores were noted among less experienced residents compared to more experienced ones except in three individual items [Presence, Safety, and Opportunity]



Table [5]: Comparison between ATEEM, FAS items score among anesthesia residents in Mansoura University hospitals and duration of experience in months [no=50]

	Duration of Experience in Months				P value	F	
	< 12 m Mean ± SD	>12 - <24 m Mean ± SD	>24 - <36 m Mean ± SD	> 36 m Mean ± SD			
ATEEM domains							
Autonomy	30.4±2.61	30.1±3.87	31.25±2.37	32.17± 1.17	0.451	0.968	
Perceptions of atmosphere	36.12± 4.31 ^a	38.3± 4.02	37.0± 6.69	41.33± 3.14 ^a	F= 2.24 P= 0.096		
Workload Support	23.28± 4.40 ^a	21.5± 4.03 ^b	22.50± 3.5 ^c	27.67± 1.21 ^{abc}	F= 3.25 P= 0.03*		
Perception of Teachers & Teaching	18.64± 2.32 ^a	18.45± 1.96 ^b	18.00± 4.34 ^c	23.0± 0.89 ^{abc}	F= 5.56 P= 0.002*		
Learning opportunities and orientation to learning	34.62± 5.48 ^a	34.6± 6.02 ^b	35.62± 7.06 ^c	42.66± 2.06 ^{abc}	F= 3.49 P= 0.023*		
Total ATEEM	142.95± 16.86 ^a	142.40± 15.37 ^b	144.37± 21.25 ^c	166.83± 5.49 ^{abc}	F= 3.62 P= 0.02*		
FAS score							
Feedback	3.32±0.90	3.36±1.2	3.38±0.91	4.67±0.51	F=3.46 P=0.024*		
Availability	3.92±1.06	3.27±1.3	3.38±0.91	4.83±0.41	F=3.32 P=0.028*		
Stimulus	3.24±0.87	3.00±0.77	3.62±1.06	4.50±0.54	F=4.54 P=0.007*		
Professionalism	3.04±1.09	3.73±.905	3.12±1.12	4.33±0.81	F=3.16 P=0.033*		
Presence	4.00±0.95	3.82±1.08	3.88±0.99	5.00±0.0	F=2.38 P=0.081		
Planning	2.68±1.21	3.36±0.92	3.38±1.19	4.33±0.51	F=4.12 P=0.011*		
Safety	3.44±1.04	3.64±1.03	3.75±1.03	4.67±0.51	F=2.472 P=0.074		
Interpersonal	3.28±1.10	3.73±1.19	3.75±0.88	4.83±0.41	F=3.70 P=0.018*		
Opportunity	3.48±1.23	3.45±1.21	3.88±0.99	4.33±1.21	F=1.02 P=0.392		
Total FAS	31.47± 5.14 ^a	31.36 ± 6.93 ^b	33.33± 7.76 ^c	41.00 ± 2.00 ^{abc}	F= 4.53 P= 0.008*		

ATEEM: Anesthetic Theatre Education Environment Measure, FAS: Faculty Supervision Evaluation; SD: standard deviation; F: analysis of variance [ANOVA]; P: significant if < 0.05. a= significance between <12 m and >12 - <24 m, b= significance between <12 m and >24 - <36 m, c= significance between <12 m and > 36 m, by post hoc LSD test.

Figure [1], the correlation coefficient [r] measures the strength and direction of a linear relationship between both questionnaires. An R-value of 0.633 suggests a moderate to strong significant positive correlation [$p \leq 0.001$] between the total FAS score and the total ATEEM score. This implies that as the total FAS score increases, the total ATEEM score also tends to increase. The blue dots represent individual data points for the Total FAS and ATEEM scores. The general

upward trend of the data points supports the positive correlation coefficient. The line of best fit [regression line] represents the average relationship between the total FAS score and the total ATEEM score. The positive slope of the line further confirms the positive relationship between the two variables.

Cronbach's Alpha was calculated for ATEEM [40 items] = 0.920, and FAS [9 items] = 0.842.

