



# Self-Assessment of Clinical Skills in Medical Internship

Rostam Yazdani,<sup>1</sup> Elaheh Yazdan-Panah,<sup>2</sup> Hajar Shafian,<sup>3,\*</sup> and Habibeh Ahmadi-Pour<sup>4</sup>

<sup>1</sup>Department of Medicine, Faculty of Medicine, Kerman University of Medical Sciences, Kerman, IR Iran

<sup>2</sup>Faculty of Medicine, Kerman University of Medical Sciences, Kerman, IR Iran

<sup>3</sup>Faculty of Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran

<sup>4</sup>Research Center for Social Factors Affecting Health, Institute for Future Studies in Health, Kerman University of Medical Sciences, Kerman, IR Iran

\*Corresponding author: Hajar Shafian, Faculty of Medical Sciences, Shahid Beheshti University of Medical Sciences, Tehran, IR Iran. E-mail: hajarshafian@gmail.com

Received 2016 August 13; Revised 2017 July 15; Accepted 2017 July 23.

## Abstract

**Background and Objectives:** Self-assessment of clinical performance in a clinical setting is defined as the process of collecting internal and external data, interpreting the data on personal performance, and comparing them with a set of standards. The current study aimed at analyzing self-assessment of clinical skills among medical interns at Kerman University of Medical Sciences, Kerman, Iran, and determining the relationship between practical skills and theoretical knowledge.

**Methods:** The current cross sectional, descriptive, analytical study was conducted in 2014 on a total of 141 interns from Kerman University of Medical Sciences selected via census sampling. Data were collected using a checklist including the main procedural skills of medical students and analyzed using the Mann-Whitney and the Kruskal-Wallis tests with SPSS.

**Results:** The majority of participants were female (n = 79; 56%). The mean score of males' clinical skills was higher than that of females, and the difference was statistically significant (P = 0.001). Analysis of the relationship between internship duration and clinical skill scores showed that the mean score of interns who had completed 6 months of their internship was higher than that of the ones who had not; the difference was statistically significant (P = 0.001).

**Conclusions:** Since the performance of future general practitioners highly depends on their learning and mastery of clinical skills, acquisition of these essential skills during internships is an important objective of medical students. Correct and complete training of clinical skills, especially during internships, is integrated into the medical curriculum, although its implementation requires careful planning and compliance with the medical standards.

**Keywords:** Internship Period, Medical Students, Self-Assessment, Clinical Skills

## 1. Background

Clinical skills and theoretical knowledge are both essential to medical education. Acquisition of clinical skills before internship is one of the most important requirements of educational curricula recommended by the general medical council (GMC) for better training of future physicians (1). Clinical education is a critical part of medical sciences, which plays an important role in students' acquisition of professional skills. Training and learning are significant aspects of working in a clinical setting, leading to the development of staff members' knowledge, skills, and attitudes (2).

Medical students can gain an understanding of the true meaning of being a physician in an actual clinical setting and apply their theoretical knowledge to treat patients (3). According to the medical education guidelines in Iran, theoretical and practical training should take place in internship programs. The training of clinical skills should be conducted during internship under the super-

vision of faculty professors in order to gain sufficient mastery of skills.

According to the guidelines of the Iranian ministry of health and medical education, the required clinical skills for students in the course of education are as follows: venous blood sampling, gastric catheterization, intramuscular injection, bladder catheterization, arterial blood sampling, wound dressing, intravenous injection, peripheral venous catheterization, suturing, nasal packing, vaginal examination, intubation, removal of foreign bodies from the ear, casting, splinting, chest tube insertion, removal of corneal foreign bodies, lumbar puncture, circumcision, and tracheostomy (4).

A lack of adequate clinical skills is a reason for insecurity among physicians and can cause potential threats to patients (5). Studies on clinical education and learning showed that clinical education is inconstant, unpredictable, and hasty (6). Moreover, faculty members and instructors are not fully aware of their students' performance, especially if their assessment focuses only on con-

tent knowledge (7, 8).

In medical education, assessment should be considered as a tool to enhance the quality of educational programs, motivating students to learn, and encouraging them toward the acquisition of required skills (9). Self-assessment of clinical performance in a clinical setting is defined as the process of collecting internal and external data, interpreting the data based on personal performance, and comparing them with the national standards (10). This method of knowledge and skill assessment is necessary for high-quality performance by physicians as well as their self-directed, lifelong learning (11).

