



Psychometry of Physician Teaching Motivation Questionnaire at Iran University of Medical Sciences

Mahdiyeh Ghasemi¹, Mehran Ebrahimi Shah-abadi², Azam Norouzi³, Seyyed Kamran Soltani Arabshahi¹, Zohreh Sohrabi^{1*}, Ghobad Ramezani⁴, Ghadir Pourbairamian⁵ and Leila Neisani Samani¹

1. Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

2. Department of Surgery, Afzalipour Hospital, Kerman University of Medical Sciences, Kerman, Iran

3. Department of Medical Education, School of Medicine, Mashhad University of Medical Sciences, Mashhad, Iran

4. Education Development Center, Kermanshah University of Medical sciences, Kermanshah, Iran

5. Education Development Center, Ardabil University of Medical Sciences, Ardabil, Iran

Abstract

Background: The development of societies relies on the type and manner of activities performed at universities. Professors play a pivotal role in the development of universities and societies. Assessment of professors' motivation and behavior and factors affecting them can improve the educational system and increase its performance. This study aimed to assess the validity and reliability of the Physician Teaching Motivation Questionnaire (PTMQ) from the viewpoint of clinical professors at Iran University of Medical Sciences (IUMS).

Methods: This is an instrument psychometric study in which the questionnaire's validity was determined through the face and content validity and its construct validity through exploratory and confirmatory factor analysis. Reliability was determined through the calculation of Cronbach's alpha and intraclass correlation coefficient and consistency between agreeers. The data were analyzed in SPSS 23 and LISREL 8.8.

Results: The results showed that all 18 items had acceptable content validity (0.68-0.97). The Cronbach's alpha and intraclass correlation coefficients were 0.81 and 0.86, respectively. The number of items remained unchanged at 18 according to exploratory factor analysis which classified them into six categories (intrinsic motivation, identified motivation, introjected motivation, career motivation, external motivation, and teaching assistant motivation) and explained 54% of the total variance of the mentioned variables. Also, the value of CFI was equal to 0.93 and the value of Cohen's kappa was between 0.77 and 0.84.

Conclusion: The Persian version of PTMQ is a valid and reliable instrument that can be used for research, educational, and practical purposes to evaluate the teaching motivation of clinical professors in other groups.

Keywords: Factor Analysis, Iran, Motivation, Physicians, Psychometrics, Reproducibility of Results, Statistical, Surveys and Questionnaires. Universities

* Corresponding author

Zohreh Sohrabi, PhD

Center for Educational Research in Medical Sciences (CERMS), Department of Medical Education, School of Medicine, Iran University of Medical Sciences, Tehran, Iran

Tel: +98 21 8862 2607

Email: zo_sohrabi@yahoo.com

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Introduction

Motivation refers to the state of an individual that can stimulate him/her to perform a special behavior. It is associated with processes that direct and strengthen the behavior (1). Career motivation is a set of energizing factors that incline a person towards his job (2). Motivation can often be used as a behavior prediction instrument. It greatly differs among various individuals and can affect individuals' behavior and performance according to their abilities and environmental factors (3,4). Williams and Burden differentiated two aspects of motivation: initiating motivation which is concerned with the reasons for doing something and deciding to do something and sustaining motivation referring to the effort for sustaining or persisting in doing something. Accordingly, motivation specifies the reason why people decide to do something, how long people are willing to sustain the activity, and how hard they are going to pursue the activity (3). Though numerous definitions of motivation have been offered, all share the basic premise that motivation "gets us going, keeps us working, and helps us complete the tasks" (4). Educational organizations always predict and carry out some measures to continuously improve their activities to affect their teaching-learning process. Meanwhile, faculty members are the main influencers of this process (5). The motivation of university faculty can be defined as the overall process that gives rise to faculty members initiating, sustaining, and regulating goal-directed behaviors (6). Lecturers are the most strategic element of education to create quality education, and their active participation and role give a large contribution to achieving the goal of education nationally. The importance of lecturers' role makes the necessity of motivation and job satisfaction in creating qualified performance. Motivation and teaching interest can improve the quality of the university concretely. University teachers are motivated by various elements, both internally and externally. This work is focused on teaching functions (7). Considering the importance of faculty members' career motivation for their active role in curriculum development, it is necessary to provide a good motivational system in higher education and universities to promote their attitudes toward understanding the significance

