Open Access Publish Free

http://jept.ir
doi 10.34172/jept.2025.10

Journal of Emergency Practice and Trauma
Volume 10, Issue 1, 2024, p. 38-46

Original Article

The stressors of medical students in emergency department rotations: A mixed-method sequential explanatory design

Amin Beigzadeh[1], Ali Reza Yusefi[2,3], Elham Sharifpoor[4], Maryam Okhovati[5*]

[1]Education Development Center, Sirjan School of Medical Sciences, Sirjan, Iran
[2]Department of Public Health, Sirjan School of Medical Sciences, Sirjan, Iran
[3]Student Research Committee, Sirjan School of Medical Sciences, Sirjan, Iran
[4]Student Research Committee, Kerman University of Medical Sciences, Kerman, Iran
[5]Medical Library and Information Sciences Department, Medical Informatics Research Center, Institute for Futures Studies in Health, Kerman University of Medical Sciences, Kerman, Iran

Received: February 13, 2025
Accepted: April 25, 2025
ePublished: May 27, 2025

***Corresponding author:**
Maryam Okhovati,
Email: okhovati.maryam@gmail.com

Citation: Beigzadeh A, Yusefi AR, Sharifpoor E, Okhovati M. The stressors of medical students in emergency department rotations: A mixed-method sequential explanatory design . Journal of Emergency Practice and Trauma 2024; 10(1): 38-46. doi: 10.34172/jept.2025.10.

Abstract

Objective: Emergency department (ED) rotations are vital for medical education, fostering clinical skills and teamwork. However, these high-stress environments pose significant mental health risks, including stress, burnout, and depression. Despite their importance, research on the specific stressors medical students face in these settings is limited, indicating a crucial gap in understanding their experiences. This study aims to identify and analyze the significant stressors affecting medical students during ED rotations.

Methods: This mixed-method sequential explanatory study, conducted at Kerman University of Medical Sciences in 2024, had two phases. In the quantitative phase, the Medical Student Stressor Questionnaire (MSSQ) survey was completed by 184 participants selected using the convenience sampling technique. In the qualitative phase, in-depth semi-structured interviews were undertaken with 16 medical students to explore their perspectives on ED stressors. Quantitative data were analyzed by mean and standard deviation. Frequency counts were used to assess students' responses to items across the six survey scales. In the qualitative phase, content analysis using the steps proposed by Graneheim and Ludman was employed to identify and analyze key themes and concepts from the interviews. The data were validated based on Goba and Lincoln's criteria. Data analysis was performed using MAXQDA-10 software.

Results: The 184 participants comprised 52.72% female students, and 62.50% were in their internship. The results indicated that female students reported higher stress levels in academic, teaching-learning, and drive/desire-related areas, while males faced more social-related stress. The top stressors included insufficient medical skill practice (M = 3.60), heavy workloads (M = 3.44), tests (M = 3.15), and poor grades (M = 3.20). The qualitative interviews with 16 students reinforced these findings, revealing themes of clinical demands and educational challenges during ED rotations.

Conclusion: This study identified significant stressors for medical students, including gender-based differences, inadequate clinical skill practice, excessive workload, anxiety over exams, and low test performance. To enhance professional development and resilience during ED rotations, we recommend increasing opportunities for hands-on clinical practice, managing workloads to reduce stress, and providing targeted resources for exam preparation. By addressing these key issues, ED rotations can become valuable growth opportunities, ultimately fostering a more supportive educational environment that promotes the well-being and development of medical students.

Keywords: Stress, Students, Medical, Emergency ward, Education

Introduction

Emergency department (ED) rotations play a vital role in medical student education by offering practical experience in high-stress settings, which develops critical thinking and swift decision-making abilities (1). These rotations contribute to the enhancement of clinical proficiency, expose students to a variety of medical cases, and facilitate the development of teamwork skills (2). Furthermore, they assist students in developing resilience and adaptability, which are essential characteristics for prospective healthcare practitioners (3).

Although medical students gain significant experience from their ED rotations, they face numerous stressors during their education, which adversely affects their mental health and overall well-being (4). Research has consistently shown that stress levels tend to escalate throughout medical education, with peaks occurring either during the second year (5) or after students enter

clinical rotations (6). Also, elevated stress levels in medical students have been linked to the development of depression (7,8), burnout (9), and various somatic complaints (8).

One factor that contributes to dissatisfaction and inefficiency in the interactions between medical students, healthcare personnel, and patients within the healthcare system is the presence of inherent stressors (10). Evidence shows that students encounter a variety of stressors that significantly impact their educational experience. These stressors include the demands of working in hospital departments, concerns regarding the potential for diseases transmission, the complexities associated with patient care, academic challenges, and the substantial workload associated with their coursework (10). In addition, a recent review identified six primary themes related to student distress: adjustment issues, ethical dilemmas, exposure to patient mortality and suffering, instances of student mistreatment, personal life events, and educational financial burdens (11). Collectively, these factors represent some of the most prominent sources of stress for students. Research conducted in Thailand has indicated that the stressors experienced by medical students are predominantly associated with academic challenges, which have been identified as a significant source of stress for the entire student population. Among these challenges, the most common contributors to academic stress were identified as examinations and assessments (12).