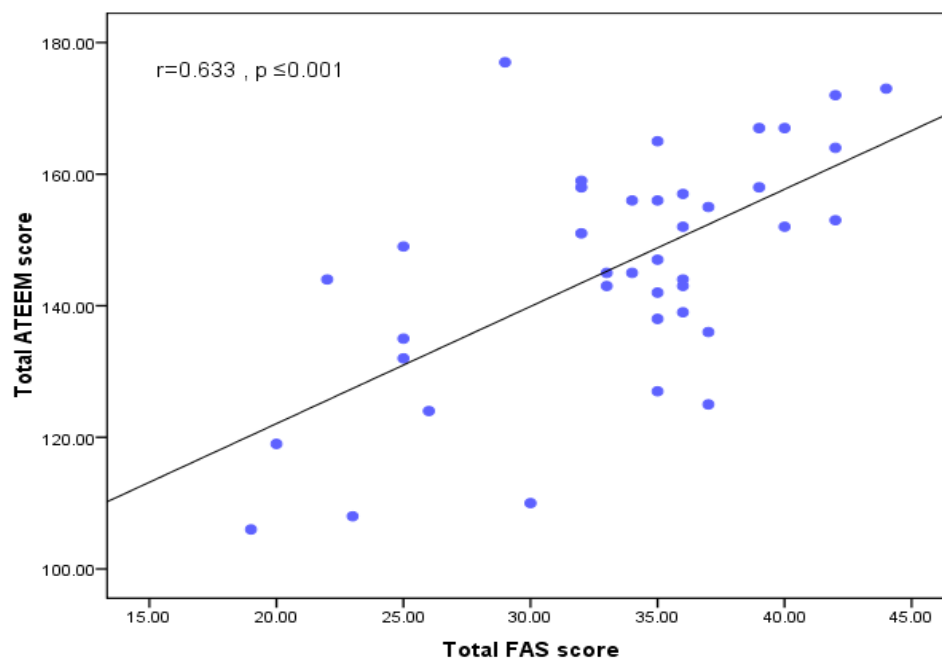


Fig.[1]: Scatter diagram showing linear regression analysis between Anesthetic Theatre Education Environment Measure [ATEEM] and Faculty Supervision Evaluation [FAS] scores among anesthesia residents in Mansoura University hospitals; showing strong significant positive correlation [n=50]

Discussion:

Each academic department in the medical field such as the anesthesia department can be considered one of the Communities of Practice [CoP] as it consists of groups of people with shared interests. A CoP is a branch of social learning theory that is implied in the constructivism paradigm. A CoP is a social system defined as a group of individuals who share a common concern, set of problems, or passion for a specific topic. In a CoP, the participating individuals aim to deepen their learning in a collective learning process [21].

Vygotsky showed that community plays a central role in the process of “making meaning”. The more knowledgeable other [MKO] in this study is the mentor having a higher level of ability or greater understanding than the learners. Scaffolding in this case is the supervision, which involves the mentor providing support structures to help student master skills just beyond their current level. In reciprocal teaching, mentors and students take turns leading discussions. Both scaffolding and reciprocal teaching focus on the shared construction of

knowledge with Vygotsky's views. Scaffolding consists of activities provided by the educator to support the student to lead through the zone of proximal development. It is the “how” of guided learning, the specific strategies and techniques used by a more knowledgeable person to bridge the gap between a learner's current abilities and potential development [22].

Most anesthesia curriculum is taught in theaters, and supervision is arguably the most important residency component as it guarantees excellent instruction, patient safety, and high standards of care. Additionally, supervision gives residents the chance to adopt the positive traits of excellent supervisors who serve as role models. The Accreditation Council for Graduate Medical Education states that clinical supervision is a necessary faculty activity that needs to be reviewed in confidence by residents on a yearly minimum basis [13,23]. However, there are few published tools available for residents to assess faculty supervision in anesthesiology in Egypt.

ATEEM questionnaire

This study revealed that the total ATEEM score was 146/160, and the individual scores were 30/32, 37/40, 23/28, 19/20, and 35/40 for autonomy, perceptions of atmosphere, workload/supervision/ support, perception of teachers and teaching, and learning opportunities and orientation to learning respectively. These results show that the scores were higher than the results conducted by Holt and Roff [8] in the UK where the instrument was developed and showed a total score of 117/160. Their mean individual scores were as follows: autonomy was 24/32, the perceptions of the atmosphere were 31/40, perceptions of workload/support/supervision were 20/28, perceptions of teachers/teaching were 15/20, and learning opportunities / orientation to learning were 27/40. They concluded that the overall scores were good [more positive than negative] with all 40 items scoring an average higher than 2.1, 14 items of which averaged 3.1 or greater.

