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Does emergency medicine clerkship change students' misconceptions towards this specialty? Pre- and post-clerkship perceptions

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Abstract: **Objective:** This study aims to understand students' skills based on their self-assessment and their perceptions regarding emergency medicine (EM) physicians, EM patients, and choosing EM as a future career.

Methods: This study employed prospective observational design. It was conducted from 2 October to 2 November 2022 in Saudi Arabia. The study participants were senior medical students at King Faisal University. Senior students who finished a four-week EM rotation were involved as post-cases, and senior students who had not finished their EM rotation were involved as pre-cases. An online survey was administrated to all students who met out criteria.

Results: A total of 161 students were included in the study; 65.2% had not yet done their EM clerkship, while 34.8% had completed their EM clerkship. Among them, 48.4% were male, and 51.6% were female. On average, post-EM clerkship students showed greater confidence in their skills of conducting an initial assessment of a patient (p=0.027), developing a management plan (p=0.007), explaining the principles of EM to others (p<0.001), presenting patient cases formally (p=0.049), interpreting electrocardiogram (p=0.006), and applying medical resuscitation (p=0.041). No significant differences were found between the average confidence in the skills and abilities of male and female students. Post-EM clerkship and male students were more likely to choose EM as a career when compared with pre-EM clerkship (p<0.001) and female students (p=0.006).

Conclusion: It seems that, after completing a four-week rotation, students exhibited significant advances in knowledge, illness management, and procedural skills. It is likely that the EM clerkship significantly improved students' perceptions of the EM specialty.

Keywords: Clinical Clerkship; Emergency Medicine; Internship; Perception; Saudi Arabia

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1. Introduction

Emergency medicine (EM) is a distinct specialty focusing on rapid diagnosis and medical management (1). It is a significant medical profession that requires sufficient training for medical school programs to be accredited. As a result, using a well-established EM curriculum in medical schools is critical. EM curriculum development began in the mid-1980s (2-4). The most recent curriculum was issued in 2010 by the clerkship directors in emergency medicine (CDEM) (5). Although the number of mandated EM clerkships more than quadrupled between 1992 and 2005, less than half of allopathic medical schools in the United States offer a dedicated EM rotation in their curriculum (6). While emergency medical services (EMS) and pre-hospital care have been available in the Kingdom of Saudi Arabia (KSA) since 1934, EM is a relatively new medical specialty in the country, having not been formally recognized as a medical specialty until 2001. The Saudi board of EM was established in 2005 to develop, implement, and evaluate a standardized EM curriculum. Since then, EM and the KSA's pre-hospital system have evolved and matured (7). There are few undergraduate EM training programs in nations where modern emergency medical training is being implemented. As a result, accessible information on students' perceptions of EM primarily comes from countries with extensive EM establishment and training (8, 9). There have been several modifications to KSA's medical specialty during the past few years. Saudi Vision 2030, a comprehensive plan for reforming KSA's economy, health, education, infrastructure, leisure, and tourist industries, was recently presented. This strategy will enhance the continuity and integration of the delivery of healthcare services. Thus, it is reasonable to anticipate a rise in primary care and EM residency jobs in the coming years (10). EM rotations help students learn fundamental and advanced resuscitation techniques, how to ad-

dress the undifferentiated patient, and common procedural skills, and gain a better knowledge of EM as a specialty. EM clerkships, on the other hand, differ in rotation duration and exposure (11). A series of recent studies indicates undergraduate medical students' perceptions and knowledge after an EM clerkship. According to a previous study, students rated significantly greater confidence in the assessment, diagnosis, and management of acutely ill patients after completing an EM clerkship (12). Also, another study has shown that a well-structured EM clerkship significantly improved medical students' positive perceptions of the EM specialty, its physicians, and the patient population (13). In fact, a study conducted in KSA has shown that EM is the 4th most preferred specialty among medical students (14). As far as we know, limited previous research in KSA has investigated three different variables pre-post EM clerkships, including medical students' attitudes, comprehension, and procedural skills, desire. The question then becomes whether four weeks of rotation plays a significant role in determining those variables. This study aims to understand any change in students' skills based on their self-assessment and their perceptions regarding EM physicians, EM patients, and choosing EM as a future career.