To the best of our knowledge, there is a notable gap in research specifically examining the stressors experienced by medical students in EDs. Existing studies have focused mainly on general stressors in medical education and often rely on fixed-response items, which fail to capture the nuanced experiences of students. Moreover, there is a lack of recent mixed-method designs that solicit direct input from medical students regarding their perceived stressors in emergency settings. In a similar line, it seems that medical students encounter a high prevalence of depression and poor mental health, primarily attributed to stress, ineffective coping strategies, and inadequate counseling support. There is a pressing need to quantify this growing issue and implement necessary measures to address and mitigate these challenges. Therefore, this study aims to fill this gap by identifying the stressors embedded in ED rotations from the opinions of medical students. Implementing a mixed-methods design enables students to prioritize their most significant stressors while also allowing them to articulate their concerns openly.

Methods

This study employed a mixed-method sequential explanatory approach in which data were collected through the Medical Student Stressor Questionnaire (MSSQ) survey and semi-structured interviews. Mixed method designs are characterized as a methodological approach that involves the collection, analysis, and integration of both quantitative and qualitative data within a single research study. This approach aims to enhance the understanding of research problems by leveraging the strengths of both data types throughout the research process (13,14). This study was structured into two primary phases. The initial phase involved gathering medical students' viewpoints concerning the stressors they encountered during their medical education training. The subsequent phase comprised in-depth semi-structured interviews aimed at elucidating medical students' perspectives concerning the stressors of the ED clinical rotations.

In this study, samples were selected using different methods. In Phase 1, using convenience sampling, 184 students were recruited to complete the MSSQ survey. Primarily, 210 students were approached to participate, of which 184 completed the MSSQ survey. To determine the percentage of students excluded from the study due to non-completion, we calculate the ratio of non-completers to the total number of students approached. The calculation reveals that approximately 12.38% of the students invited to participate were excluded from the study for not completing the questionnaire. In Phase 2, a purposive sampling method was used, and 16 students were interviewed concerning the stressors embedded in the ED rotations. The demographic information of participants is depicted in Table 1.

The inclusion criteria encompassed: 1) enrollment in the medical education program at Kerman University of Medical Sciences, 2) undergoing clinical training or internship with clinical training experience in the ED, 3) completion of the survey instrument, 4) willingness to participant in the study and provide informed consent. Students who lacked adequate time or willingness to partake in the interview process were excluded from the study.

We used the mixed-method sequential explanatory design to obtain data for the study. In this regard, two phases were taken into account. In the quantitative phase, medical students, either in their clinical training or internship, entered the study to complete the MSSQ survey in order for their stressors to be identified. Based on the responses to the MSSQ survey in Phase 1, in the qualitative phase of the study, we conducted in-depth semi-structured interviews with medical students to explore their perspectives on the embedded stressors in the ED.

Informed consent was acquired from all participants, and the research protocol received ethical approval from the Ethics Committee of Kerman University of Medical Sciences (IR.KMU.REC.1403.606). Prior to the initiation of the study, the research objectives were explained to all students, and a member of the research team addressed

Table 1. The distribution of study participants based on the demographic characteristics

Study phases	Variables	Study sample frequency (%)
Quantitative phase	Gender	
	Male	87 (47.28)
	Female	97 (52.72)
	Age (y)	
	18–24	130 (70.65)
	25–31	54 (29.35)
	Marital status	
	Single	150 (81.52)
	Engaged	22 (11.96)
	Married	12 (6.52)
	Medical phases	
	Clinical training	69 (37.50)
	Internship	115 (62.50)
Qualitative phase	Gender	
	Male	7 (43.75)
	Female	9 (56.25)
	Age (year)	
	Participants	26.50
	Medical phases	
	Clinical training	6
	Internship	10

any queries from the students. Students had the freedom to opt out of the research at any time. To facilitate the collection of questionnaires, a research team member attended the clinical rounds of medical students at the educational hospitals affiliated with Kerman University of Medical Sciences on multiple occasions and collected the questionnaires. Concerning the interviews, appointments were arranged, and a quiet environment was selected for the interviews to facilitate optimal conditions for data collection. This venue was situated at the hospitals where the students attended their rotations. Measures were implemented to ensure the confidentiality of the information and the anonymity of the participants.

The MSSQ is a validated instrument used to identify sources of stress (15,16). The MSSQ survey is structured into two components. The initial component focuses on the sociodemographic attributes of the participants, encompassing variables such as gender, age, marital status, and phase in medical education. The second component is formulated around six primary domains accentuating possible sources of stress in medical students. They include academic-related stressors (ARS), intrapersonal- and interpersonal-related stressors (IRS), teaching- and learning-related stressors (TLRS), social-related stressors (SRS), drive- and desire-related stressors (DRS), and group activities-related stressors (GARS). Respondents rate each source by choosing from five responses, 'causing no stress at all,' 'causing mild stress,' 'causing moderate stress,' 'causing high stress,' and 'causing severe stress.' The scoring method assigns points from 0 to 4 to each response. The degree of stress classification is as follows: 0–1.00 is 'causing nil to mild stress,' 1.01–2.00 is 'causing mild to moderate stress,' 2.01–3.00 is 'causing moderate to high stress, and 3.01–4.00 is 'causing high to severe stress.' The reliability coefficients of the stressor groups range from 0.64 to 0.92 (17). The internal consistency correlation of Cronbach's alpha was found to be 0.74 in a study conducted in an Iranian context (18). In order to evaluate the reliability of the questionnaire used in the current study, the test-retest method was implemented. A sample of sixteen participants responded to the identical questions, with a two-week interval between the two administrations. The internal consistency of the questionnaire was assessed using Cronbach's alpha coefficient, which yielded a value of 0.79. This result signifies an acceptable level of reliability, indicating that the items consistently measure the intended constructs.

