

Investigating the impact of the Emergency Department's overcrowding on educational indices and emergency deputies' satisfaction with clinical education



Mehdi Yarahmadi,¹ Mehri Ayati²

ABSTRACT

Background: Emergency department (ED) is a useful place in terms of clinical education opportunities for medical students, residents, and even other hospital staffs. Overcrowding in ED except for the effects on the patients' fate and ED condition, it's may be effective in resident clinical education.

Aims: This study aims to investigate the effect of emergency crowding on the education of residents.

Methods: This cross-sectional study was carried out on the emergency medicine residents for 21 weeks in ED of Imam Khomeini Hospital in Tehran. This hospital is a level-1 trauma center and a training center. The crowding indexes included Occupancy Rate (OR), Residences Work-Load (RWL). The educational indexes included the amount of Trauma Team Participation (TTP), Assistance's Physical Examinations (APE), Assistance's Taken Histories (ATH), Assistance's written orders (AWO), the participation in the clinical scientific discussion, Assistance's

Independently Procedures (AIP), and the number of Assistant Ultrasounds (AUS). Educational Indices, Clinical Education Satisfaction, and Residents' Viewpoints were evaluated by using a questionnaire on the amount of crowding in shift works.

Results: A total of 126 Resident Shifts were reviewed. There was a significant relationship between the useful education (UE) with OR ($P = 0.006$). RWL was a significant statistical relationship with all parameters except for the TTP and AUS. No relevance was found for age and sex with educational indicators. Postgraduate Year (PGY), was strongly associated with educational indicators except for TTP and AUS.

Conclusion: Emergency crowding did not adversely affect the education in term of total OR and RWL. Moreover, it has been useful and effective in educational indicators such as storytelling, conducting procedures, placing orders and physical examination.

Keywords: Emergency Crowding, Clinical Education, Emergency Medicine Resident.

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¹Department of Emergency Medicine, Imam Khomeini Hospital Complex, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

²Children's Medical Center, Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran

INTRODUCTION

Emergency crowding is a complex phenomenon that has various causes and occurs in various forms.¹ The US Emergency Medicine College has published this definition for crowding that: crowding occurs in the ED, when the known needs for emergency services, are greater than the available resources for patient care in the ED, hospital, or both.^{2,3} In a study in the United States, 91% of the 575 respondents reported that the crowding was a major emergency problem and 40% reported that overcrowding is a problem that exists on a daily basis.⁴ Given that this causes many troubles in many emergencies, it is a concern that this can affect the ability of emergency medical personnel to manage the growing number of emergency patients safely and efficiently.⁵ ED is a useful place in terms of clinical education opportunities for medical students, residents and even other hospital staffs.⁶ However, there is evidence that the hospital's crowding may have negative impacts on education. Few documented studies measure the effect of emergency crowding

on residents education.⁷⁻⁹ The main reasons for the lack of such data are due to the difficulty of calculating the Objective emergency crowding, the extent of professors educating and learners, and the lack of reliable methods for measuring educational outcomes.¹⁰ Centralized clinical education is an essential component of training in the ED. If that faculty have to see more patients and care/ treatment them due to overcrowding in the emergency, It seems logical that the time spent on residents clinical education is reduced.¹¹⁻²¹ Therefore, further studies are needed to investigate the relationship between education and overcrowding in the ED.

METHODS

Study Design

This cross-sectional study was performed in the ED of Imam Khomeini Hospital in Tehran for 21 weeks. This ED is a level I trauma center and a teaching unit. The emergency residency program in this center is 3 years long. Sex emergency residents

*Corresponding to:
submit.hna2@gmail.com

are working in each 12-hour shift, (3 residents in the first year of education, 2 resident in the 2nd year and one resident in the 3rd year). This ED is divided into E1, E2, Fast Track and CPR sections. In E1 and E2 parts, two residents of the years 1 and 2 of education are working while in the Fast Track, one resident of the first year and the CPR room, one resident in years 3 of education is in each shift. In this study, residents from all 3 years of the term time have been selected as the study population. During the 21 weeks of the study, shifts were determined randomly to examine the impact of crowding on educational indicators.