and identity of their jobs. In addition, a suitable motivational system is essential to promote and diversify multiple specialized professional skills and provide appropriate job feedback, as well as securing the autonomy of faculty members (8). Motivation factors lead to positive mental health and challenge people to grow, contribute to the work environment, and invest themselves in the organization. Research on teacher motivation has established a close relationship between teacher motivation and student learning, and studies under the SDT framework suggested that teaching behavior or styles could mediate the impact of teacher motivation on student motivation (3). Physician Teaching Motivation Questionnaire (PTMQ) was developed in 2015 in Germany to assess the motivation of clinical professors. Physicians play a major role in undergraduate medical education. Studies indicate that different forms and degrees of motivation can influence work performance in general and that teachers' teaching motivation can influence students' academic achievements. The questionnaire provides a theoretical framework based on the self-determination theory and includes 6 areas and 18 items. It was initially performed on internists and surgeons in the Germany Medical Faculty (9). According to the mentioned issues, professors' motivation is highly necessary for the growth of students and universities (5). Since there is no standard questionnaire in Iran regarding the teaching motivation of clinical professors, this study aims at investigating the validity and reliability of PTMQ to assess the teaching motivation of professors and to take effective measures for strengthening their teaching motivation which can result in the training of specialists (2). Numerous studies have been carried out in recent years on motivation; however, most of them have addressed the motivation of students or the career motivation of faculty members. Given the importance of teaching motivation of clinical professors who are often busy and have limited time for teaching; and since there is no standard questionnaire in Iran to determine their motivation, the present study aimed to translate PTMQ and evaluate its validity and reliability. The results of this study can be used for strengthening the teaching motivation of professors which can lead to the training of specialists. The majority of previous

studies are based on Herzberg's two-factor theory and researcher-made tools. PTMQ is the first validated instrument in this area.

Materials and Methods

This is an instrument psychometric, exploratory study. The instrument is PTMQ which was developed by Christoph Dybowski and Sigard Harendza in 2015 at Hamburg University, Germany, through a descriptive cross-sectional study. This study was conducted in 6 medical faculties at Germany University. The questionnaire was developed with 6 areas and 18 items. To comply with ethical principles, permission to use the English version of PTMQ was obtained from the instrument developer, Sigard Harandza, before the beginning of the study.

Data analysis

Factor analysis (exploratory and confirmatory) and SPSS 23 and Lisrel 8.8 software were used for data analysis. After receiving the code of ethics (IR.IUMS.FMD.REC.1400.518), the questionnaire was translated through the following steps:

Step 1. Forward translation: The Persian version of PTMQ is culturally matched. The original questionnaire was translated into Persian according to the IQOLA translation and adaptation protocol, and specialized translators were asked to provide proper words and phrases for each word and phrase.

Step 2. Analysis and obtaining a common version: A Persian translation was obtained in this phase.

Step 3. Reverse translation: The Persian version was retranslated back into English to compare with the original version.

Determining the qualitative validity

To this end, the questionnaire was provided to 11 professors with experience in medical and clinical education to express their opinions about the questionnaire. After performing the required amendments, the instrument was developed and edited. For judging, it is enough to select at least 2-3 or usually 5 to 10 or sometimes up to 20 experts in the field under consideration (10).

Determining the quantitative validity

The final instrument was prepared after applying

their comments. Based on Lawshe's Table and the target population, quantitative validity was determined by 11 experts in medical and clinical education using the Content Validity Index (CVI) and the Content Validity Ratio (CVR). To investigate the reliability and validity of the construct with confirmatory and exploratory factor analysis, the sample size was estimated to be 5 to 10 times the PTMQ items. Therefore, the questionnaire was given to 155 clinically expert faculty members of medical sciences universities (10). To achieve CVR index, the experts were asked to choose one of the answers (necessary, useful but not necessary, not necessary). The minimum acceptable CVR of each item was determined based on the answers of experts (necessary) and their total number (N). To achieve CVI index, the experts were asked to select one of the answers (completely relevant, relevant but needs revision, almost relevant, irrelevant). The instrument reliability was determined with the Kappa coefficient and Cronbach's alpha, and its repeatability with the interclass correlation coefficient. Spearman's correlation coefficient was used to describe the linear relationships between the factors. To evaluate the content validity index, CVR was calculated for each item using the following equation:

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

Results

Where CVR is the content validity ratio, ne is the number of experts who chose the important and relevant answer for each item, and N is the total number of experts. The minimum acceptable CVR for each item, based on experts who gave their opinion about content validity, can be determined in table 1.