To delve into the topic under investigation, we used qualitative content analysis to confirm and explore medical students' perspectives on ED stressors. Qualitative content analysis is a methodological approach employed in research to interpret and analyze textual data by systematically categorizing content into identifiable themes or patterns (19). The participants were selected through purposive sampling to ensure a comprehensive array of perspectives and to gather in-depth data. Consequently, the samples were chosen to maximize diversity in age and gender. The final participant count was established following the principle of data saturation, which posits that data collection should persist until no additional insights emerge from the gathered information. A total of 16 interviews were conducted.

Each interview began with a series of open-ended questions: "Could you please introduce yourself and share details regarding your demographic background?" Following this initial inquiry, the primary questions each participant was asked included:

1. How would you characterize your overall experience during your ED rotation?
2. What particular stressors did you face while working in the ED?
3. How conducive was the learning environment in the ED to your educational needs?

In the quantitative phase of the study, descriptive statistics, specifically the mean and standard deviation, were employed to examine the survey data. Frequency counts were utilized to assess the participants' responses to individual items across the six survey scales. The statistical analyses were conducted using SPSS software version 27 (Chicago, USA).

In the qualitative phase, the interviews were recorded in audio format and transcribed verbatim. The interviews

varied between 30 to 45 minutes, contingent upon the specific circumstances and the participants' preferences. The qualitative content analysis method proposed by Graneheim and Lundman was used to analyze the data (20) thoroughly. The data analysis procedure was as follows: Initially, each interview was transcribed verbatim and subjected to multiple readings for the content to be understood comprehensively. Subsequently, the text was segmented into meaning units, which were then condensed. Each meaning unit comprised words and sentences that were interrelated. These meaning units were further condensed and assigned codes in the third step. The fourth step involved classifying these codes into subcategories and categories based on their similarities and differences. Each category was characterized by codes that shared commonalities at the manifest level. Ultimately, the underlying meanings and content of the data were extracted, leading to the formulation of themes that encapsulated the latent meanings present within the text.

To ensure data accuracy and reliability, we used Guba and Lincoln's standards of confirmability, credibility, dependability, and transferability (21). Credibility was enhanced through thorough data engagement and sufficient collection time. An external reviewer ensured dependability by overseeing the data collection and validating the findings. For confirmability, the researchers maintained a neutral stance during analysis, involving co-researchers in the review of coding to minimize individual bias. Transferability was ensured by meticulous documentation of data collection and analysis procedures and detailed descriptions of the data.

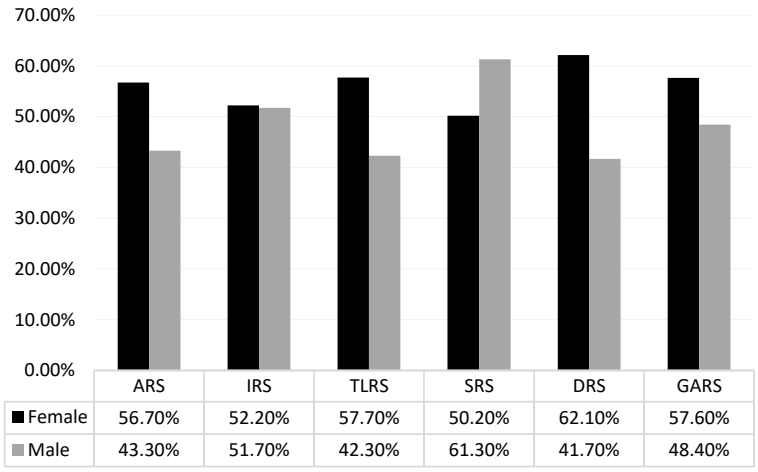
Results

A total of 184 medical students responded to the survey. Ninety-seven (52.72%) students were female, and 130 (70.65%) students were in the 18–24 age range. Besides, 115 (62.50%) students were in their internship. The demographic profile of the medical students is depicted in Table 1.

In terms of gender-based differences in the various types of stressors experienced by medical students, data showed that female medical students tend to experience higher levels of stress in areas such as ARS (56.70% for females vs. 43.30% for males), TLRS (57.70% for females vs. 42.30% for males), and DRS (62.10% for females vs. 41.70% for males). In contrast, male medical students appeared to face higher SRS (61.30% for males vs. 50.20% for females). The data also indicated that the stress levels are more balanced between genders in the domain of IRS (Figure 1).

More data analysis on the top ten stressors ranked based on the degree of stress they caused as perceived by medical students is shown in Table 2. he highest-rated stressors reported as high to severe included not having enough medical skill practice (mean = 3.60, SD = 2.10), heavy workloads (mean = 3.44, SD = 1.18), tests/examinations (mean = 3.15, SD = 1.13), and getting poor grades (mean = 3.10, SD = 2.00). Moving into the moderate to high stress range, the data showed that medical students were also highly stressed by the unjustified grading process (mean = 2.74, SD = 1.10), the large amount of content to be learned (mean = 2.69, SD = 1.08), poor motivation to learn (mean = 2.65, SD = 1.08), uncertainty about expectations (mean = 2.50, SD = 1.16), lack of teaching skills by medical teachers (mean = 2.36, SD = 1.11), and insufficient feedback from medical teachers (mean = 2.27, SD = 1.09).