Educational Indicators

During this study, various indexes were identified from books, articles, and opinion of the professors. Then, with the Delphi technique, these indexes were sorted and determined by the given privileges. Each resident was asked to collect all the cooperation's at the end of each shift Including: trauma team participation, the number of complete physical examination of patients, the number of histories taken by resident, the number of orders written by resident, participation in the scientific clinical discussion with attending faculty, the number of procedures done independently, the number of Ultra sonographies done under direct supervision of faculty.

Crowding Indexes

The OR is defined as the crowding index in this study. It included the total of patients admitted to the Emergency Medicine Service, the total number of patients admitted to other services, and the total number of patients waiting to be admitted in each section divided by the number of beds approved in each emergency department. The total OR in our study was divided into two groups, such as E1: total OR, which included all patients in the E1 and CPR rooms, and E2: total OR, which included all patients in the E2, operating rooms, and the fast track. Therefore, a total OR for E1 and one total OR E2 were obtained. The method for collecting data was as follows: E1 include all the patients admitted at that moment were asked from the supervisor (according to the written data of the information department) and was added to the number of patients admitted to the CPR room (this information was obtained from the CPR Resident). Moreover, those were divided by the number of beds approved in these two sections which consisted of 30 beds and multiplied by 100 to obtain OR at that moment. This process was performed at the start of each shift, mid-shift, and the end of each shifter, then the average of the numbers obtained was recorded as E1: total OR, in

that shift. As for total E2, the number of patients admitted to the E2 section was initially asked at the same time as the supervisor section, according to the written data of the information department. The number of patients in the operating room was also asked at the same time from the Resident. The number of patients waiting for the outpatient operating room was also requested from the triage room. The number of Fast Track patients was also required from the Resident, summed up the resulting numbers and divided by the number of beds approved in the E2, which was 26 beds, and to get E2 OR at the same time the resulting number was multiplied by 100. Like E1, data were collected at the start of each shift, mid-shift, and the end of each shifter, and the resulting numbers were taken to the total OR E2. It should be noted that the patients' waiting list in E1, E2, and fast-track sections was first given to the supervisor and then delivered to the relevant resident, as well as the number of hospitalized patients at the same time were received from the section supervisor.

As to measure RWL, at the beginning of each shift, each assistant was asked to record the total number of patients delivered from the previous shift, as well as all number of patients admitted by him during the shift. Then, at the end of the shift, the number of patients for each resident was recorded as a workload for that resident and a crowding index. RWL will describe the assistant's workload.

Data Collection

Assistants were asked to complete the form including Gender, Age, Year of Education, Resident Crowding Estimation, Useful Education (UE) and Faculty Active Role in Clinical Education (FARCE), at the end of each shift. The first question was that "My clinical education was useful today" and the responses are in the following order: I strongly disagree, disagree, I have no idea, I agree, and I very much agree. The second question was "The faculty played an active role in today's clinical education." The answer options were the same as the previous question. Residents were also asked to complete the assessed variables for the crowding index and the education index according to the training provided.

Data Analyses

SPSS v.16 software performed statistical analysis. As to describe the data, the study used indicators such as mean, frequency, SD, and Interquartile Range (IQR). T-test and chi-square test were used to analyze the data. Regression analysis was also used to study the Crude and Adjusted effects of the variables.

