

# Research Paper: Admission Indicators for Prehospital Emergency Medical Students



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## ABSTRACT

**Background:** Appropriate and timely response in urgent situations requires vast knowledge and physical and mental preparedness. Since emergency medical technicians are the first professional respondents in the health system, selecting the right people to study in this field is very important. Because there is no specific model in Iran to propose the indicators in the selection of applicants for this field, the present study was conducted to offer some indicators for the admission of prehospital emergency medical students.

**Materials and Methods:** This research was conducted using a mixed qualitative and quantitative approach in three steps: reviewing the relevant texts, meetings of scientific and operational experts, and determining the validity and reliability of the content. After finalizing, the areas and indicators of student selection were used in the interview process of candidates in 2020. SPSS v. 24 software was used for quantitative data analysis.

**Results:** The selection tool for prehospital emergency medical students included 4 areas (with 26 criteria): 1) general qualifications area with 8 criteria (documents concerning degree and identity, written GPA of diploma, entrance exam score, type of diploma, special abilities, working in relief organizations, gaining a scientific-sports position, and interviewing of faculty members); 2) physical health with 7 criteria (height, body mass index, visual health, hearing health, stuttering, organ dysfunction-physical disability, and chronic debilitating diseases); 3) psychological status with 5 criteria (orderliness, responsibility, quick and correct decision making, stress management, and belief in teamwork); and 4) physical fitness with 6 criteria (1600-m run, 45-m speed-run, 4×9 m run, sit-up, long jump, and Swedish swimming in 30 s).

**Conclusion:** Given the vital importance of prehospital emergency medical jobs as the front line of the health system response, selecting the right people will play a significant role in increasing the quality of services provided, increasing patient satisfaction, and ultimately improving health of the community.

## Keywords:

Admission indicators,  
Student, Prehospital medical  
emergencies

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## 1. Introduction

**A**fter introducing the concept of human capital, the issue of higher education has become one of the most important issues in countries. In higher education centers, the educational system is based on the three main elements of student, content, and faculty. Any weakness or deficiency in these three elements will cause severe problems in the education process. Therefore, as much as the content of the courses and the sensitivity to the selection of faculty members are essential, the issue of assessing and selecting students is important and vital for higher education [1].

In the previous studies, the predictor variables in student admission in order of importance were values (such as truthfulness, fairness, honesty, and trustworthiness), maturity and responsibility, writing ability, interpersonal communication skills, ability to work in a team, commitment to discipline, breadth of opinion, critical thinking and problem-solving ability, motivation, ability to do work, leadership, independence, having an open mind, and establishing professional communication [2, 3].

The prehospital emergency staff attends to urgent and critical patients [4]. It should be noted that the priority of prehospital medical emergencies is to prevent the aggravation or occurrence of injuries and death in humans. This objective will be achieved by the timely presence at the scene, rapid initial diagnosis, appropriate on-site treatment, transfer to a proper medical center, and care during transfer [5].

The duties of prehospital emergency medical staff may put them in sensitive and stressful situations around the clock. Therefore, candidates to enter this job must be physically, mentally, and psychologically prepared to serve in harsh environments, such as epidemics, traffic, industrial, mountainous, marine accidents as well as man-made and natural disasters, such as floods, earthquakes, storms, fires, and wars. Ambulance driving, transporting the sick/injured individuals, providing primary medical services, informing and performing other services as directed by the emergency physician are some services of this group of healthcare workers. For this reason, the applicants must have the necessary preparation to work under challenging conditions and communicate with the patient/injured people and their relatives. Therefore, it is important to admit students whose success can be predicted [3].

To hire prehospital emergency medical technicians, the Prehospital Medical Emergency and Accident Manage-

ment Center In Iran have used the indicators of proper physical health (lacking chronic, infectious, incurable diseases, and neurological diseases, lacking congenital or acquired disability); being smoke-, drugs- and psychotropic substances-free (even once); no stuttering; having normal vision and hearing, height over 170 cm, BMI less than 29, physical fitness and skills for quick help [6]. In Iran, the admission of prehospital emergency medical students is done through the national exam of universities and in a semi-centralized manner. Also, no standard tool is available for post-diploma and undergraduate students in the field of prehospital emergency medicine in the second stage (interview). So, we decided to design a suitable tool for admitting prehospital emergency medical students at the post-diploma level.