To validate the findings from the quantitative phase of the study, the qualitative phase involved presenting the final data analysis of the questionnaires to medical students and soliciting their insights for a more comprehensive exploration of the stressors associated with the ED environment. The interviews corroborated the data obtained in the initial phase of the study. Furthermore, the in-depth semi-structured interviews illuminated additional dimensions of the stressors of ED clinical



	ARS	IRS	TLRS	SRS	DRS	GARS
Female	56.70%	52.20%	57.70%	50.20%	62.10%	57.60%
Male	43.30%	51.70%	42.30%	61.30%	41.70%	48.40%

Figure 1. Prevenance of stressors based on gender. ARS: academic-related stressors; IRS: inter- and intra-personal-related stressors; TLRS: teaching- and learning-related stressors; SRS: social-related stressors; DRS: drive- and desire-related stressors; GARS: group-activity related stressors

Table 2. Top ten stressors ranked by mean degree of stress as perceived by medical students

Degrees of stress	Rank	Items	Degree of stress Mean (SD)
High to severe	1	Lack of medical skill practice	3.60 (2.10)
	2	Heavy workload	3.44 (1.18)
	3	Tests/examinations	3.15 (1.13)
	4	Getting poor grades	3.10 (2.00)
Moderate to high	5	Unjustified grading process	2.74 (1.10)
	6	Large amount of content to be learned	2.69 (1.08)
	7	Poor motivation to learn	2.65 (1.08)
	8	Uncertainty about expectations	2.50 (1.16)
	9	Lack of teaching skills by teachers	2.36 (1.11)
	10	Lack of enough feedback from teachers	2.27 (1.09)

rotations based on the content analysis of the textual data collected. In this phase of the study, 16 interviews were conducted with medical students in which seven males (43.75%) and nine females (56.25%) with a mean age of 26.50 participated.

The content analysis technique revealed 89 primary codes, which were categorized into two main themes and four subthemes. Table 3 illustrates the themes, subthemes, and their representative quotes.

Discussion

This study aimed to identify and explore the most significant stressors noted by medical students in ED rotations, following a mixed-method sequential explanatory approach in which data were collected through the MSSQ survey and in-depth semi-structured interviews. The results indicated that female students reported higher stress levels in academic, teaching-learning, and drive/desire-related areas, while males faced more social-related stress. The top stressors included insufficient medical skill practice, heavy workloads, tests, and poor grades. Qualitative interviews revealed themes of clinical demands and educational challenges as significant issues during ED rotations.

Similar studies have been conducted in different contexts, such as the United States (22), Portugal (23), Saudi Arabia (24), and Iran (25), about the stress prevalent among medical students. Research conducted in Pakistan revealed a prevalence of depression, anxiety, and stress among medical students (26). Additionally, another study from the same region examined stressors originating from academic and psychosocial domains, suggesting that the experience of stress is not confined to cultural and societal influences (27).

Research has shown that female and male medical students often experience different types and levels of stressors during their medical training, particularly in high-intensity clinical settings like the ED. Studies have found that female medical students tend to report higher levels of stress related to academic performance and expectations. A study by Dahlin et al found that female medical students experienced significantly more academic-related stress compared to their male counterparts (28). This may be due to factors like heightened pressure to excel, perfectionist tendencies, and concerns about meeting the demands of the rigorous medical curriculum (29). The study conducted by Hill et al is in line with our investigation, observing notable gender disparities concerning academic workload, inadequate time-management skills, personal health issues, and exposure to human suffering, with female students indicating higher levels of stress in all these domains (22). The heightened perception of stress among female students in this study cannot be ascribed to a singular cause. This observation aligns with research conducted by Dyrbye et al, which identified elevated stress levels among female medical students in Canada and the United States (30,31). Furthermore, this finding is consistent with the study conducted by Khan et al in Pakistan, which also reported increased stress levels among female students (32).

On the other hand, male medical students appeared to face higher stress levels related to social factors, such as interpersonal relationships and navigating the hierarchical structure of the medical team. We assume that the competitive nature of the medical field and the need to assert oneself in the ED setting may contribute to these gender-based differences. Our data also revealed that the stress levels are more balanced between genders in the domains of intrapersonal- and interpersonal-related stressors. This indicates that the emotional and relational aspects of medical training may be experienced similarly by both female and male students in the high-intensity ED environment.

Within the top ten identified stressors, four were categorized as high to severe stressors and six were classified as moderate to high stressors. In the context of medical students, there are notable concerns regarding insufficient hands-on experience and the substantial workload encountered during their medical education training. These results align with the findings of Beigzadeh et al, indicating that medical students perceive intense workload and insufficient clinical skill practice as significant challenges during clinical rounds (33). Other stressors in this category were apprehensions of exams and poor academic performance. Although the evaluation process is crucial in the educational curriculum for medical students to improve the acquisition of clinical knowledge and competencies and promote their engagement and learning outcomes (34), our data indicates that medical students have significant concerns regarding evaluation issues. Medical teachers can significantly support medical students regarding evaluation issues by fostering a clear