RESULTS

A total of 126 questionnaires were completed included 66 questionnaires were completed in day shift and 60 in night shifts. In addition, females completed 51 questionnaires and 75 for males. As the results show, OR except the UE (P-value = 0.006) did not have any significant relationship with any of the studied indices (Table 1). The two educational indicators are conducted under the supervision of the faculty, the number of ultrasonographic conducted by the assistance under the supervision of the faculty in each shift (ADUS) and the number of patients visited by the assistance under the control of the faculty in each shift (APV). OR with ADUS and APV had no significant relationship with P-values of 0.367 and 0.599, respectively. Also, the association of OR with the UE was significant (P-value = 0.006) but abut in FARCE was not significant (P-value = 0.778). As shown in Table 1, Results shows that the relationship between RWL and educational indices, other than TTP and ADUS was significant and meaningful. However, between the RWL with the UE and FARCE, no significant relationship was found (P-value = 0.358 and P-value = 0.05030, respectively). Assistance's age, except for UE and AFRCE, had no significant relationship with any of the educational indices. Table 1 shows the average rate of indicators based on gender. As can be seen in the table, none of the indicators were

related to gender. According to the results, between the TTP, APE, and AWO there was no difference between the 3 years of residency. Therefore, ATH was different for the residents of the first year with 2nd and 3rd year of education. However, there were no differences between the residents of the 2nd year with the 3rd year of education. There was a significant difference in AIP between the three years of residency and APV was different for the residents of the 3rd year with the first and 2nd year of education. However, there were no differences between the residents of the 1st year with the 2nd year of education. About the ADUS, there was no difference between the 3 years of residency. Also, there was no statistically significant relationship between the UE and the educational years (P = 0.074) while FARCE had a significant difference between educational years (P = 0.002).

DISCUSSION

A total of 126 Resident-Shifts were reviewed. Our results show that UE has a significant relationship with OR (p = 0.006). Therefore, there was a significant relationship between RWL and educational indicators such as ATH, AIP, AWO, APE, and APV. Therefore, in this framework, educational factors are directly related to RWL and the greater the number of patients was synonymous with

Table 1 The relationship between crowding indicators and other variables studied on educational outcomes

Variables	OR	RWL	AGE		Mean	SD	P-value	Year of education		P-value
			P-value	Gender				1	2	
TTP	0.191	0.578	0.349	Male	0.16	0.464	0.847	1	2	0.984
								3	3	0.189
								2	1	0.984
								3	3	0.282
								3	1	0.189
								2	2	0.282
ATH	0.396	0.000	0.180	Male	11.94	10.610	0.451	1	2	0.000
								3	3	0.000
								2	1	0.000
								3	3	0.277
								3	1	0.000
								2	2	0.277
APE	0.430	0.000	0.155	Male	11.96	10.592	0.429	1	2	0.000
								3	3	0.000
								2	1	0.000
								3	3	0.254
								3	1	0.000
								2	2	0.254

Table 1 Continue

Variables	OR	RWL	AGE		Gender	Mean	SD	P-value	Year of education		P-value
			P-value								
AWO	0.399	0.000	0.146		Male	11.86	10.604	0.411	1	2	0.000
										3	0.000
									2	1	0.000
										3	0.241
										1	0.000
										2	0.241
AIP	0.398	0.003	0.472		Male	2.47	2.738	0.648	1	2	0.000
										3	0.026
									2	1	0.000
										3	0.001
										1	0.026
										2	0.001
APV	0.599	0.031	0.936		Male	9.53	8.103	0.166	1	2	0.248
										3	0.000
									2	1	0.248
										3	0.005
										1	0.000
										2	0.005
ADUS	0.367	0.226	0.197		Male	0.24	0.551	0.835	1	2	0.770
										3	0.281
									2	1	0.770
										3	0.625
										1	0.281
										2	0.625
UE	0.006	0.358	0.000					0.000			0.074
FARCE	0.778	0.530	0.044					0.151			0.002

