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Original Article

Ranking and Analyzing the Achievement of the Goals of the Integration of Medical Education and the Health System from the Point of View of Academic Staff Members and Using the Fuzzy PROMETHEE

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Abstract

Background: Despite the passage of several decades since the approval and implementation of the plan to integrate medical education and the health system, the analysis and extent of achieving the goals of this plan have been neglected and require careful and detailed investigation.

Objectives: The present study aimed to investigate the achievement of the goals of the integration of medical science education and the health system from the point of view of the faculty members and ranking these goals.

Methods: The present survey was conducted on 548 faculty members at Kerman University of Medical Sciences as the statistical population; however, a total of 225 subjects were selected using Morgan table and stratified random sampling. Data were collected using a questionnaire measuring the 24 goals of merge plan based on five fields. The viewpoint of eight experts as well as fuzzy PROMETHEE was used to rank the goals. Data were analyzed using SPSS 26 and Visual PROMETHEE software.

Results: According to the members of the academic staff, the goals of the integration of medical education and the health system have been fulfilled. From the point of view of academic staff members, therapeutic goals are the goals, which have been most realized. There is no difference from the point of view of the educational group and the academic rank, regarding the realization of the goals of the integration plan. By ranking the goals, it was found that the most important goal of the integration plan is therapeutic goals, followed by educational, health, research, and social goals.

Conclusion: According to the faculty members of Kerman University of Medical Sciences, the goals of the integration plan have been realized; however, it is still far from the ideal. From the point of view of academic staff members and goal-ranking experts, the most important goal of the integration plan is therapeutic goals.

Keywords: Integration; Medical Education; Health System; Faculty Members; Fuzzy PROMETHEE

Background

During the years after the Islamic Revolution, the training of healthcare professionals in Iran underwent tremendous changes (1). The educational program review staff of the medical department was formed in the first years of the establishment of the cultural revolution staff, and it examined the state of medical science education quantitatively and qualitatively and pointed out the existing problems in its final report (2). The great heterogeneity of educational programs in different faculties, the predominant employment of medical science specialists in institutions related to the Ministry of Health or in the private sector, the lack of participation in the education of medical sciences in the country, the significant lack of health manpower in most parts of the country, a lack of emphasis on social aspects in medical science education, and the very low capacity of basic medical science education at master's and

doctorate levels (only three universities and with limited capacity), were part of the issues raised in this report (3-9).

As a result of the publication of the above research report, with the approval of the Islamic Council in 1985, all the powers, duties, and responsibilities of the Ministry of Culture and Higher Education in medical science education were transferred to the new ministry (3). With the separation of medical science education from the Ministry of Culture and Higher Education, and its integration into the Ministry of Health and Welfare, the Ministry of Health and Medical Education was formed (10).

Finally, in 1985, a new organization named "Ministry of Health and Medical Education" was established from the collection of colleges and higher education institutions of the Department of Medicine and the Ministry of Health. From the beginning of the formation of this ministry, the goals were designed in such a way that each province would have a medical science university that will be responsible for all the educational, research, health, and therapeutic affairs of the respective province. As a result of the integration, knowledge and dynamism of the universities with the experience and follow-up of the healthcare system, the medical system of the country created a coherent system in all relevant matters -from the village to the provincial capital, to improve the medical condition of the country in terms of quantity and quality.

The main goals of this merger and the creation of a single management in matters related to health and medical education at that time were presented as follows:

A. Using all the country's health and treatment facilities to expand medical education and provide the country's needed manpower.

B. Responding better to the health needs of the community by breaking the fence of medical schools from the campus of the school and affiliated hospitals, and transferring the implementation of part of the education in the community, to help make medical education community-oriented.

C. Improving the scientific level of institutions, outpatient service centers, and hospitals of the Ministry of Health by instilling the academic spirit into the above organizations (3, 11).

Also, over time, other goals such as expanding universities and increasing the number of medical students, using more clinical and educational facilities in the medical education system, aligning medical education with the real problems and needs of the society, unifying the human resource and consumer sectors forces appeared (12, 13). In this regard, the mentioned plan increased the number of medical students, faculty members, and medical schools and created the field of community-oriented medical education and expansion of coverage to rural areas (14).

On the other hand, some experts believe that the merger plan causes problems such as lack of attention of officials to educational issues, less efficiency of teaching hospitals despite the high costs, unemployment of graduates of the medical department, lack of motivation of faculty members and students, decline in the quality of the treatment and public dissatisfaction with hospital services (3, 4, 8, 15).

Also, some reports indicate that the integration of medical education with healthcare fields on one hand has led to the development of expert manpower and improvement of health indicators; on the other hand, it has caused a decline in the quality of medical education and the provision of medical services in hospitals (16).

Although the goals, challenges, and problems of the integration plan have been discussed over the decades, the investigation of the goals and the level of achievement appears to have been neglected and requires further investigation. In this sense, in this research, the degree of achievement of the goals of the integration plan has been investigated from the point of view of academic staff members, and then these goals have been prioritized using the fuzzy PROMETHEE approach and the opinions of experts.