Table 3. Themes, subthemes, and representative quotes

Themes	Subthemes	Representative quotes
Clinical demands	Time pressure and multitasking	"*The emergency department is like a whirlwind. You are constantly being pulled in different directions, trying to keep up with orders and procedures and updating multiple patients simultaneously. It is mentally exhausting.*" (Participant No. 6) "*The sheer volume of patients and the rapid turnover in the emergency department is overwhelming. You have to be able to shift gears quickly, gather relevant information, and act decisively, all while engulfed in chaos.*" (Participant No. 16) "*The pace is relentless. You have to be on your toes, making quick decisions and prioritizing tasks, all while the clock is ticking. It is a real test of your ability to multitask under intense pressure.*" (Participant No. 1)
	High-acuity patient care	"*Nothing could have prepared me for the intensity of the emergency department. Seeing critically ill and injured patients come through the doors, often in life-threatening conditions, is incredibly stressful. You have to be able to think and act quickly, without much room for error.*" (Participant No. 12) "*The acuity level in the ER is unlike anything I have experienced before. Patients may deteriorate rapidly, transitioning from a stable condition to a critical state within minutes, and you have to be ready to jump into action, even as a student. It is a constant adrenaline rush; it is incredibly taxing.*" (Participant No. 9) "*Dealing with trauma cases, like car accidents, is particularly stressful. You must remain calm and focused, even when the situation is chaotic, and the stakes are incredibly high. It is a true test of your medical knowledge and composure.*" (Participant No. 15)
Educational challenges	Difficulty integrating didactic knowledge	"*I thought I had a solid grasp of the theoretical knowledge from my classroom learning, but when faced with real patients in the ER, it is like everything I knew just flew out of the window. Translating that information into effective clinical practice is much harder than expected.*" (Participant No. 2) "*The emergency department completely differs from the controlled, textbook-based classroom environment. Trying to quickly apply all the concepts and algorithms I have memorized to the fast-paced, ambiguous cases I see here is incredibly challenging.*" (Participant No. 14) "*It is frustrating when I know the underlying pathophysiology or treatment guidelines, but I struggle to implement that knowledge when faced with a complex, undifferentiated patient presentation. The real-world context adds an extra layer of complexity that I am still trying to navigate.*" (Participant No. 5)
	Balancing clinical duties and learning objectives	"*It feels like there is a constant tug-of-war between providing patient care and trying to focus on my own learning needs. I want to be as helpful as possible to the team, but I also do not want to miss valuable educational opportunities.*" (Participant No. 13) "*The emergency department is such a fast-paced environment that it is hard to take the time to reflect on my own learning. I am so busy trying to keep up with the clinical tasks that my educational goals often take a back seat.*" (Participant No. 8) "*The emergency department is such a high-intensity setting that it is easy to get caught up in the moment and lose sight of the bigger picture. I must constantly remind myself to step back, reflect on my learning, and ensure I get the most out of this experience.*" (Participant No. 4)

and supportive learning environment. They should establish transparent communication about the teaching process and evaluation criteria and provide timely, constructive feedback to help students understand their performance (35,36).

Concerning moderate- to high-severity stressors, the significance of unjustified grading process (12,37), substantial volume of content (38), lack of motivation (39,40), ambiguity regarding expectations (33,37,41), medical teachers' insufficient teaching skills (39,41) and lack of adequate teacher feedback (41) have been investigated in different studies. Our findings corroborate with the study by Bahri et al, who identified stressors such as tests and examinations, a large amount of content to be learned, obtaining poor marks, insufficient skills in medical practice, and heavy workload as the most significant (42). It is essential to note that our results align with those of previous research; however, the hierarchy of stressors may differ considerably from findings reported in other studies (12,43,44).

The interviews revealed two themes and four concepts pertinent to the stressors of the ED. They included clinical demands, emphasizing time pressure, multitasking, high-acuity patient care, and educational challenges, highlighting the difficulty of integrating didactic knowledge and balancing clinical duties and learning objectives.

Concerning the first theme, the fast-paced environment of the ED requires medical students to juggle multiple tasks and make rapid decisions under time constraints, which can be mentally taxing. The theme of clinical demands was a significant focus in the discussions with participants, underscoring the various stressors commonly encountered in ED environments. Two key elements were identified: First, the pressure of time constraints and the necessity for multitasking, and second, the complexities associated with providing care for high-acuity patients. Time constraints represent a significant source of stress and error for medical students in the ED, where the immediacy of patient requirements frequently conflicts with students' learning objectives. Empirical studies suggest that the fast-paced environment of the ED (45) can elevate stress levels and errors among healthcare practitioners, thereby influencing their decision-making processes and overall job satisfaction (46). Research, including the Harvard Medical Practice Study, indicates that roughly 1.5% to 3% of documented adverse events transpired within EDs (47). The imperative for prompt evaluation and intervention can generate a high-pressure environment in which delays in treatment may lead to adverse consequences for patient outcomes (48). These pressures may lead to heightened levels of anxiety, which can impede the processes of effective learning and the retention of essential knowledge. Multitasking constitutes a considerable challenge for medical students in the ED. Medical students have to frequently manage various

responsibilities, such as conducting patient assessments, completing documentation, and engaging with supervising physicians. The continual transition between these tasks can result in cognitive overload, heightening the risk of errors and adversely affecting the quality of their educational experience (49). The intricate nature of high-acuity patient care adds a layer of complexity to the learning environment; students must manage critical medical conditions while simultaneously honing their clinical reasoning and collaborative skills (50). The interaction among time constraints, multitasking, and the provision of high-acuity care highlights the necessity for effective educational strategies within the ED for medical students. Integrating organized mentorship, simulation-based training, and reflective practices can potentially improve the educational experience for medical students, thereby promoting resilience and proficiency in addressing clinical challenges.

Concerning educational challenges, this theme emerged as a critical area of concern for medical students in the ED, particularly regarding the integration of didactic knowledge and the balancing of clinical duties with learning objectives. Medical students often find it difficult to apply theoretical knowledge acquired in the classroom to the fast-paced, unpredictable environment of the ED. A systematic review examining the challenges associated with clinical medical education in Iran revealed that medical students require opportunities to apply and integrate their clinical knowledge during clinical rotations to enhance patient care. The results of this study indicated that medical students often lack familiarity with the course objectives and encounter numerous clinical responsibilities (37). These findings are consistent with those of our investigation. The exigent circumstances inherent in emergency care require prompt decision-making. This demand can be particularly daunting for students honing their clinical reasoning skills (51). Moreover, the simultaneous demands of fulfilling clinical duties and achieving educational objectives can result in considerable stress. Students frequently face the expectation to conduct patient assessments and complete documentation while concurrently assimilating intricate clinical information, which may contribute to cognitive overload (49). This balancing act can hinder their ability to engage fully in the learning process, as they may prioritize immediate clinical tasks over reflective learning. As a result, the educational experience within the ED may fall short of adequately equipping students for their future clinical roles. To mitigate these challenges, it is imperative to establish structured educational frameworks that foster the integration of theoretical knowledge with practical application.