A total of 11 experts gave their opinions, and according to table 1, the acceptable CVR is 0.59; therefore, only the items with a CVR greater than 0.59 remained in the questionnaire. The following questionnaire was developed after evaluating CVI and CVR.

According to table 2, items with a CVR less than the favorable amount for 11 experts were deleted and the other items remained (minor amendments, suggested by the experts, were performed in some items). Therefore, items 9, 16, and 18 were revised according to their CVI and CVR (Table 3).

Table 1. The minimum acceptable CVR based on the number of commented experts

Number of experts	Minimum acceptable CVR
5	0.99
6	0.99
7	0.99
8	0.78
9	0.75
10	0.62
11	0.59
12	0.56
18	0.45

Construct validity

The instrument construct validity was determined in this study through exploratory and confirmatory factor analysis using Bartlett's sphericity test, scree plot, eigenvalue, and varimax rotation in LISREL. In addition, the principal component analysis method was used for eigenvalues greater than one, and the varimax method to rotate the matrix.

Exploratory and confirmatory factor analysis

After exploratory factor analysis, the main four outputs were obtained as shown in table 4. The Bartlett's test was significant ($p < 0.001$) indicating the acceptable performance of factor analysis according

Table 2. Psychometry of the instrument

Items	CVI based on experts viewpoint				CVI	CVR based on experts viewpoint			CVR
	Completely relevant (4)	Relevant but needs revision (3)	Almost relevant (2)	Irrelevant (1)		Not necessary (1)	Useful but not necessary (2)	Necessary (3)	
I look forward to my next teaching unit most of the time	7	1	-	-	1	2	2	7	0.81
I enjoy my teaching most of the time	9	2	-	-	1	-	1	10	1
During teaching, I am completely in my element	8	2	1	-	0.90	1	2	8	0.90
Teaching enriches my job	9	2	-	-	1	-	1	10	1
I teach because it is important for me to make my contribution to students becoming good physicians in the future	7	4	-	-	1	2	-	9	0.81
I teach because I am convinced it is a physician's duty to pass on his knowledge	8	3	-	-	1	-	1	10	1
I teach because I find my lessons' contents important	9	1	1	-	0.90	1	2	8	0.90

I teach, otherwise I would have a bad conscience towards my colleagues	9	2	-	-	1	2	2	7	0.81
I teach, otherwise I would have a bad conscience towards my supervisors	5	2	4	-	0.63	5	1	5	0.54
I teach because I need the lessons to accomplish my occupational objectives	8	2	1	-	0.90	1	-	10	0.90
I teach because it is advantageous to my occupation	6	5	-	-	1	1	3	7	0.90
I teach because it could promote my career	7	4	-	-	1	2	-	9	0.81
I teach most of the time because my supervisors expect it from me	8	3	-	-	1	1	3	7	0.90
I mainly teach because it belongs to my scope of duties	5	3	3	-	0.73	1	4	6	0.90
I mainly teach, otherwise I would get into trouble with my supervisors	8	3	-	-	1	1	2	8	0.90
I teach although teaching is rather irrelevant to me in comparison to my other occupational activities	7	3	1	-	0.90	7	1	3	0.36
I teach although I hardly ever feel like doing it	7	4	-	-	1	2	2	7	0.81
I teach although I often perceive it as an annoying chore	3	3	2	3	0.54	4	2	5	0.63

Table 3. The revised items

9. I teach, otherwise I would have to answer my supervisors

16. I teach although teaching has a lower priority than my other activities, including treatment

18. I teach although I perceive it is exhausting and time-consuming in comparison to my field of expertise (treatment)

Table 4. Bartlett's test

Test name	Result	
Sampling quality index	0.83	
Bartlett's sphericity test	Chi square estimation	286.306
	Degree of freedom	79
	Significance level	0.001

to the correlation matrix obtained in the study sample (Table 4). In addition, it shows explorable relationships between variables that underwent factor analysis. The results of exploratory factor analysis showed that the extracted values calculated for each item were between 0.583 and 0.976 which were appropriate.