## 2. Materials and Methods

This research is a mixed study using qualitative and quantitative approaches simultaneously. To achieve prehospital emergency medical student admission indicators, at the first stage, we searched databases of Scopus, ProQuest, PubMed, Science Direct, and Google Scholar using keywords of “emergency medical technician training”, “prehospital emergency medical care”, “admission criteria of prehospital medical emergency students”, “characteristics of emergency medical technician”, “general competencies”, “physical health”, “psychological condition”, and “physical readiness.” Through literature review, we attempted to determine the student admission indicators by emphasizing the admission of new prehospital emergency medical students and considering their roles and duties objectively and recommendatory, where possible.

The second stage of the study, 14 panels with the participation of relevant experts (Vice-Chancellor for Education, Director of University Education, Head of Educational Development office, 3 members in charge of emergency medical bases, 3 members of the scientific group of prehospital emergency medicine, 2 physical education experts, and 3 psychologists) were held to evaluate the data obtained from the first stage. The results of the first and second stages of the study were the selection of 29 criteria for admission of prehospital emergency medical students in 4 areas of general qualifications, physical health, psychological status, and physical fitness.

In the third stage, we used the Delphi method. This method is a structured process for collecting and classifying the knowledge of a group of experts, done by distributing questionnaires among them and controlling feedback on the answers and comments received [7].

So, the criteria obtained from the first and second stages were sent by e-mail to 20 faculty members. They were recruited by purposive sampling method from the members of the prehospital emergency medicine department, emergency medicine, and emergency base officials that were available in Tehran, Qazvin, Semnan, Yazd, Alborz, and Gilan provinces. They were willing to participate in the study. After receiving their comments, the changes were applied, and the revised criteria were sent to the experts. Finally, after receiving experts' opinions and making final changes, 26 criteria were developed in the four mentioned areas.

After finalizing the areas and criteria for admission of prehospital emergency medical students, a meeting was held with the presence of experts to decide on how to score the areas and criteria. According to experts' opinions, a score of 100 was considered for all areas. Then, scoring each of the areas and criteria was done according to the priority and importance of that area and criteria. Also, starred criteria such as stuttering, organ dysfunction, physical disability, and chronic debilitating diseases were considered without the score.

In psychological status, Cattell's 16-factor personality questionnaire was approved to assess the criteria. Cattell (1975) reduced personality to 19 basic dimensions, which he called profound traits, and using the factor analysis method, constructed a 16-factor personality questionnaire (16PF). Based on 16PF, a complete assessment of each person's personality is acquired. Cattell has given each factor two names, one for high scores and the other for low scores. Therefore, this questionnaire was based on basic research in psychology to provide complete coverage of personality quickly and has been used in many studies to evaluate and examine personality traits. The questionnaire is a self-report tool that has 187 questions. Each question can be scored based on one or even two factors. It is suitable for people over 16. This test, like other structured tests, is designed based on the assumption that human traits are relatively stable in different situations and differ from person to person, which is at the same time measurable [8-10].

Barzegar evaluated the validity of the 16PF Persian version on high school students [11]. They used three different test-retest methods with short time interval, test-retest with long time interval, and internal matching method (the Cronbach  $\alpha$ ). The average validity obtained from the test-retest with a short distance was 65%, with a long-distance 52%, and with the internal consistency method 54%. The average validity coefficient of this questionnaire was 76%, indicating the acceptable va-

lidity and reliability of this questionnaire [11]. Because Cattell's 16-factor personality questionnaire examines the deep layers of the participant's personality in a short time, and since this questionnaire has been used in various studies and has reliable validity and reliability, we used it in the present study.

A total of 74 volunteers from all over Iran in 2020, who were introduced to Qazvin University of Medical Sciences by the assessment organization, were evaluated by 26 proposed admission indicators for prehospital emergency medical students. Volunteers were enrolled in the study using the census method.