Similarly, the results differed from those declared by Zeb et al., [9] in Pakistan who compared ATEEM questionnaire between private and public hospitals and his mean score was 117.16 out of 160. Their mean scores in Public and private hospitals respectively were Autonomy: 24.5, 26.3, the Perceptions of the atmosphere: 26.0, 30.0, workload/Supervision/Support: [17.7, 23.0], the Perception of Teachers and Teaching: [13.4, 17.7], and Learning opportunities and orientation to learning: [27.7, 32.1]. They concluded that the learning environment in private hospital was more positive than the public hospital perceived by the trainees.

Khan et al., [11] in South Africa and Koohpayehzadeh et al., [10] in Iran found similar results as their ATEEM total score being nearly the same about 114 out of 160. Similar to this study, autonomy was the highest scoring domain, while workload, supervision and support were the lowest scoring domain. In Thailand by Vongspanich et al., [12] ATEEM score was 122.9/160 here Perceptions of Autonomy is also the highest score but the perception of learning opportunities and orientation to learning was the fifth domain.

This illustrates those anesthetic trainees in developing countries such as Pakistan, Iran, and Egypt face similar factors that promote or inhibit a conducive anesthetic theatre educational environment in developed countries such as Thailand things differ a lot.

The apprenticeship model can be applied to supervision in medical education. The resident, like the apprentice, arrives with limited knowledge in their chosen discipline and becomes part of a group or community sharing the same subject. The apprentice joins the group and takes up a position of 'legitimate peripheral participation' [LPP]. They belong through their apprenticeship or enrollment on a master or PhD program where it acknowledged they're at the beginning of their learning journey. LPP is similar to Vygotsky's Zone of Proximal Development. This is a designated position for

residents/apprentices where they're working at the starting edge of their knowledge with the purpose of developing confidence and expertise [24] .

FAS questionnaire

In this study, the overall perception of the quality of the supervision denoted by the FAS questionnaire was 33.07 ± 6.51 [average score 3.77 ± 0.69]. These results were different from those reported by de Oliveira Filho et al., [14] in Brazil where the instrument was developed. They mentioned that the instructors' supervision quality perceived by residents was rated as below expectations in 130 evaluations [13%] which was lower than that reported by our study, fulfilling expectations in 589 evaluations [62%] which is greater than our study, and exceeding expectations in 235 evaluations [25%] which is lower than our study.

Dexter et al., [15] studied anesthesiology residents' and nurse anesthetists' perceptions of effective clinical faculty supervision using de Oliveira Filho questions and reported that Mostly [$>50\%$] of nurses and residents perceived that faculty supervision score met their expectations [mean score ≥ 3.0]. This differs from previously conducted studies by McHugh and Thoms [25] in the UK who reported substantial heterogeneity among hospitals in the supervision of trainee anesthetists as more than half of consultants reported not knowing daily which trainee elective lists, they were supervising. According to Lockyer et al., [26] in Canada, where anesthesiologists often personally perform "anesthetics performance appraisal of anesthesiologists" using multisource feedback [e.g., surgeons or operative room nurses evaluating anesthesiologists

These differences in supervision perception can be attributed to dyadic variance related to each resident's unique perceptions of instructors. Many factors can influence this, such as being lenient in evaluations of instructors, having compassion or distaste for particular faculty members, being hostile toward certain instructors. In addition, being afraid of reprisals or being worried that connection with the instructor may eventually suffer [14], as well the "halo effect", which represents bias resident assessment scores on all questions[27].