Considering eigenvalues greater than 1 as a criterion and the scree plot slope, 6 factors were extracted with a power of 54.695% of the total changes in the components of PTMQ.

The results of table 5 were used to categorize the items among the factors based on their factor loadings. The table shows the correlation matrix between the items and factors after rotation; the correlation was between -1 and +1. Researchers of this study used only the factors with a factor loading greater than 0.40; and only factors with factor loadings higher than 0.40 are listed in table 5. The results of this table demonstrate that 18 items out of 18 items had factor loadings higher than 0.40, indicating the main objective of this research (*i.e.*, recognizing the components of physicians' teaching motivation).

The reliability and internal validity of the model depend on the strengths of the relationships between variables or the degree of correlation and factor loadings between them. The more these loadings are, the better the model fits reality (Table 6). Cronbach's alpha, as the internal agreement index of variables, was used to determine reliability in SPSS 23 (Table 7).

Table 5. Factor loadings of research questions according to variables

Item number	First factor	Second factor	Third factor	Fourth factor	Fifth factor	Sixth factor
1	<u>0.877</u>	-	-	-	-	-
2	<u>0.832</u>	-	-	-	-	-
3	<u>0.641</u>	-	-	-	-	-
4	0.824	-	-	-	-	-
5	-	0.818	-	-	-	-
6	-	0.731	-	-	-	-
7	-	0.815	-	-	-	-
8	-	-	0.764	-	-	-
9	-	-	0.935	-	-	-
10	-	-	-	0.748	-	-
11	-	-	-	0.805	-	-
12	-	-	-	0.872	-	-
13	-	-	-	-	0.910	-
14	-	-	-	-	0.829	-
15	-	-	-	-	0.722	-
16	-	-	-	-	-	<u>0.840</u>
17	-	-	-	-	-	<u>0.857</u>
18	-	-	-	-	-	0.824

Table 6. Results of confirmatory factor analysis of the items

Item number	Factor loading	Standard coefficient	Significance coefficient	Conclusion
1	0.641	0.61	12.65	Confirmed
2	0.582	0.79	14.38	Confirmed
3	0.725	0.74	10.91	Confirmed
4	0.596	0.55	15.33	Confirmed
5	0.602	0.68	14.20	Confirmed
6	0.648	0.76	10.18	Confirmed
7	0.714	0.81	12.58	Confirmed
8	0.739	0.59	13.39	Confirmed
9	0.708	0.78	14.48	Confirmed
10	0.694	0.69	16.29	Confirmed
11	0.683	0.81	15.43	Confirmed
12	0.705	0.84	11.92	Confirmed
13	0.627	0.71	13.75	Confirmed
14	0.684	0.82	14.69	Confirmed
15	0.716	0.66	12.31	Confirmed
16	0.596	0.58	14.72	Confirmed
17	0.639	0.75	10.68	Confirmed
18	0.694	0.65	14.95	Confirmed

Table 7. Cronbach's alpha of the instrument items

Factor	Scale	Items	Cronbach's alpha
1	Intrinsic motivation	1-4	0.82
2	Identified motivation	5-7	0.84
3	Introjected motivation	8,9	0.79
4	Career motivation	10-12	0.81
5	External motivation	13-15	0.78
6	Teaching assistant motivation	16-18	0.83
Total		18	0.81

To determine the instrument repeatability, the interclass correlation coefficient was calculated for all dimensions; it was 0.86 for the whole instrument (Table 8).

In addition, the linear relationship between the factors was described through Spearman's correlation

coefficient and the results showed a positive, strong correlation between the main factors.

The Kappa coefficient can vary between zero and one and is expressed as a percent. According to the literature, a Kappa coefficient of 0.61-1 has high categorizing power (Table 9).

Table 8. Interclass correlation coefficient

Scales	Interclass correlation coefficient
Intrinsic motivation	0.93
Identified motivation	0.88
Introjected motivation	0.79
Career motivation	0.84
External motivation	0.86
Teaching assistant motivation	0.85
Total	0.86

Based on the values of table 10, the Kappa coefficient over 0.6 is the minimum acceptable value, and values higher than 0.8 are ideal for agreement between two reviewers or two evaluators.