2. Methods

2.1. Study design and participants

This study employed prospective observational design. The study was done from 2 October to 2 November 2022 in the eastern region of KSA. The study participants were senior medical students at King Faisal University. Senior students who finished a four-week EM rotation were involved as post-cases, and senior students who had not finished their EM rotation were involved as pre-cases. Both groups had the same baseline characteristics (same year, rotation, and assessments). The four-week rotation at King Faisal University was held at King Fahad hospital in Al-Ahsa, KSA, which is affiliated with the National Commission for Academic Accreditation and Assessment (NCAAA). Overall, students participated in 60 hours of clinical encounters, eight interactive sessions, exercise at three simulation/ clinical skills sessions, and completed end-of-rotation clinical assessments and oral examinations.

2.2. Data collection

We calculated the required sample size to be 197 convenient participants of senior medical students at King Faisal University, with a confidence interval of 95% and a margin of error of 5% (15). The inclusion criterion was senior medical students who had finished four-week rotations at King Faisal University. The exclusion criteria were students who were not enrolled in King Faisal University and were not senior medical students.

Participants who met our criteria completed the questionnaire. Medical students enrolled in the EM clerkship were invited to participate in an anonymous online pre-rotation survey. The survey was valid and had been used in another research and the measures were crafted to reflect several of the Liaison Committee for Medical Education (LCME) core competencies (13). The survey contained 32 questions that asked the participants about their prior experience and confidence with patient assessment, diagnosis, and management plans, trauma and medical resuscitations, presentations in formal and informal settings, and specific procedure skills. Students were also asked about their perceptions of EM, EM physicians, and their interest in a career in EM. After four weeks of rotation, students were contacted to participate in the post-rotation survey that included the same categories as the pre-rotation survey. Likert scales ranging from 1 ("not at all confident") to 5 ("very confident") were used in both surveys to assess questions about students' levels of confidence with the skills and procedures under study. Questions about students' perceptions of EM were scored from 1 (strongly disagree) to 5 (strongly agree). Participation in the survey was optional. No subject identifiers were included in the surveys, and thus did not influence the students' grades.

2.3. Statistical analysis

The sociodemographic characteristic frequencies, means, and standard deviations (SD) of the participants' scores were calculated and tabulated. An independent sample t-test with 95% confidence interval (CI) was used to assess the difference in the mean scores of each response for students who had not done an EM clerkship and those who had completed their EM clerkship. To assess the difference between the mean scores for each response in males and females, an independent samples t-test was again used.

Pearson Chi-square was used to assess the correlation between EM clerkship and choosing EM as a future career. Similarly, Pearson Chi-square analysis was utilized to assess the correlation between gender and choosing EM as a future career. Significance was declared at a p-value of 0.05 or less with a confidence interval of 95%. All the calculations were performed using IBM SPSS version 27.0.1.

2.4. Ethical considerations

Ethical approval was obtained from the institutional review board of King Faisal University (KFU-REC-2022-OCT-ETHICS249). An English informed consent form was signed by the participants. Ethical consideration and confidentiality of all participants' information were maintained throughout the study. The data have been prospectively collected using a self-assessment survey. The online questionnaire was created with Google Questionnaire.