After the admission process, the candidates' satisfaction with the method was assessed using a researcher-made questionnaire. In the mentioned questionnaire, 9 items of "the behavior of the interviewers are appropriate", "the documents intended for the interview are appropriate", "the intended items are appropriate for a physical health examination", "the intended items are appropriate for a psychological status examination", "the intended items are appropriate for a physical fitness examination", "the conditions of the general qualification assessment station are appropriate", "the conditions of the psychological status assessment station are appropriate", "the conditions of the physical fitness assessment station are appropriate", and "the conditions of the physical health assessment station are appropriate" were examined. The items were scored on a 5-point Likert-type scale, with scores ranging from 5=very much to 1=very low. The maximum score is 45, and the minimum score is 9. Higher scores indicate a high level of satisfaction, and lower scores indicate a poor level of satisfaction.

To evaluate the content validity of the present study, two quantitative methods of Content Validity Ratio (CVR) and Content Validity Index (CVI) were used. Lawshe designed the content validity ratio. To calculate this ratio, 20 panels were held with the participation of experts. First, the experts were explained the purpose of the study and the indicators developed. They were asked to categorize each indicator based on a 3-point Likert scale from "item is necessary" to "item is useful but not necessary", and "item is not necessary." After collecting the opinions of experts, the content validity ratio was calculated using the following formula:

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}}$$

In the above formula, is the number of experts who answered the "necessary" option, and "N" is the total num-

ber of experts. If the value calculated for each indicator was greater than the value of the Lawshe table based on the number of experts, the validity of the content of that indicator would be accepted. The minimum acceptable criterion for this study was determined according to Lawshe table 0.42 (due to the participation of 20 experts). Indicators for which the value of the calculated content validity ratio was less than the desired amount were removed [12-14].

Waltz and Bausell designed the content validity index. To calculate the content validity index, 20 panels were held with the participation of experts. First, the experts were explained the purpose of the study and the indicators developed. To determine this index, the experts were asked to rate the relevance of each indicator based on a 4-point Likert scale from “unrelated”, to “need to be thoroughly reviewed”, then “relevant but in need of review”, and finally, “completely relevant.” We divided the number of experts who chose options “relevant but in need of review” and “completely relevant” by the total number of experts. If the value calculated is less than 0.7, the item is rejected. If the value is between 0.7 and 0.79, a review should be performed, and if the value is greater than 0.79, it is acceptable [12, 13, 15]. The internal consistency method (the Cronbach  $\alpha$  coefficient of 0.9) was used to determine the tool’s reliability. SPSS v. 24 was used to analyze the data.

### 3. Results

The result of the first and second stages of the study was identifying 29 criteria for the admission of prehospital emergency medical students in 4 areas of general qualifications, physical health, psychological status, and physical fitness. After holding two rounds of Delphi and removing 3 criteria, finally, 26 criteria in four areas remained. These areas are as follows: general qualifications with 8 criteria (documents concerning degree and identity, written GPA of diploma, entrance exam score, type of diploma, special abilities, working in relief organizations, gaining a scientific-sports position, and interviewing of faculty members), physical health with 7 criteria (height, body mass index, visual health, hearing health, stuttering, organ dysfunction-physical disability, and chronic debilitating diseases), psychological status with 5 criteria (orderliness, responsibility, quick and correct decision-making, stress management, and belief in teamwork), and physical fitness with 6 criteria (1600 m run, 45 m speed-run, 4×9 m run, sit-up, long jump and Swedish swimming in 30 s). Also, some criteria were determined as starred indicators. According to the executive instructions of the National Assessment and Educa-

tion Organization, the presence of defects in any of these criteria prevented the acceptance of the candidate in the interview process. Starred criteria in physical health are stuttering, organ dysfunction and physical disability, and history of chronic and debilitating diseases.

After not obtaining acceptable CVI scores, we removed the three criteria of “membership in cultural organizations and institutions”, “obtaining a position”, and “artistic appreciation letter” from the area of general competence and one criterion of “a history of infectious diseases” from the area of physical health. In the remaining 26 criteria, the CVR value was more than 0.42, and the CVI score was more than 0.79. In this study, the Cronbach  $\alpha$  coefficient for 26 student admission criteria was calculated to be 0.9 (Table 1).