This study had its own limitations. Firstly, convenience sampling in the quantitative phase may introduce bias, as it does not ensure a representative sample of the entire medical student population. This could limit the generalizability of the findings. Second, relying on self-reported data from the MSSQ and semi-structured interviews may introduce response bias. Participants may underreport or overreport their stress levels due to social desirability or recall bias, thus affecting the accuracy of the data collected. Finally, the study's single-institution design may limit the applicability of the findings to other educational settings or geographic locations.

Conclusion

This study underscores the considerable stressors medical students encounter during their medical training and clinical rotations in the ED, providing valuable insights into the relationship between clinical responsibilities and educational obstacles. The results demonstrate that male and female students encounter different types of stressors, with female students reporting elevated levels of stress related to academic performance, teaching-learning, and drive/desire-related issues. In contrast, male students are more affected by social pressures. Similarly, stressors such as insufficient medical skill practice, heavy workloads, tests, and poor grades were considered severe to high stressors. The high-pressure environment of the ED intensifies stress due to time constraints and the necessity for multitasking, thereby complicating the synthesis of theoretical knowledge with practical application. To enhance the educational experience, it is crucial to establish structured frameworks that assist students in managing these challenges. By addressing these stressors, it is possible to improve both educational outcomes and overall well-being, ultimately better preparing medical students for their future clinical responsibilities. It is essential to recognize that educational managers play a critical role in fostering a learning environment conducive to educational attainment (52).

Furthermore, increased job satisfaction within the workplace can significantly enhance organizational commitment (53). Clinical instructors can implement the findings by developing structured support systems focusing on academic success and emotional well-being. For instance, they can create mentorship programs that pair students with experienced clinicians who can guide the management of clinical responsibilities and the navigation of stressors. Additionally, incorporating regular workshops on time management, effective study techniques, and stress reduction strategies can empower students to balance their academic and clinical duties more effectively.

Acknowledgments

We sincerely express our thanks to all the students who took part in this study.

Authors' Contribution

Conceptualization: Amin Beigzadeh, Ali Reza Yusefi, Elhan Sharifpoor, Maryam Okhovati.

Data curation: Amin Beigzadeh, Elhan Sharifpoor.
Formal analysis: Amin Beigzadeh, Ali Reza Yusefi, Elhan Sharifpoor, Maryam Okhovati.
Investigation: Amin Beigzadeh, Elhan Sharifpoor.
Methodology: Amin Beigzadeh, Ali Reza Yusefi, Elhan Sharifpoor, Maryam Okhovati.
Project administration: Amin Beigzadeh.
Supervision: Amin Beigzadeh.
Writing–original draft: Amin Beigzadeh, Ali Reza Yusefi, Elhan Sharifpoor, Maryam Okhovati.
Writing–review & editing: Amin Beigzadeh, Ali Reza Yusefi, Elhan Sharifpoor, Maryam Okhovati.

Competing Interests
None.

Ethical Approval
This study was ethically approved by the Ethics Committee of Kerman University of Medical Sciences under the code IR.KMU.REC.1403.606. The Ethics Committee approved the acquisition of oral informed consent from participants.

Funding
None.