3. Results

A total of 161 out of 197 students participated as a match to the inclusion criteria of the research. Thirty-six students out of 197 refused to participate. Giving an overall response rate of 81%. Out of these, 105 (65.2%) students had not yet

Table 1 Comparison of self-assessed skills and abilities of students based on gender and EM clerkship status

Variable	Pre-EM Clerkship	Post-EM Clerkship	p[t]	Males	Females	p[t]
	Mean Score (SD)			Mean Score (SD)		
Conduct an initial assessment of an acutely ill patient	3.43 (1.17)	3.84 (1.01)	0.027*	3.56 (1.12)	3.58 (1.14)	0.937
Identify a "sick" vs. "non-sick" patient	3.85 (1.08)	3.96 (0.99)	0.503	3.76 (1.07)	4.01 (1.02)	0.123
Formulate a differential diagnosis	3.59 (1.03)	3.89 (1.02)	0.078	3.65 (1.09)	3.73 (0.99)	0.622
Develop an appropriate management plan	3.05 (0.95)	3.46 (0.87)	0.007*	3.24 (0.86)	3.14 (1.03)	0.508
Explain to others the core elements and principles of the modern practice of EM	2.90 (1.18)	3.61 (1.17)	<0.001*	3.31 (1.22)	2.99 (1.20)	0.096
Present patient cases in a formal setting	3.45 (1.06)	3.80 (1.13)	0.049*	3.62 (1.15)	3.53 (1.04)	0.623
EKG interpretation	2.98 (1.32)	3.55 (1.09)	0.006*	3.44 (1.13)	2.94 (1.36)	0.013
Basic life support	3.87 (1.03)	4.16 (0.95)	0.078	3.97 (1.06)	3.96 (0.97)	0.948
Major medical resuscitation	3.32 (1.28)	3.75 (1.19)	0.041*	3.45 (1.19)	3.49 (1.34)	0.821
Major trauma resuscitation	2.99 (1.36)	3.38 (1.32)	0.086	3.10 (1.28)	3.14 (1.43)	0.845

[t]: Independent samples t-test
*p<0.05, significant
EM: emergency medicine; EKG; electrocardiogram

Table 2 Comparison of students' perception of EM based on gender and EM clerkship status

Perception	Pre-EM Clerkship	Post-EM Clerkship	p[t]	Males	Females	p[t]
	Mean Score (SD)			Mean Score (SD)		
I see EM as a future lifestyle	2.43 (1.25)	3.39 (1.44)	<0.001*	2.97 (1.33)	2.57 (1.42)	0.062
I see EM as a future financial reward	2.69 (1.18)	3.48 (1.19)	<0.001*	3.21 (1.24)	2.73 (1.20)	0.016*
I see EM as the opportunity to serve the underserved	3.22 (1.11)	3.77 (1.19)	0.004*	3.54 (1.16)	3.29 (1.16)	0.175
I can choose EM as my future career (EM-interested)	2.23 (1.15)	3.20 (1.57)	<0.001*	2.87 (1.40)	2.28 (1.32)	0.006*

[t]Independent samples t-test
*p<0.05, significant

Table 3 Comparison of students' perception of EM physicians based on gender and EM clerkship status

Perception	Pre-EM Clerkship	Post-EM Clerkship	p[t]	Males	Females	p[t]
	Mean Score (SD)			Mean Score (SD)		
Have prestige in the local community	3.50 (1.01)	3.25 (1.18)	0.169	3.27 (1.11)	3.54 (1.03)	0.108
Are respected by other physicians	3.89 (1.01)	3.52 (1.10)	0.034*	3.58 (1.12)	3.93 (0.96)	0.034*
Have a flexible work schedule	2.87 (1.43)	3.68 (1.19)	<0.001*	3.58 (1.40)	2.75 (1.29)	<0.001
Have a predictable work schedule	2.81 (1.30)	3.52 (1.39)	0.002*	3.33 (1.40)	2.80 (1.30)	0.012*
Have job security in the future	3.55 (1.07)	3.91 (1.03)	0.041*	3.86 (1.08)	3.51 (1.03)	0.035*
Are generally satisfied with their career choice	3.35 (1.00)	3.63 (1.05)	0.108	3.56 (1.04)	3.34 (1.00)	0.161
Make less income relative to others	2.84 (1.04)	2.84 (1.25)	0.995	2.78 (1.22)	2.89 (1.00)	0.534
Are compassionate providers	3.45 (0.94)	3.46 (1.03)	0.918	3.31 (0.96)	3.59 (0.96)	0.064
Have adequate patient contact	3.40 (1.21)	3.71 (1.26)	0.125	3.56 (1.21)	3.46 (1.26)	0.587
Use technical skills and procedures	4.02 (0.96)	4.20 (0.98)	0.269	4.05 (0.99)	4.11 (0.95)	0.709
Perform primary healthcare tasks for patients	3.95 (1.05)	3.80 (1.07)	0.396	3.71 (1.08)	4.08 (1.00)	0.022*
Deal with behavioral problems	3.69 (1.14)	3.77 (1.18)	0.667	3.65 (1.10)	3.77 (1.19)	0.519
Are susceptible to burnout	4.35 (0.94)	4.09 (1.01)	0.102	4.08 (1.09)	4.43 (0.81)	0.019*