In order to confirm the homogeneity of the items of this scale in terms of content and form regarding dimensions, confirmatory factor analysis of six factors was performed on the questionnaires and the results of their fit are shown in the table 11.

Discussion

The objective of this study was the translation of the PTMQ and the evaluation of its validity and reliability from the viewpoint of clinical professors of internal and surgical groups at Iran University of Medical Sciences (IUMS). The study population included clinical training experts and specialists of the internal and surgical departments of IUMS from whom 11 individuals were selected as samples for psychometry of the instrument. The results showed that PTMQ is valid and reliable. According to the CVI and CVR obtained in this study, the questionnaire was finally confirmed after some changes in 3 items (9,16, and 18). The construct validity was evaluated through exploratory and confirmatory factor analysis using Bartlett's sphericity test, scree plot, eigenvalue, and varimax rotation. Considering eigenvalues greater than 1 and scree plot slope, 6 factors were extracted with a power of 54.695% of the total changes in the components of PTMQ. It can be concluded that 18 items out of 18 items had factor loadings higher than 0.40, indicating the main objective of this research (*i.e.*, recognizing the components of physicians' teaching motivation). Then, the

Table 9. Spearman's rank correlation coefficient between the instrument factors

Factor	1	2	3	4	5	6
1	-	0.696	0.702	0.618	0.691	0.688
2	0.728	-	0.759	0.724	0.853	0.708
3	0.809	0.744	-	0.685	0.701	0.725
4	0.730	0.794	0.756	-	0.744	0.699
5	0.815	0.769	0.813	0.735	-	0.716
6	0.763	0.780	0.863	0.814	0.752	-

Table 10. Kappa value of the instrument items

Items	Kappa coefficient
1	0/81
2	77/0
3	0/83
4	0/79
5	0/84
6	0/78

reliability was determined through Cronbach's alpha, which is known as the internal consistency of variables, using SPSS 23. Cronbach's alpha for the 6 dimensions of the instrument was 0.82 for intrinsic motivation, 0.84 for identified motivation, 0.79 for introjected motivation, 0.81 for career motivation, 0.78 for external motivation, and 0.83 for teaching assistant motivation. To determine the instrument repeatability, the interclass correlation coefficient

Table 11. Tool suitability indicators

Indicator	Standard index	Index value in the desired model	Conclusion
Chi-square	Between 2 and 3	2.67	The fit of the tool is appropriate
RMSE	<0/1	0.018	The fit of the tool is appropriate
NFI	0/91>	0.94	The fit of the tool is appropriate
NNFI	0/9>	0.95	The fit of the tool is appropriate
CFI	0/9>	0.93	The fit of the tool is appropriate
RFI	0/9>	0.92	The fit of the tool is appropriate
IFI	0/9>	0.93	The fit of the tool is appropriate
GFI	0/9>	0.94	The fit of the tool is appropriate

was calculated for all dimensions; it was 0.86 for the whole instrument. In addition, Spearman's correlation coefficient was used to describe the linear relationships between the factors, and the results showed a positive, strong correlation between the main factors. Agreement between the participants was determined through the instrument reliability. The results of items were as follows: Item 1 (0.81), Item 2 (0.77), Item 3 (0.83), Item 4 (0.79), Item 5 (0.84), and Item 6 (0.78) (Figures 1 and 2). Faculty members are the main and most valuable pillars of medical sciences universities. Professors' motivation, vitality, innovation, and efficiency has a profound impact on the improvement of teaching and education

quality (11). Conceptually, motivation is based on the assumption that any behavior has a reason and there is a motivation behind any action performed. On the other hand, the development of motivation is an individual, situational, permanent, endless, variable, dynamic, and complicated subject. As a result, there are no definite and valid rules and instructions for the motivation of people; rather, planning for motivation in every organization can be ideally performed based on the characteristics of individuals and the environment. Rockwell *et al* found that the incentives that encourage faculty members to deliver distance education mainly revolve around intrinsic or personal rewards (the opportunity to provide