References
1. Johnson GA, Pipas L, Newman-Palmer NB, Brown LH. The emergency medicine rotation: a unique experience for medical students. J Emerg Med. 2002;22(3):307-11. doi: 10.1016/s0736-4679(01)00497-8.
2. Ahn J, Golden A, Bryant A, Babcock C. Impact of a dedicated emergency medicine teaching resident rotation at a large urban academic center. West J Emerg Med. 2016;17(2):143-8. doi: 10.5811/westjem.2015.12.28977.
3. McAllister M, McKinnon J. The importance of teaching and learning resilience in the health disciplines: a critical review of the literature. Nurse Educ Today. 2009;29(4):371-9. doi: 10.1016/j.nedt.2008.10.011.
4. Shanafelt TD, Boone S, Tan L, Dyrbye LN, Sotile W, Satele D, et al. Burnout and satisfaction with work-life balance among US physicians relative to the general US population. Arch Intern Med. 2012;172(18):1377-85. doi: 10.1001/archinternmed.2012.3199.
5. Rosal MC, Ockene IS, Ockene JK, Barrett SV, Ma Y, Hebert JR. A longitudinal study of students' depression at one medical school. Acad Med. 1997;72(6):542-6. doi: 10.1097/00001888-199706000-00022.
6. Compton MT, Carrera J, Frank E. Stress and depressive symptoms/dysphoria among US medical students: results from a large, nationally representative survey. J Nerv Ment Dis. 2008;196(12):891-7. doi: 10.1097/NMD.0b013e3181924d03.
7. Stecker T. Well-being in an academic environment. Med Educ. 2004;38(5):465-78. doi: 10.1046/j.1365-2929.2004.01812.x.
8. Mosley TH Jr, Perrin SG, Neral SM, Dubbert PM, Grothues CA, Pinto BM. Stress, coping, and well-being among third-year medical students. Acad Med. 1994;69(9):765-7. doi: 10.1097/00001888-199409000-00024.
9. Dyrbye LN, Power DV, Massie FS, Eacker A, Harper W, Thomas MR, et al. Factors associated with resilience to and recovery from burnout: a prospective, multi-institutional study of US medical students. Med Educ. 2010;44(10):1016-26. doi: 10.1111/j.1365-2923.2010.03754.x.
10. Talbi S, Rasteghar A, Saif MH. Investigating the relationship between stressful educational period and interaction with patient. J Med Educ Dev. 2019;13(4):358-66. doi: 10.18502/jmed.v13i4.528.
11. Dyrbye LN, Thomas MR, Shanafelt TD. Medical student distress: causes, consequences, and proposed solutions. Mayo Clin Proc. 2005;80(12):1613-22. doi: 10.4065/80.12.1613.
12. Saipanish R. Stress among medical students in a Thai medical school. Med Teach. 2003;25(5):502-6. doi: 10.1080/0142159031000136716 .
13. Pregoner JD. Research approaches in education: a comparison of quantitative, qualitative and mixed methods. IMCC J Sci. 2024;4(2):31-6.
14. Bazrafshan A, Haghdoost A, Rezaie H, Beigzadeh A. A practical framework for evaluating health services management educational program: the application of the mixed-method sequential explanatory design. Res Dev Med Educ. 2014;4(1):47-54. doi: 10.15171/rdme.2015.008.
15. Yusoff MS, Rahim AF, Yaacob MJ. The development and validity of the Medical Student Stressor Questionnaire (MSSQ). ASEAN J Psychiatry. 2010;11(1):231-5.
16. Yusoff MS. A multicenter study on validity of the Medical Student Stressor Questionnaire (MSSQ). Int Med J. 2011;18(1):14-8.
17. Yusoff MS, Rahim AF. The Medical Student Stressor Questionnaire (MSSQ) Manual. Malaysia: KKMED Publications; 2010.
18. Alizadeh R, Khorashadizadeh F, Shafiei R, Farahdel M, Poorbarat S. Examining the state of stress and its influencing factors in the students of North Khorasan University of Medical Sciences. J North Khorasan Univ Med Sci. 2024;16(2):91-5. doi: 10.32592/nkums.16.2.91.
19. Hsieh HF, Shannon SE. Three approaches to qualitative content analysis. Qual Health Res. 2005;15(9):1277-88. doi: 10.1177/1049732305276687.
20. Graneheim UH, Lundman B. Qualitative content analysis in nursing research: concepts, procedures and measures to achieve trustworthiness. Nurse Educ Today. 2004;24(2):105-12. doi: 10.1016/j.nedt.2003.10.001.
21. Lusardi P. Qualitative research in nursing: advancing the humanistic imperative. Nurs Res. 1996;45(1):62. doi: 10.1097/00006199-199601000-00014.
22. Hill MR, Goicochea S, Merlo LJ. In their own words: stressors facing medical students in the millennial generation. Med Educ Online. 2018;23(1):1530558. doi: 10.1080/10872981.2018.1530558.
23. Loureiro E, McIntyre T, Mota-Cardoso R, Ferreira MA. [The relationship between stress and life-style of students at the Faculty of Medicine of Oporto]. Acta Med Port. 2008;21(3):209-14. [Portuguese].
24. El-Gilany AH, Amr M, Hammad S. Perceived stress among male medical students in Egypt and Saudi Arabia: effect of sociodemographic factors. Ann Saudi Med. 2008;28(6):442-8. doi: 10.5144/0256-4947.2008.442.
25. Bineshian F, Saberian M, Haji Aghajani S, Ghorbani R, Fredonian M, Bineshian D, et al. Study of stress level among medical school students of Semnan University, Iran. Eur Psychiatry. 2009;24(S1):24-E1238. doi: 10.1016/s0924-9338(09)71471-3.
26. Alvi T, Assad F, Ramzan M, Khan FA. Depression, anxiety and their associated factors among medical students. J Coll Physicians Surg Pak. 2010;20(2):122-6.
27. Shah M, Hasan S, Malik S, Sreeramareddy CT. Perceived stress, sources and severity of stress among medical undergraduates in a Pakistani medical school. BMC Med Educ. 2010;10:2. doi: 10.1186/1472-6920-10-2.
28. Dahlin M, Joneborg N, Runeson B. Stress and depression among medical students: a cross-sectional study. Med Educ. 2005;39(6):594-604. doi: 10.1111/j.1365-2929.2005.02176.x.
29. Dyrbye LN, Thomas MR, Shanafelt TD. Systematic review of depression, anxiety, and other indicators of psychological distress among US and Canadian medical students. Acad Med.