In this regard, the results of a study by Antonelli showed a significant correlation between student assessment and self-assessment in the first year of clinical training at the University of Edinburgh, Scotland. This study focused on the self-assessment of clinical skills, such as history-taking and retina examination (12). Some additional studies applied self-assessment to evaluate the students' clinical skills during internship. In this section, some of findings of these studies are described.

A study by Amini et al. on 200 medical interns of Tabriz University of Medical Sciences (Tabriz, Iran) analyzed the self-assessment of 20 basic clinical skills and determined the effects of available educational opportunities on their capabilities. This study reported that the general skill of the subjects was 51%, based on the employed questionnaire. They assessed their skills as poor in lumbar puncture, tracheal intubation, splinting, chest tube insertion, corneal foreign body removal, and foreign body removal from the ear. Most of the techniques were acquired only through observation, without the direct supervision of instructors or resident assistants (13).

Moreover, a study by Fakhri and Bahrapour investigated the educational status and common practical skills of interns in different wards at hospital affiliated to Kerman University of Medical Sciences. A total of 60 medical students who had completed their internship at Kerman Medical School after being admitted in 1990 were evaluated, and their skill levels of 34 procedures were determined. The results indicated that proper planning of clinical skill training was essential to improve performance (14).

A study by Jalili et al. at Kerman University of Medical Sciences determined the application and adequacy of trained clinical skills. A total of 120 interns were examined, and it was found that the level of trained skills was higher than average for most of the participants (15). Moreover, a study by Sicaja et al. compared medical students' self-assessment of clinical skills with those of the instructors' expected level of skills at Zagreb School of Medicine. In this study, a total of 252 medical students and 129 instructors

were analyzed. The results showed that the instructors' expectations of the students' skill levels were higher than the students' self-assessment (16).

In a study by Moatari and Fallahzadeh, final-year medical students of Shiraz University of Medical Sciences, Shiraz, Iran, self-evaluated their skills for performing general medical procedures. In this study, the highest mean scores were assigned to patient history-taking, basic procedures, interpretation of test results, and diagnostic decision-making. The lowest mean scores were assigned to geriatric medicine, nutrition, care management, and advanced procedures. The results showed that by strengthening the mentioned skills, it is possible to improve the quality of community care services (17).

Since the skills of final-year medical students reflect their medical education effectiveness, evaluation of such skills can clarify the status of graduate students in terms of general skills. General skills are the skills a medical student is expected to achieve in the course of education (17). Identification of students' strengths and weaknesses can provide evidence to help with reviewing the implementation process of medical education programs. The current study aimed at analyzing self-assessment of clinical skills among interns and examining the relationship between practical skills and theoretical knowledge.

## 2. Methods

The current cross sectional descriptive, analytical study aimed at analyzing interns' self-assessment of clinical skills at Kerman University of Medical Sciences in Kerman, Iran, in 2014. A total of 141 interns in the first semester of the academic year 2014 - 2015 were selected via census sampling. Interns from different departments were enrolled in the study.

Data were collected using a 22-item questionnaire on necessary procedural skills for interns issued in the third meeting of the council for graduate medical education on February 21, 2009; in addition, a checklist from similar previous studies was employed (4, 13). The checklist included 20 major procedural skills for medical students, each comprised of 6 questions. The first 4 questions were related to skill acquisition, including performance on patients or moulage, performance under the supervision of an instructor or resident assistant, and independent performance; the questions were set up in a yes/no format.

One question evaluated the frequency of independent skill performance (more or less than twice). Another question focused on the students' self-assessment of their performance (poor, relatively good, and excellent). Finally, an open-ended question determined if interns believed that the status of clinical skill training improved or worsened

over the past few years, as well as how the presence of resident assistants affects the process of clinical skill training.

To determine the frequency of variables, descriptive statistics were performed; the Mann-Whitney U test was then applied to determine the correlation of clinical skill scores with gender, cumulative grade point average, and duration of internship. Moreover, the Kruskal-Wallis test was applied to determine the relationship of clinical skills with basic sciences and pre-internship scores.

Finally, the frequency of procedural skills was compared descriptively with the results of a similar study (14). The collected data were analyzed using SPSS version 20 (SPSS Inc., Chicago, IL, USA). All the checklists were completed anonymously, and the participants were assured that their information was kept confidential.