After finalizing the criteria, a score of 100 was allocated for all areas. In this scoring, 25% is allocated to general qualification, 25% to physical health (in this area, according to the experts present at the meeting, starred criteria were considered without a score), 20% to physical fitness, and 30% to psychological status. Table 2 presents the approved scores for each criterion.

We evaluated 74 volunteers from all over Iran by 26 proposed admission indicators for prehospital emergency medical students in 2020. They were introduced to Qazvin University of Medical Sciences by the assessment organization. After the admission process, a researcher-made questionnaire of volunteer satisfaction of 74 volunteers was completed by researchers. According to Table 3, the Mean $\pm$ SD score of candidates’ satisfaction is 4.46 $\pm$ 0.6, indicating a very high level of satisfaction of candidates in all areas (Table 3).

### 4. Discussion

The present study was conducted to prepare the proper indicators for admission of prehospital emergency medical students. Finally, 26 indicators in four areas were developed, which will be discussed separately below.

Regarding the area of general qualifications, 8 criteria of presentation of educational-identity documents, written GPA of diploma, score obtained in the university entrance exam, type of diploma, interview of faculty members with the candidate, membership in relief organizations, obtaining a position, and a letter of appreciation for scientific-sports activities and special abilities were approved. In line with the present study, Palm Beach State College (2017) and Dean College (2017) have considered the cri-

**Table 1.** Content validity index and content validity ratio of admission indicators for prehospital emergency medical students

Areas of Evaluation	Admission Criteria	CVR	CVI		
			Relatedness	Measurability	Clearness
General qualifications	Documents concerning degree and identity	0.7	0.9	0.95	0.95
	Written GPA of diploma	0.6	0.9	0.95	0.95
	Entrance exam score	0.7	0.95	0.95	0.95
	Special abilities	0.7	0.9	0.95	0.9
	Working in relief organizations	0.6	0.9	0.9	0.9
	Gaining a scientific-sports position	0.7	0.95	0.95	0.9
	Type of diploma	0.7	0.9	0.95	0.95
	Interviewing of faculty members	0.7	0.9	0.85	0.9
Physical health	Height	0.8	0.95	0.95	0.9
	BMI	0.6	0.95	0.95	0.95
	Visual health	0.9	0.95	0.95	0.95
	Hearing health	0.8	0.95	0.95	0.95
	Stuttering	0.9	0.95	0.95	0.95
	Organ dysfunction-physical disability	0.9	0.95	0.95	0.95
	Chronic debilitating diseases	0.9	0.95	0.95	0.9
Psychological status	Orderliness	0.9	0.95	0.9	0.9
	Responsibility	0.9	0.95	0.9	0.9
	Quick and correct decision-making	0.9	0.95	0.9	0.9
	Stress management	0.9	0.95	0.9	0.9
Physical fitness	Belief in teamwork	0.8	0.95	0.9	0.9
	1600 m run	0.8	0.9	0.95	0.95
	45 m speed-run	0.8	0.9	0.95	0.95
	4×9 m run	0.8	0.9	0.95	0.95
	Sit-up	0.8	0.9	0.95	0.95
	Long jump	0.8	0.9	0.95	0.95
Swedish swimming in 30 s	0.8	0.9	0.95	0.95	