[t]Independent samples t-test
*p<0.05, significant

Table 4 Comparison of students' perception of EM patients based on gender and EM clerkship status

Perception	Pre-EM Clerkship	Post-EM Clerkship	p[t]	Males	Females	p[t]
	Mean Score (SD)			Mean Score (SD)		
Have a variety of ailments	3.80 (0.96)	3.86 (0.94)	0.719	3.72 (0.88)	3.92 (1.01)	0.190
Often need critical (ICU) care	3.30 (1.07)	3.11 (1.11)	0.271	3.13 (1.01)	3.34 (1.14)	0.221
Improved symptoms while in ED	3.73 (0.91)	3.96 (0.89)	0.125	3.81 (0.85)	3.82 (0.96)	0.936
Are compliant with their follow-up treatment	3.15 (0.95)	3.13 (1.06)	0.867	3.08 (0.99)	3.20 (0.98)	0.413
Come from a variety of cultural groups	4.12 (1.03)	4.34 (0.84)	0.182	4.08 (1.00)	4.31 (0.94)	0.124

[t] Independent samples t-test
*p<0.05, significant
ICU: intensive care unit; ED: emergency department

Table 5 Comparison of students' perception of EM patients based on gender and EM clerkship status

Variable	I can choose EM as my future career (EM-interested)					Total number	P
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree		
	Number (%)						
Pre-EM Clerkship	34 (32.4)	34 (32.4)	21 (20.0)	11 (10.5)	5 (4.8)	105	
Post-EM Clerkship	13 (23.2)	7 (12.5)	9 (16.1)	10 (17.9)	17 (30.4)	56	<0.001*
Total	47 (29.2)	41 (25.5)	30 (18.6)	21 (13.0)	22 (13.7)	161	

X^2=26.057, p<0.05, Significant

Table 6 Response regarding choosing EM as a future career in males and females

Variable	I can choose EM as my future career (EM-interested)					Total number	P
	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree		
	Number (%)						
Female	32 (38.6)	19 (22.9)	17 (20.5)	7 (8.4)	8 (9.6)	83	
Male	15 (19.2)	22 (28.2)	13 (16.7)	14 (17.9)	14 (17.9)	78	<0.001*
Total	47 (29.2)	41 (25.5)	30 (18.6)	21 (13.0)	22 (13.7)	161	

X^2=26.057, p<0.05, Significant

done their EM clerkship, while 56 (34.8%) students had completed their EM clerkship. There were 78 (48.4%) male and 83 (51.6%) female students. Looking at the self-assessed skills and abilities, overall, the students expressed the greatest confidence in basic life support (3.97±1.01) and identifying a sick vs. non-sick patient (3.89±1.05), while the students on average felt least confident about their major trauma resuscitation skills (3.17±1.35). The average score for students who had done their clerkship in EM was higher in all questions compared to students who had not yet done their EM clerkship, but not all these differences in the mean score were found to be significant.