ATEEM and FAS mean scores and correlation to gender

In this study, there is a statistically significant difference regarding ATEEM and FAS mean scores and gender where the female's scores were significantly lower than the male's scores in all items except for [feedback and safety items]. This was agreed upon by Khan et al., [11] who found total scores for male and female registrars were 118.4 [13.5] and 115.3 [18.7] respectively [$p = 0.419$]. But this is in contrast to Koohpayehzadeh et al., [10] Thailand by Vongspanich et al., [12] who found no significant difference in the mean scores of



domains of male and female [$p= 0.742$] residents. The original article in the UK did not mention this comparison. In the learning opportunities domain, this difference showed women are less fortunate to learn and experience new things in the operating room compared to men, but the reasons were not clarified. Miller and Katz [28] and Knfe et al., [29] studied surgical residents' perceptions of the operating theatre educational environment "OREEM" questionnaire and found that female scores showed a statistically significant difference [$P= 0.001$]. This is contrary to Taramsaria et al., [30] in Iran who compared the perceptions of externs [years 4 and 5] and interns [years 6 and over] regarding the educational environment by using the Dundee Ready Education environment measure [DREEM]. The study found that there was no significant difference between male and female students in educational environment subscales. Shams and El-Masry [18] studied the implications of anesthesiology as a profession on personal and family life of women anesthesiologists in Mansoura Hospital Universities and found serious implications exist for the personality and family life of women who chose anesthesiology as a specialty and career, and most of these implications were significantly more prevalent among women with an academic career. Furthermore, women joining the department significantly affected anesthesiology as a profession. They concluded that rearing and caring at home are the primary role for any woman whatever the level of education, especially in Arab countries. Biologically, the most appropriate time for a woman to have children coincides with the period when career demands are most intense leading to the balancing of career and family demands particularly difficult during this period[31]. This critical period usually overlaps with medical study and training, particularly combined with financial limitations and high work demands.

In this study, many female residents may seek to change the female doctors' attitudes toward perceiving their work environment. Hence, searching for the causes of this perceived difference by using specific questions is an important matter in future research.

The zone of proximal development relates to the difference between what a novice resident [1st year] can achieve independently and what a relatively older resident can achieve with guidance and encouragement from a skilled mentor. Vygotsky views the zone of proximal development as the area where the most sensitive instruction or guidance should occur enabling the residents to develop skills they will later use independently, thus fostering higher mental functions. The ZPD is not a static space but constantly shifts as the resident learns and develops new skills. As a resident's competence grows, their zone of proximal development also expands to encompass new challenges. Support [supervision] is tapered off [i.e., withdrawn] as it becomes unnecessary, much as a scaffold is removed from a building during construction. The residents will then be able to complete the task again independently [entrusted][22].

ATEEM and FAS mean scores and correlation to duration of experience

There is a statistically significant difference regarding ATEEM mean scores and the duration of experience [year of residency] where scores of early years were significantly lower than late in all items. In addition, the FAS mean score is lower in the early years than the late years and FAS items were significantly higher in the late years except for presence [is present during critical phases of the anesthetic]. This is in contrast with that reported by Holt and Roff [8] ATEEM results as they reported many statistically significant differences in the mean scores of items between years of training. From the first senior year to the second specialist registrar year, there is a discernible trend of a perceived decline in the anesthetic trainee education environment. The average total scores for each training year demonstrate that there is a minor increase in ratings from the second to third specialist registrar year, which again deteriorates in the fourth and fifth specialist registrar year. This is in contrast also with Khan et al., [11] who used the ATEEM tool and reported that junior and senior registrars scored 117.1 [17.0] and 115.7 [17.1] respectively [$p = 0.708$]. In addition, Koohepayehzadeh et al., [10] used ATEEM and reported that juniors perceive the learning environment have more positive than seniors. Their total scores were 118, 113, 111, and 113 for the 1st, the 2nd, 3rd, and 4th year of residency respectively $p=0.525$ With so many low-scoring items during the last two years of training, the pattern shown is quite concerning. Smith and Castanelli [3] used an instrument consisting of 38 questions grouped into the themes of social atmosphere, supervision, workplace-based learning, and formal teaching programs. They reported that the total score and scores for each domain were influenced by the trainee's level of training; respondents who were introductory trainees scored higher than other in all other training levels [overall median 157]. The next highest scoring group was provisional fellows [median 149], while the lowest scoring groups were basic and advanced trainees [medians: 147.5 and 147, respectively]. Knife et al., [29] explained that by the fact that seniors often execute most surgical procedures with assistance, have a stronger managerial role in the ward, and handle administrative duties like scheduling, whereas juniors typically watch and assist more in the operating room so juniors perceive environment more positive.