**Table 2.** Admission criteria and area scores for prehospital emergency medical students

Areas	Admission Criteria	%			
		Criteria Scores	Area Score		
General qualifications	Written GPA of diploma	4	25		
	Entrance exam score	5			
	Special abilities	1.5			
	Working in relief organizations	1.5			
	Gaining a scientific-sports position	2			
	Type of diploma	1			
	Interviewing of faculty members	Adorned appearance=2 Respectful treatment=1.5 Verbal communication=1.5 Sense of responsibility=2 Skills in basic life support=3		10	
Physical health	Height	Male volunteer	Female volunteer	10	
		Less than 170=0 170-175=2 176-180=5 181-185=8 186-190=10 More than 190=0	Less than 160=0 160-165=2 166-170=5 171-175=8 176-180=10 More than 180=0		
	Body Mass Index	Less than 18.5=0 18.5-24.9=5 25-29.9=3 30-34.9=1 More than 35=0		5	25
		Visual health		5	
	Hearing health		5		
	Stuttering*		-		
	Organ dysfunction-physical disability*		-		
	Chronic debilitating diseases*		-		
	Psychological status	Orderliness		6	30
		Responsibility		6	
Quick and correct decision-making			6		
Stress management			6		
Belief in teamwork			6		
Physical fitness	1600 m run		4	20	
	45 m speed-run		3		
	4×9 m run		3		
	Sit-up		3		
	Long jump		3		
	Swedish swimming in 30 s		4		

\*A positive response to the starred items will result in the rejection of the candidate.

**Table 3.** Volunteers satisfaction scores

Variables	Mean±SD
The behavior of the interviewers is appropriate.	4.72±0.45
The documents intended for the interview are appropriate.	4.48±0.63
The intended items are appropriate for a physical health examination.	4.37±0.82
The intended items are appropriate for a Psychological status examination.	4.55±0.68
The intended items are appropriate for a physical fitness examination.	4.51±0.73
The conditions of the general qualification assessment station are appropriate.	4.34±0.89
The conditions of the psychological status assessment station are appropriate.	4.48±0.73
The conditions of the physical fitness assessment station are appropriate.	4.34±0.81
The conditions of the physical health assessment station are appropriate.	4.31±0.84
Total	4.46±0.6

teria for providing credentials for admission of prehospital emergency medical students [16, 17].

Moreover, the current study indicators are similar to the indicators of Kapiolani College (2018) for the selection of prehospital emergency medical technicians, Faraji Deh et al. (2015) for the admission of doctoral students, and Kuncel et al. (2010) for the admission of students in different universities in which the written GPA of the diploma and the score obtained in the entrance exam are among their main indicators [18-20]. Based on the results of previous studies and the present study, the written GPA of the diploma and the score obtained in the entrance exam can predict the scientific success of students in the study period.

According to the present study, Kapiolani College (2018) for the selection of prehospital emergency medical technicians and the Prehospital Medical Emergency and Accident Management Center (2016) for the employment of prehospital emergency technicians have gained an advantage from the interview with volunteers criteria [6, 18]. The results indicate that open-ended interviews are useful in evaluating the students in terms of appearance, communication skills, self-confidence, responsibility, interest in prehospital medical emergencies, altruism and self-esteem, belief in teamwork, acceptance of service in difficult situations, and decision-making power in emergencies. Additionally, in line with the current research, Kapiolani College (2018) used membership indicators in relief organizations and gaining a position and a scientific-sports certificate to select pre-

hospital emergency medical technicians [18]. According to the obtained results, the history of membership or activity in relief organizations and obtaining a position and scientific-sports certificate can predict scientific success and readiness of the student to work in difficult and critical conditions in the future.

Concerning physical health, 7 criteria of height, body mass index, visual health, hearing health, speech status, organ dysfunction and physical disability, and history of chronic debilitating diseases were evaluated.

According to experts' opinions, female volunteers whose height was less than 160 cm and male volunteers with less than 170 cm scored 0 in the height criterion. Also, female volunteers taller than 180 cm and male volunteers taller than 190 cm did not get any points in the height criterion. Prehospital emergency medical technicians who are too short or too tall will not fit while transporting the patient with colleagues, leading to the patient's falling.

Moreover, starred criteria, i.e., stuttering, organ dysfunction-physical disability, and chronic debilitating diseases, were considered without the score. Candidates who met these criteria were excluded from the study. The emergency medical technician who stutters cannot communicate effectively with patients, companions, and colleagues. The technician who has organ failure and chronic physical illness will not be able to work under challenging conditions.