### 3. Results

In the current study, the majority of the participants were female ( $n = 79$ ; 56%). Overall, 67 (47.5%) participants were admitted in the academic year of 2007 - 2008 academic year and already completed more than 6 months of their internship. In addition, 74 (52.5%) participants were admitted in the academic year of 2008 - 2009 and completed fewer than 6 months of their internship. The analysis of the relationship between gender and clinical skill scores showed that the mean score of males' clinical skills was higher than that of females, and the difference was statistically significant ( $P < 0.001$ ). On the other hand, the difference between interns' basic science scores and their cumulative grade-point average was not significant. Similarly, the difference between the pre-internship and clinical skill test scores was not significant.

Investigation of the relationship between internship duration and clinical skill score indicated that the mean score of interns who had completed more than 6 months of their internship was higher than that of the ones who had not; the difference was statistically significant ( $P = 0.001$ ). The findings related to the interns' self-assessment of clinical skills are presented in Table 1. The results of a similar study, performed at Kerman University of Medical Sciences (14), are presented in Table 2 to compare the changes in clinical skill training.

### 4. Discussion and Conclusions

Assessment is an essential part of the educational process and can determine the level of students' achievement of educational objectives (18). Self-assessment plays a major role in acquiring the general and specialized skills needed in the medical profession for clinical excellence,

since learners can understand and improve their learning and performance needs (19, 20). The students participating in the current study observed various clinical procedures, with a few exceptions such as circumcision and tracheostomy, which may be due to the limited number of these types of patients during their clinical training.

In the current study, procedures performed by the interns themselves at the hospital were evaluated more accurately. In fact, acquisition of clinical skills requires the students to gain clinical experience and skill practice through observation, participation, clinical practice, and management of patients under the supervision of instructors (21). In order to improve these skills, the use of simulators can be helpful. In this regard, Ortwein et al. suggested that the use of simulation programs, such as simulation with standardized patients, provides a realistic approach in which students can learn various clinical skills (22).

It seems that the interns' autonomy in choosing their hospital units during the internship period can significantly affect clinical skill training in such settings. Therefore, for optimal performance, some procedures can be assigned to interns; hence, they learn the procedures fully and practically. Another solution is to mandate working in the hospital units for all students and interns.

In a study by Amini et al. students' weaknesses in some skills were attributed to the following factors: the complex and specialized nature of the skill and its dependence on the performance of other skills; the complexity and difficulty of skill acquisition and performance; a lack of opportunities to encounter and practice the skill; and a lack of emphasis on the skill as a routine procedure. In addition, due to the complexity of some procedures or a lack of frequent performance by experts, observation and self-training may not be adequate for interns. Accordingly, experts or faculty members should assist and accompany interns in such procedures. Overall, a targeted educational program that provides learning opportunities and assigns tasks to interns can improve their skills and learning.

Comparison with the results of the study by Fekri et al. (14) indicates a significant decline in clinical skill training; in fact, training of all procedures under the supervision of competent experts significantly reduced. Similarly, it was observed that independent performance of these procedures requires examination and feedback to eliminate shortcomings. One of the reasons for it may be the recent increase in the number of resident assistants performing these procedures, and therefore, intervening in the process of internship training.

In response to the final question on the survey, "Has clinical skill training improved or worsened over the past few years?" and "How does the presence of resident assistants affect the training process?" 72.6% of the interns eval-

**Table 1.** Frequency Distribution of Self-assessment Scores of Clinical Skills Among Interns at Kerman University of Medical Sciences<sup>a</sup>