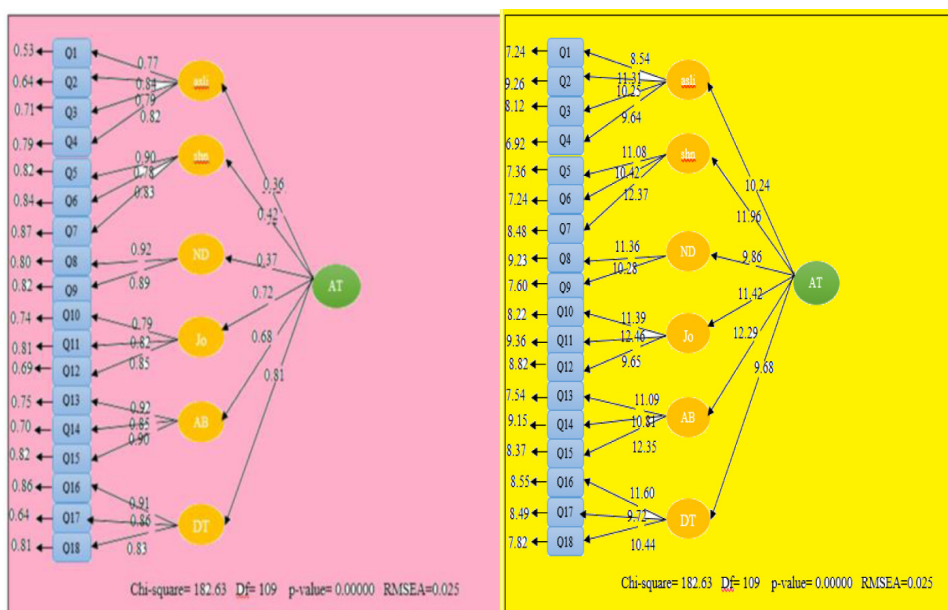


Figure 1 and 2. Dimension scores in standard and meaningful model.

innovative instruction and reach self-gratification) (12).

Wolcott found that motivation for the most part the faculty members of distance education programs is to fulfill personal or socially derived satisfactions, rather than the promise of a stipend, merit pay, a promotion, or an award (13). According to Maguire, external incentives of professors include tenure and promotion, the level of job satisfaction, administrative and technical support, and the amount of support and recognition received from peers (14). Esmaili *et al* performed a study on the characteristics of a good professor and its impact on the educational motivation of dentistry students. The results of path coefficients of structural equations showed that the characteristics of a good professor in the framework of the good professor include knowledge (0.86), personality (0.84), communications (0.82), teaching method (0.79), evaluation (0.68), and ethics (0.60) and in the framework of academic motivation comprise intrinsic motivation (0.84), self-concept (0.78) and external motivation (0.74). The mean motivation score of students in the possible range of 1-5 was 3.37, which was favorable. The results also showed that the characteristics of a good professor do not affect the academic motivation of students (15). Mirmohammadkhani *et al* studied the effect of motivation factors on the educational performance of faculty members. In this descriptive cross-sectional study, “being respected in the workplace” and “passion for teaching” were respectively the most important factors from the viewpoint of faculty members of Semnan University of Medical Sciences. The findings of this study represented that both intrinsic and external motivation factors can affect the performance of professors. Therefore, managers should provide the necessary tools to increase the motivation of faculty members and their performance.

Conclusion

Determining the factors affecting career motivation is necessary for increasing the efficiency and job satisfaction of faculty members. Faculty members are

certainly more important than programs, activities, equipment, and materials in the system. Medical sciences universities require motivated professors as the pillars of education to affect the education of students and improve the health of society and prohibit the emergence of a sick and unproductive society in the future. Studies on physicians in educational settings show that long working hours, underpayment, job insecurity, lack of job independence, and insufficient resources are the factors related to job dissatisfaction and stress (16,17). Faculty members are the main body of medical sciences universities. Motivation is one of the most important tools for propelling faculty members toward effective activities in the workplace. Therefore, it is necessary to adequately know the conditions and provide appropriate situations to increase the job passion of faculty members. In addition, managers and the relevant officials should keep the career motivation of faculty members at a high level and improve their efficiency (1).

Ethics approval

The Iran University of Medical Sciences (IUMS) Research Ethics Committee has approved this study. Informed consent was obtained from all the participants. We confirm that all methods were performed in accordance with the guidelines and regulations of the Iran University of Medical Sciences (IUMS) Research Ethics Committee approval reference number IR.IUMS.FMD.REC.1400.518.

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Conflict of Interest

The authors declare that they have no competing interests.

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