According to experts' opinions, candidates with a very low body mass index (below 18.5) and a very high body mass index (above 35) did not score on the body mass index indicator. Indeed, skinny and obese people cannot work in challenging and critical situations. In line with the present study, Dean College (2017) for the admission of emergency medical students and the Medical Emergency and Accident Management Center (2016) for the recruitment of emergency medical technicians used the same indicators mentioned above in this area [6, 16]. According to the results of previous studies and the present study, indicators in the field of physical health predict the student's ability to perform clinical and invasive skills in emergencies.

Regarding psychological status, 5 criteria of order and neatness, responsibility and accountability, quick and correct decision-making, stress management in emergencies, and belief in teamwork were approved. Psychological interview and Cattell's 16-factor personality questionnaire were approved, citing the opinion of psychologists to assess the criteria in the field of psychological status. Open and structured questions were used in the interview process. Because Cattell's 16-factor personality questionnaire examines the deep layers of the participant's personality in a short time, and since this questionnaire has been used in various studies with reliable validity and reliability, we intended to use this questionnaire in the present study.

In line with the current study, Faraji Deh et al. used all the indicators in this field to accept doctoral students [19], and Kyllonen et al. used all the indicators in this field to select graduate students [21]. Findings indicate that these indicators can predict students' readiness to work in sensitive and stressful situations.

Concerning the area of physical fitness, 6 criteria were examined (1600 m run, 45 m speed-run, 4×9 m run, sit-up, long jump, and Swedish swimming in 30 s). According to the present study, the Prehospital Medical Emergency and Accident Management Center (2016) used the same indicators to hire prehospital medical emergency technicians [6]. Besides, Kashaf and Nazarian used the criteria of horizontal traction, lying down and sitting, sitting bending, 1600 m run, vertical jump, 4×9 m run, and rope to evaluate the physical fitness of Shahid Rajaei Teaching Training University students [22]. The results of their study are in line with the current study [22]. According to the results, these indicators can assess students' readiness to work in challenging and critical situations.

The present study provides educational administrators with how to transit from the current situation to the desired situation in terms of student admission. It is also ex-

pected that implementing these indicators developed for the admission of students in post-diploma and Bachelor's degrees in prehospital emergency medicine will make the selection of students in the country more scientific and effective. Finally, those students will be admitted who can be employed in the prehospital medical accident and emergency management center of the country after graduation, favorably provide services in the emergency and disaster conditions and promote health in the community.

## 5. Conclusion

Prehospital emergency medical staff is the front line of the health system in response to medical emergencies, accidents, and disasters, such as epidemics, traffic, industrial, mountainous, marine accidents as well as natural and man-made disasters, such as floods, earthquakes, hurricanes, fires, and wars. Thus, this staff must be trained in various capabilities, such as ambulance driving in harsh weather conditions, responding to various internal medical and trauma emergencies in different sex and age groups, transporting patients/injured people, communicating, informing, and other services. Access to appropriate and approved indicators for selecting eligible and potentially qualified people among the candidates of the national entrance exam to continue their education is of great importance. According to the results of the present study, considering the criteria related to the areas of general qualification, physical health, psychological status, and physical fitness for the selection of candidates can play a significant role in facilitating the education of emergency medical students, hiring of capable graduates to the field of operations, increasing the quality of care services, enhancing client satisfaction, and ultimately improving the health of the community.

## Ethical Considerations

### Compliance with ethical guidelines

The present study was registered as a research project in the Ethics Committee of Qazvin University of Medical Sciences (Code: IR.QUMS.REC.1399.164).

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### Authors' contributions

Study concept and design: Yousof Akbari Shahrestanaki, Sakineh Moghaddam Zeabadi, Masoumeh Ziaha; Data

analysis and interpretation of data: Yousof Akbari Shahrestanaki, Sakineh Moghaddam Zeabadi, Masoumeh Ziaieha; Writing – original draft: Yousof Akbari Shahrestanaki, Sakineh Moghaddam Zeabadi; Review of the article and final approval: Yousof Akbari Shahrestanaki, Sakineh Moghaddam Zeabadi; Data collection, reading and approval of the final manuscript: All authors.

### Conflict of interest

The authors declared no conflict of interest.

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