educational opportunities, but on the other hand, RWL has no relation with UE and FARCE questions. Therefore, it seems that the workload in the perception of the assistants was not effective in the quality of education, and education in crowded and non-crowded conditions was not different, and the role of the faculty did not differ in different conditions of high or low workloads. In a study of 30 pediatricians, low-cost clinics with longer hospitalization and more delayed work-ups were associated with lower educational qualities.¹² In another study in the anesthetizing part of the operating room, of the 1558 surgeries, 33% reduction in the interaction between the resident with faculty was observed. When a faculty should serve at the same time in more than one operating room, the shortage of faculty presence in the department was associated with a reduction in educational time.¹³ However, in contrast to these findings, some studies in the emergency departments suggest that the crowds did not

affect students' learning from faculty education. As Kelly et al.¹⁴ found, an expert emergency medical faculty, independent of emergency crowding rates and the number of patients, received higher educational assessment scores from emergency residents. Berger et al.¹⁵ also found that high-level emergency department Faculties, regardless of the amount of clinical work, received higher education assessment grades from medical students. According to the perception comprehensive in terms of the quality of education, these studies suggest that excellent educators, independent of the clinical workload, they will be excellent educators, that it conflicts with previous studies.^{12,13} In the study of Mahler and colleagues,⁹ there was no significant difference between the quality of supervision and guidance during procedures or the quality of teaching by faculty during shifts. During crowded shifts, emergency responders saw fewer patients and had fewer procedures. However, the residents' opinion about

the value of shift training based on crowds was not significantly different. The long-term effects of crowding on the training of emergency department residents are not known. Another point was that the UE was associated with OR, it can be said that OR included all the emergency patients and other services, but RWL was only related to the same resident in the same shift. RWL seems to be more efficient and credible. So to this, it can be said that the crowding does not affect clinical education and the perception of assistance from the role of faculty in education. Nevertheless, depending on the number of patient's educational factors (biographies, physical examination, etc.), increase with crowding. Assistants do not consider these tasks to be educational objectives, and they do not feel trained in doing these things.^{10,16,17} Differences in educational factors between assistants with different academic years, probably due to the burden of work distributed among the assistants, mainly affects the assistants of year 1. On the other hand, in terms of procedures, the assistance from the 2nd year of education was significantly more active than those in Year 1 and 3. Sophisticated procedures are not possible by assistants in the first year of education. the assistance of the 3rd year of education are more likely to be involved in the supervision and guidance of the emergency department than to be in the process of carrying out the procedures, which is, of course, correct in terms of training and the chain Education is reserved.^{10,18} Regarding the number of visits don by the assistants (under the direct supervision of the faculty), there was no difference between the assistants in first and 2nd years of education and the faculty supervision were the same of this two graduates, but they differed with regarding the assistance of the third year of education. It seems that the creation of independence for high-level assistants can be a good solution to deal with the crowding-out effect on the training of assistants.⁶ In this way, senior assistants who have more opportunities to manage more complex situations and can be more independent by relying on more knowledge and experience than other assistants. Therefore, the faculty will have more time to teach first-year assistants. In this way, the knowledge and expertise of the assistants will be created, so that they can act independently in the future.^{19,21} In the present study, with increasing age, the satisfaction index of the usefulness of clinical education and the role of the faculty in education was increased. In previous research, this issue has not been addressed; perhaps this can be attributed to the differences between the new generation in access to technology and facilities and training materials, which need further studies to make a definitive comment.

CONCLUSION

It seems that in our study, emergency crowding with regard to OR and RWL has not had a negative impact on education and has been useful and effective in educational indicators such as taken history, procedures done, writing orders and physical examinations. Our study looks like a pattern similar with scenario B in the study of Shayne et al.⁶

LIMITATIONS

Residents may have less inclination at the crowded times to learn, which may have an impact on the results of the current study. Therefore, in order to reduce this limitation, the evaluated shifts were chosen randomly. Assistants may be afraid of giving low scores to clinical education, so to minimize this limitation, the completion of questionnaires was made without mentioning the person's profile.

CONFLICT OF INTEREST

Author declares there is no conflict of interest regarding all aspect of the study.

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