Procedures	Observing <sup>b</sup>	Performing the Procedure <sup>c</sup>	Performing the Procedure <sup>d</sup>	Performing the Procedure Independently	Performing the Procedure <sup>e</sup>	Poor	Skill Level Relatively Good	Excellent
Venous blood sampling	133 (94.3)	103 (73.0)	56 (39.7)	77 (54.6)	52 (36.9)	69 (48.9)	57 (40.4)	15 (10.6)
Gastric catheterization	140 (99.3)	0 (0)	113 (80.1)	139 (98.6)	135 (95.7)	5 (3.5)	62 (44.0)	74 (52.5)
Intramuscular injection	138 (97.9)	112 (79.4)	73 (51.8)	116 (82.3)	101 (71.6)	25 (17.7)	69 (48.9)	47 (33.3)
Bladder catheterization	139 (98.6)	93 (66.0)	98 (69.5)	122 (86.5)	114 (80.9)	22 (15.6)	45 (31.9)	74 (52.5)
Arterial blood sampling	136 (96.5)	71 (50.4)	88 (62.4)	121 (85.8)	112 (79.4)	33 (23.4)	71 (50.4)	37 (26.2)
Dressing and bandaging	133 (94.3)	0 (0)	90 (63.8)	130 (92.2)	117 (83.0)	17 (12.1)	76 (53.9)	48 (34.0)
Intravenous injection	118 (83.7)	62 (44.0)	38 (27.0)	47 (33.3)	34 (24.1)	91 (64.5)	29 (20.6)	21 (14.9)
Peripheral venous catheterization	124 (87.9)	84 (59.6)	45 (31.9)	59 (41.8)	35 (24.8)	92 (65.2)	37 (26.2)	12 (8.5)
Suturing	140 (99.3)	129 (91.5)	123 (87.2)	139 (98.6)	129 (91.5)	14 (9.9)	59 (41.8)	68 (48.2)
Nasal packing	120 (85.1)	0 (0)	50 (35.5)	55 (39.0)	38 (27.0)	89 (63.1)	34 (24.1)	18 (12.8)
Vaginal examination	119 (84.4)	77 (54.6)	78 (55.3)	63 (44.7)	42 (29.8)	85 (60.3)	50 (35.5)	6 (4.3)
Intubation	136 (96.5)	130 (92.2)	67 (47.5)	35 (24.8)	14 (9.9)	106 (75.2)	29 (20.6)	6 (4.3)
Foreign body removal from the ear	107 (75.9)	0 (0)	39 (27.7)	37 (26.2)	34 (24.1)	100 (70.9)	21 (14.9)	18 (12.8)
Casting	109 (77.3)	0 (0)	31 (22.0)	29 (20.6)	18 (12.8)	113 (80.1)	21 (14.9)	7 (5.0)
Splinting	103 (73.0)	0 (0)	27 (19.1)	18 (12.8)	6 (4.3)	131 (92.9)	7 (5.0)	3 (2.1)
Chest tube insertion	120 (85.1)	28 (19.9)	52 (36.9)	24 (17.0)	15 (10.6)	111 (78.7)	27 (19.1)	3 (2.1)
Corneal foreign body removal	88 (62.4)	0 (0)	17 (12.1)	10 (7.1)	6 (4.3)	126 (89.4)	13 (9.2)	1 (0.7)
Lumbar puncture	126 (89.4)	82 (58.2)	30 (21.3)	11 (7.8)	4 (2.8)	118 (83.7)	21 (14.9)	2 (1.4)
Circumcision	57 (40.4)	0 (0)	5 (3.5)	3 (2.1)	3 (2.1)	136 (96.5)	4 (2.8)	1 (0.7)
Tracheostomy	21 (14.9)	0 (0)	3 (2.1)	1 (0.7)	1 (0.7)	138 (97.9)	3 (2.1)	0 (0)

<sup>a</sup> Values are expressed as No. (%).<sup>b</sup> Observing the procedure on a patient.<sup>c</sup> Performing the procedure on a moulage.<sup>d</sup> Performing the procedure under the supervision of an instructor or a resident assistant.<sup>e</sup> Performing the procedure more than twice.

uated the training as deteriorated and considered the presence of resident assistants as negative. They believed that non-educational responsibilities and miscellaneous activities caused them to lose out on opportunities to learn the necessary skills.

On the other hand, 23% of the students considered the presence of resident assistants positive and helpful in training. This finding was in line with the results reported by Vahidshahi et al. (23). In that study, only one-third of the participating students had a positive attitude toward

**Table 2.** Comparison of the Status of Clinical Skill Training In 1997 and 2014 at Kerman University of Medical Sciences

Procedures	Percentage <sup>a</sup>		Percentage <sup>b</sup>	
	1997	2014 (Present Study)	1997	2014 (Present Study)
Intravenous injection	30	27.0	93	33.3
Intramuscular injection	37	51.8	90	82.3
Peripheral venous catheterization	23	31.9	87	41.8
Gastric catheterization	82	80.1	100	98.6
Splinting	50	22.0	88	20.6
Casting	52	19.1	65	12.8
Corneal foreign body removal	50	12.1	63	7.1
Foreign body removal from the ear	66	27.7	80	26.2
Nasal packing	87	35.5	80	39.0
Suturing	43	87.2	100	91.5
Circumcision	22	3.5	28	2.1
Chest tube insertion	12	36.9	12	17.0
Intubation	52	47.5	63	24.0
Lumbar puncture	67	21.3	83	7.8
Dressing and bandaging	38	63.8	100	83.0

<sup>a</sup>Percentage of Interns Learning the Procedure Under the Supervision of an Instructor or a Resident Assistant.