2006;81(4):354-73. doi: 10.1097/00001888-200604000-00009.
30. Dyrbye LN, Thomas MR, Massie FS, Power DV, Eacker A, Harper W, et al. Burnout and suicidal ideation among US medical students. Ann Intern Med. 2008;149(5):334-41. doi: 10.7326/0003-4819-149-5-200809020-00008.
31. Dyrbye LN, Thomas MR, Harper W, Massie FS Jr, Power DV, Eacker A, et al. The learning environment and medical student burnout: a multicentre study. Med Educ. 2009;43(3):274-82. doi: 10.1111/j.1365-2923.2008.03282.x.
32. Khan MS, Mahmood S, Badshah A, Ali SU, Jamal Y. Prevalence of depression, anxiety and their associated factors among medical students in Karachi, Pakistan. J Pak Med Assoc. 2006;56(12):583-6.
33. Beigzadeh A, Yamani N, Bahaadinbeigy K, Adibi P. Challenges and strategies of clinical rounds from the perspective of medical students: a qualitative research. J Educ Health Promot. 2021;10:6. doi: 10.4103/jehp.jehp_104_20.
34. Heydari S, Beigzadeh A. Medical students' perspectives of reflection for their professional development. BMC Med Educ. 2024;24(1):1399. doi: 10.1186/s12909-024-06401-2.
35. Vali L, Shokoohi M, Beigzadeh A. Characteristics of a capable university teacher the viewpoints of faculty members of health services management department in Iranian medical universities. Iran J Med Educ. 2014;14(2):90-100.
36. Beigzadeh A, Bazyar H, Delzendeh M, Razmi MH, Sharifi N. Comparing the effect of lecture method and cooperative teaching method on the learning, communication skills, and attitudes of students: a quasi-experimental study. Front Educ. 2024;9:1449538. doi: 10.3389/feduc.2024.1449538.
37. Beigzadeh A, Yamani N, Bahaadinbeigy K, Adibi P. Challenges and problems of clinical medical education in Iran: a systematic review of the literature. Stride Dev Med Educ. 2019;16(1):e89897. doi: 10.5812/sdme.89897.
38. Weurlander M, Scheja M, Hult H, Wernerson A. The struggle to understand: exploring medical students' experiences of learning and understanding during a basic science course. Stud High Educ. 2016;41(3):462-77. doi: 10.1080/03075079.2014.930122.
39. Beigzadeh A, Yamani N, Sharifpoor E, Bahaadinbeigy K, Adibi P. Teaching and learning in clinical rounds: a qualitative meta-analysis. J Emerg Pract Trauma. 2021;7(1):46-55. doi: 10.34172/jept.2020.32.
40. Nazarieh M, Delzendeh M, Beigzadeh A. Motivation as an integral factor in English language learning for medical students. Res Dev Med Educ. 2023;12(1):7. doi: 10.34172/rdme.2023.33133.
41. Beigzadeh A, Bahaadinbeigy K, Adibi P, Yamani N. Identifying the challenges to good clinical rounds: a focus-group study of medical teachers. J Adv Med Educ Prof. 2019;7(2):62-73. doi: 10.30476/jamp.2019.44710.
42. Yusoff MS, Yee LY, Wei LH, Siong TC, Meng LH, Bin LX, et al. A study on stress, stressors and coping strategies among Malaysian medical students. Int J Stud Res. 2011;1(2):45-50.
43. Yusoff MS, Abdul Rahim AF, Yaacob MJ. Prevalence and sources of stress among Universiti Sains Malaysia medical students. Malays J Med Sci. 2010;17(1):30-7.
44. Guthrie E, Black D, Bagalkote H, Shaw C, Campbell M, Creed F. Psychological stress and burnout in medical students: a five-year prospective longitudinal study. J R Soc Med. 1998;91(5):237-43. doi: 10.1177/014107689809100502.
45. Beigzadeh A, Naghibzadeh Tahami A, Rezaei H, Bahman Bijari B, Nazarieh M, Seyed Askari SM. Epidemiology of trauma in Shahid Bahonar hospital in Kerman. J Emerg Pract Trauma. 2016;2(2):33-6. doi: 10.15171/jept.2015.16.
46. Laxmisan A, Hakimzada F, Sayan OR, Green RA, Zhang J, Patel VL. The multitasking clinician: decision-making and cognitive demand during and after team handoffs in emergency care. Int J Med Inform. 2007;76(11-12):801-11. doi: 10.1016/j.ijmedinf.2006.09.019.
47. Leape LL, Brennan TA, Laird N, Lawthers AG, Localio AR, Barnes BA, et al. The nature of adverse events in hospitalized patients. Results of the Harvard Medical Practice Study II. N Engl J Med. 1991;324(6):377-84. doi: 10.1056/nejm199102073240605.
48. Nugus P, Holdgate A, Fry M, Forero R, McCarthy S, Braithwaite J. Work pressure and patient flow management in the emergency department: findings from an ethnographic study. Acad Emerg Med. 2011;18(10):1045-52. doi: 10.1111/j.1553-2712.2011.01171.x.
49. Vella KM, Hall AK, van Merrienboer JJ, Hopman WM, Szulewski A. An exploratory investigation of the measurement of cognitive load on shift: application of cognitive load theory in emergency medicine. AEM Educ Train. 2021;5(4):e10634. doi: 10.1002/aet2.10634.
50. van Schaik SM, O'Brien BC, Almeida SA, Adler SR. Perceptions of interprofessional teamwork in low-acuity settings: a qualitative analysis. Med Educ. 2014;48(6):583-92. doi: 10.1111/medu.12424.
51. Alfaro-LeFevre R. Critical Thinking, Clinical Reasoning, and Clinical Judgment E-Book. Elsevier Health Sciences; 2019.
52. Salajegheh M, Bahman Bijari B, Shokouhi M, Safipour Afshar A, Beigzadeh A. Educational environment assessment at outpatient clinics in teaching hospitals of Kerman University of Medical Sciences, Iran, from resident's perspective based on the ACLEEM questionnaire. Stride Dev Med Educ. 2015;12 Suppl:119-30.
53. Rezaei H, Bahman Bijari B, Beigzadeh A, Seyed Askari SM, Khadir E. Job satisfaction and organizational commitment of nurses in teaching hospitals affiliated to Kerman University of Medical Sciences. Iran J Med Educ. 2017;17:245-50.