A significantly higher mean score was noted in conducting an initial assessment of an acutely ill person (p=0.027), developing an appropriate management plan (p=0.007), explaining the core elements and principles of EM to others (p<0.001), presenting patient cases in a formal setting (p=0.049), EKG interpretation (p=0.006) and major medical resuscitation (p=0.041) among the students who had done their EM clerkship. The highest difference in mean score was in presenting patient cases in a formal setting, followed by EKG interpretation. On average, post-EM clerkship students scored 0.71 and 0.57 higher than pre-EM clerkship students, respectively.

Regarding the association of gender with skills, no significant difference was found in mean score of the female and male students in any of the self-assessed skills and abilities (Table 1).

Comparing the perception of students on EM, overall, the students, disagreed with choosing it as a future career (2.57±1.39).

However, the post-EM clerkship students had a significantly higher mean score for each question compared to pre-EM clerkship students. The students who had done their EM clerkship were comparatively more willing to see EM as a future lifestyle (p<0.001), a future financial reward (p<0.001), as an opportunity to serve the underserved (p=0.004), and choose it as a future career (p<0.001). With respect to gender, males were, on average, more likely to see EM as a future financial reward (p=0.016) and choose it as a future career (p=0.006) (Table 2).

Considering the students' perception of EM physicians, the

highest overall mean scores in this category belonged to statements that the EM physicians are susceptible to burnout (4.26±0.97) followed by EM physicians use highly technical skills and procedures (4.08±0.97) indicating that both pre-EM clerkship and post-EM clerkship students and both male and female students believed that EM physicians are susceptible to burnout and use technical skills and procedures. The statement that received the least overall mean score was that the EM physicians make less income relative to others (2.84±1.11), indicating that both male and female students, those who had done their EM clerkship and those who had not, did not believe that EM physicians had less income than others. It was interesting to note that students who had done their EM clerkship agreed significantly less (p=0.034) with the statement that the EM physicians were respected by other physicians compared to students who had not yet done their clerkship. However, post-clerkship students agreed significantly more (p<0.001) with the statement that EM physicians have a flexible working schedule, a predictable working schedule (p=0.002), and job security (p=0.041). Regarding gender, females, on average, believed more strongly that EM physicians are respected by other physicians (p=0.034), perform primary healthcare tasks (p=0.022), and are susceptible to burnout (p=0.019) while males, on average, believed more strongly that EM physicians have a flexible work schedule (p<0.001) and job security (p<0.035) (Table 3).

Looking at the perception of EM patients, overall, the students, strongly believed that the patients in EM come from a variety of cultural groups (4.20±0.97). Most of the students did not agree with the statement that the patients are compliant with their follow-up treatment (3.14±0.99), followed by the belief that patients often needed intensive care unit (ICU) admission (3.24±1.08). No significant differences were found between the opinions of the students who had or had not done their clerkship in EM and between male and female students in this regard (Table 4).

About 30.4% of the students who had done their EM clerkship were in strong agreement to choosing EM as a future career, a percentage significantly higher (X^2=26.057, p<0.001) than the only 4.8% of the pre-clerkship students strongly agreeing to choosing EM as a future career (Table 5). Similarly, 17.9% of the male students were strongly willing to choose EM as a future career as opposed to a significantly smaller percentage (X^2=10.727, p=0.030) of female students (9.6%) (table 6).

4. Discussion

This study provides the first data-based evaluation to understand how students' skills change based on their self-assessment and how their perceptions regarding EM physicians, EM patients, and choosing EM as a future career in KSA alter after their EM clerkship.