Objectives

The current research was conducted with the aim of investigating the achievement of the goals of the integration of medical science education and the health system from the point of view of the faculty members of Kerman University of Medical Sciences and ranking these goals. In addition, this research seeks to answer the following questions:

1. From the point of view of the faculty members of Kerman University of Medical Sciences, what is the extent of achieving the goals of integrating medical science education and the health system?

2. Is there a relationship between the faculty members at Kerman University of Medical Sciences and their attitudes toward the degree of achieving the goals of medical science education and the health system?

3. Is there a relationship between the academic rank of faculty members at Kerman University of Medical Sciences and their attitude toward the degree of achieving the goals of medical science education and the health system?

4. What is the prioritization of the goals of the integration of medical science education and the health system using the fuzzy PROMETHEE method?

Methods

The present survey was performed in 2023. The statistical population included all faculty members of Kerman University of Medical Sciences (n = 548) of whom 225 subjects were selected by stratified random sampling and Morgan table. This sampling method involved all academic departments (seven faculties) in the research. Table 1 shows the number of faculty members at Kerman University of Medical Sciences and the number of subjects selected from each department. Table 1 shows the number of faculty members at Kerman University of Medical Sciences and the number of subjects selected from each department.

A questionnaire of goals was used to evaluate the achievment of the goals of integration of medical science education and the attitude of faculty members toward it. The validity of the questionnaire was evaluated and verified using the opinions of experts and academic staff. To measure the validity of the questionnaire, face validity and content validity were used, based on the opinions of ten experts.

For this purpose, face validity was used; i.e., ten academic staff and experts were asked to express their views on the items of the questionnaire. The experts expressed their opinions about the grammar of the sentences and the spelling of the items, and corrections were made.

The content validity was also checked by content validity ratio (CVR) and content validity index (CVI). To calculate the CVR, the opinions of ten experts were used. They were then asked to rate each question on a three-point Likert scale:

- Essential
- Useful but not necessary
- Not necessary

After gathering the opinions of experts, CVR is calculated using the following equation:

$$CVR = \frac{n_e - \frac{N}{2}}{\frac{N}{2}} \quad (1)$$

In this equation:

N: Total number of experts

n_e: The number of experts who have chosen the necessary option.

Based on the number of experts who evaluated the questions, the minimum acceptable CVR value was determined (0.62 with 10 experts; opinion).

To check the CVI index, a questionnaire was used that determined the degree of relevance, Simplicity and clarity of each item with a four-part spectrum (1-4). The number of experts who chose options 3 and 4 is divided by the total number of experts. If the resulting value is less than 0.7, the item is rejected, if it is between 0.7-0.79, it should be revised, and if it is greater than 0.79, it is acceptable.

By performing calculations, CVR=0.88 and CVI=0.92 were obtained. According to the fact that the value of CVR obtained by experts (10 people) is more than 0.62; therefore, from this point of view, the validity of the questionnaires was confirmed. Since the values obtained for this index for all questions were higher than the critical value of 0.79, the validity of the questionnaire was confirmed from this point of view.

Cronbach's alpha coefficient was used to evaluate the reliability of the questionnaire, which was 0.90 and confirmed. The questionnaire used consisted of 27 items (goals) in two parts. The first part dealt with demographic information, including gender, academic department, and academic rank of professors and the second part included items of the goals of integration of medical science education and health system based on five fields: educational, research, therapeutic, health, and social.

Table 1. Number of Statistical Population and Samples Based on Academic Department at Kerman University of Medical Sciences

Academic Department	Statistical Population, N	Sample Size, N	Percentage
Faculty of Public Health	37	15	7%
Faculty of Midwifery and Nursing	28	11	5%
Faculty of Medicine	316	130	58%
Faculty of Allied Medicine	27	11	5%
Faculty of Pharmacy	26	11	5%
Faculty of Dentistry	69	28	12%
Faculty of Management and Medical Informatics	33	14	6%
Faulty of Persian Medicine	12	5	2%
Total	548	225	100%

A five-point Likert scale from 1 to 5 was used for scoring. Thus, faculty members were asked to choose one of the strongly disagree, disagree, no opinion, agree, and strongly agree on options with regard to the degree of their opinions for the degree of achievement of integration goals.

According to the scores given, the average level of degree of goals integration or the line between achieving or not achieving goals of integration was 3.4, because dividing the number of intervals by scales results in a distance of 0.8. Hence, levels of achievement were identified (Figure 1) (17). As soon as the validity and reliability were confirmed, the questionnaire was placed at disposal of the faculty members and then collected after completion.

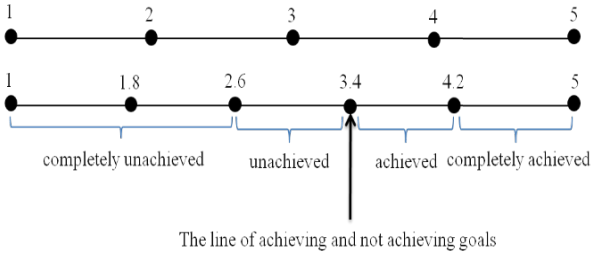

Figure 1. Classification of goals of integration

Data were analyzed using descriptive and inferential statistics. In descriptive statistics, mean and standard deviation and in inferential statistics ANOVA were used. Finally, the data were analyzed using SPSS version 26.