<sup>b</sup>Percentage of Interns Capable of Independent Performance of the Procedure.

the teaching role of resident assistants. In general, residents could not reduce educational weaknesses in the interns (23).

The role of resident assistants in training students and interns is the focus of many studies (24-26). Although the educational role of resident assistants in some cases such as holding educational classes is emphasized, it is often considered marginal and unimportant, especially in clinical education (including clinical rounds, clinical training, and work shifts); however, resident assistants are frequently present during internship training (27). Therefore, the organization of workshops for resident assistants may improve their teaching and training methods and inform them about the educational objectives of internship programs.

Acquisition of necessary clinical skills is one of the most important objectives of medical education, since the performance of a future physician is closely related to the learning and mastery of these skills. Correct and complete training of clinical skills during medical education, especially during the internship, is an integrated part of the medical curriculum, although implementation of this type of training requires careful planning and consideration of national standards.

Competency-based training should be performed by

expert instructors. Moreover, the significant role of resident assistants should not be ignored; hence, the graduate students can perform effectively in the future. Therefore, proper planning by medical faculties, accurate monitoring by the authorities, and final clinical evaluations can improve the quality of clinical education, thus enhancing the quality of community care services and indicators of health service delivery.

### Supplementary Material

Supplementary material(s) is available [here](#) [To read supplementary materials, please refer to the journal website and open PDF/HTML].

### Acknowledgments

Authors would like to thank all the interns of Kerman University of Medical Sciences (2014) that cooperated with the current study.

### References

1. Association of American Medical Colleges. *Recommendations on Undergraduate Medical Curriculum*. 2008. Available from: [https://www.aamc.org/download/130608/data/clinicalskills\\_oct09.qxd.pdf.pdf](https://www.aamc.org/download/130608/data/clinicalskills_oct09.qxd.pdf.pdf).