We evaluated the self-assessed skills and abilities of students in several areas based on their EM clerkship status, including patient care (determining sick vs. non-sick patients, initial patient assessment, EKG interpretation, basic life support, major medical and trauma resuscitation), medical knowledge (developing differential diagnoses and management plans), interpersonal skills (formal and informal presentations), and systems-based practice (understanding and being able to explain the practice of EM). We also compared four different domains of students' perceptions based on their EM clerkship status (perception of EM, EM physicians, EM patients, and choosing EM as a future career). Although EM is a well-known specialty globally, it is regarded as an emerging specialization in KSA, attracting researchers to do studies on this interesting specialty (8). Indeed, identifying a variation in perception among students after a four-week rotation is challenging (11). In line with previous studies, our results demonstrated that the average score of each item in self-assessed skills and abilities was higher for students who had done their clerkship in EM compared with those who had not yet done their EM clerkship (13). Also, our results indicated that students gained the greatest confidence in basic life support and identifying a sick vs. a non-sick patient. difference between female and male students regarding the mean score in any of the self-assessed skills and abilities, but this comparison was not done in other studies. In contrast to the findings of a previous study in the United States, we discovered that post-EM clerkship students had considerably higher mean scores across all questions compared to pre-EM clerkship students. However, in line with the same study, there was no statistically significant difference between pre- and post-clerkship mean ratings in some statements regarding the perception of EM physicians. Additionally, there were no significant differences in the perceptions of male and female students or students who had completed or not completed their EM clerkships in this regard. Conversely, a significant number of post-clerkship students agreed more with the statement that EM physicians have a flexible working schedule, a predictable working schedule, and job security (11). Students who had completed their EM clerkship were more likely to consider EM as a future lifestyle and financial reward, as an opportunity to serve the underserved, and to choose it as a future career. A study in UAE reached a similar conclusion (16). Interestingly, both pre-EM and post-EM clerkship students, and male and female students believe EM physicians are susceptible to burnout. These basic findings are consistent with research showing that EM physicians are more susceptible to burnout than physicians in other departments (17). Studies have shown that knowledge of the specialty, training, and scope would affect choosing the specialty as a future career (18). Our results demonstrated that approximately 30.4% of students who had completed their EM clerkship strongly agreed to choose EM as a future career, which is noticeably higher than the 4.8% of pre-clerkship students who said the same. This finding is in accordance with earlier research that has found that clinical rotations positively influence students' perceptions of the specialty and improve their attitudes toward it as a career (19-21). It is noteworthy to mention that 17.9% of male students were strongly

inclined to pursue EM as a future career, compared with a substantially lower percentage of female students (9.6%). A similar pattern was found in a study in the United States, showing that female students had less interest in a career in EM (22). These numbers have serious implications for patient health. Female patients treated by male physicians have been demonstrated to have poorer results when assessed in the ED for acute coronary syndrome. There was less mortality when they were cared for by female physicians. As a result, the demographic diversity of emergency medical practitioners is more than a social justice problem since it affects patient trust and patient care quality (23). Furthermore, a study in KSA found that female patients had a clear preference for the involvement of a female physician in the ED to manage digestive problems, clinical diagnosis, non-life-threatening situations, and physical examination, with religion being the most influential factor in participants' choices (24).

5. Limitations

Several aspects constrain the generalizability of the results. First, the sample size was rather limited. Second, response rates varied throughout pre- and post-rotation questionnaires. Also, students who completed the survey before and after the EM clerkship were not the same students. Third, this was a one-site research at a hospital with no EM residency program. Consequently, students' experiences may differ from those at more established hospitals. Students' impressions of EM may also alter based on the location of their clinical centers. The significant transitions in our students' attitudes regarding EM are encouraging.

6. Conclusion

Students demonstrate considerable gains in confidence with knowledge, disease management, and procedure skills after completing a four-week rotation. The EM clerkship greatly increased students' perceptions of the EM specialty. Male students who completed their EM clerkship were more likely to consider EM as a future career. Improved student perceptions following the clerkship can boost medical students' enthusiasm for pursuing a career in EM. More research, including a larger number of universities, is strongly advised to identify the impact of EM clerkship on students.

7. Declarations

7.1. Acknowledgement

None.

7.2. Authors' contribution

All authors met the criteria for authorship contribution based on the recommendations of the international committee of medical journal editors.

7.3. Conflict of interest

The authors declare that they have no conflict of interest regarding the publication of this study.

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