This is also contrary to different FAS studies. Hindman et al., [27] reported that anesthesia faculty operating room supervision scores were not affected by the level of resident general clinical experience [year of residency] and if teaching and supervision were the same things, then teaching becomes less necessary as residents gained more clinical experience. They explained that faculty should engage in greater levels of supervision, so they may better recognize the educational needs of more senior residents and change the content of their teaching accordingly. If so, greater levels of supervision might result in continued, rather than decreased, teaching effectiveness as a resident progress. In addition, Dexter et al., [15] reported that there was no association between years since



starting training and the perception of meeting expectations for supervision by faculty anesthesiologists among nurses or residents.

The difference in this study from the other studies is that using questionnaires or other scores can be attributed to different societal medical contexts such as different graduate medical education training structures and the requirements across countries. In addition, the duration of post-medical school training and national requirements rotations, the number of cases exposed, faculty supervision, national in-training written exams, and duty hour limits. Moreover, the low number of residents in this study as an adequate sample of residents is needed to obtain a reliable general measure of individual faculty supervisory performance.

The analysis shows a significant positive correlation between the Total FAS score and the Total ATEEM score. This suggests that better faculty supervision [as indicated by higher Total FAS scores] is associated with a more favorable educational environment [as indicated by higher Total ATEEM scores]. The strong statistical significance [$p \leq 0.001$] indicates that this finding is highly unlikely to be due to chance.

Regarding the practical implications of the findings, this study presents information that can be used to assess the impact of training program modifications. In addition to being extremely helpful for educational planning, the ATEEM and FAS data should be a fundamental part of techniques for quality assessment that certify the supervision level and learning environment. As a result, greater performance would be expected as the learners' ideal and actual environments would be more in line. The areas that are equal efforts to bring about change [lowest score] in the learning environment [workload/ supervision/ support & learning opportunities and orientation] workload should be carefully considered as it significantly affects the perception of the learning environment and regarding faculty supervision [a planning which include participates/helps in peri anesthesia planning]. This focuses on creating a supportive learning environment with enough "hands-on" training, particularly in times of emergency. Preoperative planning, case discussions, and postoperative feedback ought to be standard procedures. Reasonable hours of duty are mandatory for anesthetic residency.

Proactive steps must be taken to comprehend and resolve the problems raised by female residents in anesthetic residency programs to present resolution in how people consider the teaching environment. Special concerns should be paid to junior residents in terms of assistance and training

Limitation of Study:

[1] No piloting was conducted as the study was restricted to anesthesia programs at Mansoura University hospitals and their limited number [census sample]. This restricts the findings' application to all anesthesia residents in Egypt, and more research that takes into account other educational facilities in various cities should be conducted. [2] This study did not compare private and governmental institutions.

Conclusion:

This study assesses environment and faculty supervision in Egyptian clinical anesthesia using both ATEEM and FAS tools. The overall ATEEM score was found to be at a satisfactory level in most studied samples, as well as FAS where mostly the studied samples were fulfilling and exceeding expectations. This indicates that the residents had good perceptions of their training and supervisors, learning opportunities, and supervision being provided to them. Efforts toward adjusting workload should be carefully considered as it significantly affects the perception of the learning environment with reasonable hours of duty and regarding faculty supervision; results emphasize how crucial it is to create a supportive learning environment with enough "hands-on" training, particularly in times of emergency. The information gathered from the ATEEM and FAS may also help predict test results for trainees as well as other traits like attitudes and stress. As well, these tools may be a helpful complement to educational reviews in evaluating the success of educational goals and objectives as well as the quality of anesthesia instruction and learning.

Recommendation:

To make the learning environment more permissive the faculty efforts should be given in areas of defects highlighted by both questionnaires as

- Adjusting workload should be carefully considered as it significantly affects the perception of the learning environment with reasonable hours of duty and regarding faculty supervision
- Create a supportive learning environment with enough "hands-on" training, particularly in times of emergency

Further studies with increasing sample sizes are recommended to allow the ability to generalize results and reduce predictable bias. As well, large-scale longitudinal studies are required to establish the impact of residents' characteristics, educational environment, and learning approaches on their academic achievement and success in Egypt.

After improving the deficit in the learning environment and faculty supervision further research is needed to assess the degree of stress and burnout reduction in anesthesia residents.



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