2. Lambert V, Glacken M. Clinical support roles: a review of the literature. *Nurse Educ Pract.* 2004;**4**(3):177-83. doi: [10.1016/S1471-5953\(03\)00039-8](https://doi.org/10.1016/S1471-5953(03)00039-8). [PubMed: [19038155](https://pubmed.ncbi.nlm.nih.gov/19038155/)].
3. Spencer J. Learning and teaching in the clinical environment. *BMJ.* 2003;**326**(7389):591-4. doi: [10.1136/bmj.326.7389.591](https://doi.org/10.1136/bmj.326.7389.591). [PubMed: [12637408](https://pubmed.ncbi.nlm.nih.gov/12637408/)].
4. Education MoHaM. The third application dated 3 March 2008 meeting of the Medical Education. In: Education MoHaM, editor. *Education MoHaM*. Tehran: Ministry of Health and Medical Education; 2008.
5. Mercer P, Board M. A survey of the basic practical skills of final-year medical students in one UK medical school. *Med Teach.* 2009;**20**(2):104-8. doi: [10.1080/01421599881183](https://doi.org/10.1080/01421599881183).
6. Irby DM. Teaching and learning in ambulatory care settings: a thematic review of the literature. *Acad Med.* 1995;**70**(10):898-931. [PubMed: [7575922](https://pubmed.ncbi.nlm.nih.gov/7575922/)].
7. Stillman PL, Regan MB, Swanson DB. A diagnostic fourth-year performance assessment. *Arch Intern Med.* 1987;**147**(11):1981-5. [PubMed: [3675100](https://pubmed.ncbi.nlm.nih.gov/3675100/)].
8. Elnicki DM, Shumway JM, Halbritter KA, Morris DK. Interpretive and procedural skills of the internal medicine clerkship: performance and supervision. *South Med J.* 1996;**89**(6):603-8. [PubMed: [8638200](https://pubmed.ncbi.nlm.nih.gov/8638200/)].
9. Matthiesen V, Wilhelm C. Quality outcomes and program evaluation in nursing education: an overview of the journey. *Qual Manag Health Care.* 2006;**15**(4):279-84. [PubMed: [17047502](https://pubmed.ncbi.nlm.nih.gov/17047502/)].
10. Epstein RM, Siegel DJ, Silberman J. Self-monitoring in clinical practice: a challenge for medical educators. *J Contin Educ Health Prof.* 2008;**28**(1):5-13. doi: [10.1002/chp.149](https://doi.org/10.1002/chp.149). [PubMed: [18366128](https://pubmed.ncbi.nlm.nih.gov/18366128/)].
11. Linn BS, Arostegui M, Zeppa R. Performance rating scale for peer and self assessment. *Br J Med Educ.* 1975;**9**(2):98-101. [PubMed: [1148135](https://pubmed.ncbi.nlm.nih.gov/1148135/)].
12. Antonelli MA. Accuracy of second-year medical students' self-assessment of clinical skills. *Acad Med.* 1997;**72**(10 Suppl 1):S63-5. [PubMed: [9347742](https://pubmed.ncbi.nlm.nih.gov/9347742/)].
13. Barzegar M. The state of clinical competencies of medical students in performing basic clinical procedures at Tabriz University of Medical Sciences and Health Services. *Iran J Med Educ.* 2001;**1**(4):9-16.
14. Fekri AR, Bahrapour A. *Investigate the statue of education to the practical skills of students in Kerman University of Medical Sciences in common activities in different parts of the hospital*. Kerman: Kerman University of Medical Sciences; 1997.
15. Jailli Z, Nakhaee N, Gereshki AR. *Investigation of the application and adequacy of Primary clinical skills of medical practitioners view*. Kerman: Kerman University of Medical Sciences; 2005.
16. Sicaja M, Romic D, Prka Z. Medical students' clinical skills do not match their teachers' expectations: survey at Zagreb University School of Medicine, Croatia. *Croat Med J.* 2006;**47**(1):169-75. [PubMed: [16489711](https://pubmed.ncbi.nlm.nih.gov/16489711/)].
17. Moattari M, Fallahzadeh M. Senior medical students' self evaluation of their capability in general competencies in Shiraz University of Medical Sciences. *Iran J Med Educ.* 2008;**7**(2):371-7.
18. Morrison J. ABC of learning and teaching in medicine: Evaluation. *BMJ.* 2003;**326**(7385):385-7. [PubMed: [12586676](https://pubmed.ncbi.nlm.nih.gov/12586676/)].
19. Das M, Mpofu D, Dunn E, Lanphear JH. Self and tutor evaluations in problem-based learning tutorials: is there a relationship? *Med Educ.* 1998;**32**(4):411-8. [PubMed: [9743805](https://pubmed.ncbi.nlm.nih.gov/9743805/)].
20. Fraser SW, Greenhalgh T. Coping with complexity: educating for capability. *BMJ.* 2001;**323**(7316):799-803. [PubMed: [11588088](https://pubmed.ncbi.nlm.nih.gov/11588088/)].
21. Dunn SV, Hansford B. Undergraduate nursing students' perceptions of their clinical learning environment. *J Adv Nurs.* 1997;**25**(6):1299-306. [PubMed: [9181430](https://pubmed.ncbi.nlm.nih.gov/9181430/)].
22. Ortwein H, Frohmel A, Burger W. [Application of standardized patients in teaching, learning and assessment]. *Psychother Psychosom Med Psychol.* 2006;**56**(1):23-9. doi: [10.1055/s-2005-867058](https://doi.org/10.1055/s-2005-867058). [PubMed: [16421779](https://pubmed.ncbi.nlm.nih.gov/16421779/)].
23. Vahidshahi K, Mahmoudi M, Shahbaznejad L, Zamani H, Ehteshami S. The attitude of residents, interns and clerkship students towards teaching role of residents. *Iran J Med Educ.* 2009;**9**(2):147-55.
24. LaPalio LR. Time study of students and house staff on a university medical service. *J Med Educ.* 1981;**56**(1):61-4. [PubMed: [7463437](https://pubmed.ncbi.nlm.nih.gov/7463437/)].
25. Brown RS. House staff attitudes toward teaching. *J Med Educ.* 1970;**45**(3):156-9. [PubMed: [5418782](https://pubmed.ncbi.nlm.nih.gov/5418782/)].
26. Pelletier M, Belliveau P. Role of surgical residents in undergraduate surgical education. *Can J Surg.* 1999;**42**(6):451-6. [PubMed: [10593247](https://pubmed.ncbi.nlm.nih.gov/10593247/)].
27. Garakyaraghi M, Sabouri M, Avizhgan M, Ebrahimi A, Zolfaghari M. Interns' Viewpoints toward the Status of Training by Residents in Isfahan University of Medical Sciences. *Iran J Med Educ.* 2008;**7**(2):361-9. Persian.