Next, a new fuzzy PROMETHEE was used to rank the goals. It falls into the category of techniques for ranking options. This technique has been successfully used in various fields so far. The fuzzy PROMETHEE introduced by Ho is the combination of fuzzy PROMETHEE with greater flexibility (18).

After examining the the goals of integration of medical science education and health system, the questionnaires were given to experts (one expert per faculty) to determine the importance of each goal according to their viewpoints. Since it was essential to choose participants who were fully aware of the current status, experts were selected from the heads or deputies of each faculty. Since the involved experts had different abilities, experiences, and competencies in group decision-making, different weights were given to them (Table 2).

Since the number of faculty members of the Faculty of Medicine is more than other faculties, and they are divided into two departments of basic and clinical sciences with multiple faculties, two experts were selected from this faculty.

Table 2. Expert Weights to Rank Goals of Integration

Expert number	Faculty related to expert	Expert weight (%)
1	Faculty of Public Health	6
2	Faculty of Midwifery and Nursing	5
3	Faculty of Medicine	23
4	Faculty of Management and Medical Informatics	3
5	Faculty of Medicine	27
6	Faculty of Dentistry	18
7	Faculty of Pharmacy	8
8	Faculty of Allied Medicine	10

The Faculty of Persian Medicine did not participate in this ranking. Since personal characteristics of individuals influence their subjective interpretations of qualitative variables, by defining the domain of qualitative variables, experts responded to the questions with the same mentality. These variables are defined as triangular fuzzy. These variables are defined in Table 3.

Table 3. Triangular Fuzzy Number of Verbal Variables

Verbal variables	Determined fuzzy number	Triangular fuzzy number
Very high	(1,0.25,0)	0.9375
High	(0.75,0.15,0.15)	0.75
Medium	(0.5,0.25,0.25)	0.5
Low	(0.25,0.15,0.15)	0.25
Very low	(0,0,0.25)	0.0625

The fuzzy sets determined by the Minkowski formula were calculated using equation 2.

$$x = m + \frac{\beta - \alpha}{4} \qquad (2)$$

In this equation:

β: Upper limit of the triangular fuzzy number

α: Middle limit of the triangular fuzzy number

m: The lower limit of the triangular fuzzy number.

Also, the fuzzy average of each goal was calculated using equations 3 and 4.

$$A_i=(a_1^{(i)}, a_2^{(i)}, a_3^{(i)}, \ldots, a_n^{(i)}) \quad i=1,2,3,\ldots,n \qquad (3)$$

$$A_{ave}= (m_1, m_2, m_3, \ldots, m_n) = \left(\frac{1}{n}\sum_{i=1}^{n} a_1^{(i)}, \frac{1}{n}\sum_{i=1}^{n} a_2^{(i)}, \frac{1}{n}\sum_{i=1}^{n} a_3^{(i)}, \ldots, \frac{1}{n}\sum_{i=1}^{n} a_n^{(i)}\right) \qquad (4)$$

In this equation:

A_i: Expert's view i

$a_n^{(i)}$: Component (goal) opinion

A_{ave}: Average of expert's view

m_n: Expert number

After receiving the questionnaires, the experts described the importance of each question with one of the fuzzy linguistic variables (very low, low, medium,

high, and very high). Then, after evaluating the questionnaires, the data were ranked using fuzzy PROMETHEE in Visual PROMETHEE software (17).

Results

The findings of each goal and their field are shown in Table 4. As seen in Table 4, according to the members of the academic staff, the goals of integrating the education of medical sciences and the health system have been achieved. The total average of goals achieved is equal to 3.98, which is placed in the goal achieved section according to Figure 1.

In addition to the descriptive analysis of the data, in this research, an attempt has been made to reach conclusions about the attitude of the academic staff toward the achievement of the goals of the integration of medical education and the health system. For this purpose and to answer the second and third questions of the research, ANOVA test was used. By comparing the significant values of 0.31 and 0.65 with a significance level ($\alpha = 0.05$), it is determined that the p-value is higher than the acceptable error value ($P > 0.05$). Therefore, it can be stated with a 95% confidence interval that there is no relationship between the educational group and the academic rank of the academic staff members of the University of Medical Sciences and the achievement of the goals of the integration of medical science education and the health system of the academic staff members.

To answer question 4 and rank the goals of integration of medical science education, the experts were provided with a questionnaire to determine the importance of each question through verbal variables. Mean fuzzy scores of goals on the importance of goals are presented in Table 5.

Table 4. Success Degree of the Integration Plan in Achieving the Goals According to the Faculty Members

Item	Goals	Mean (SD)
1	Creating more coordination between different departments of health care and educational services in the country	4.21(0.90)
2	The use of educational system and more medical facilities	3.95(0.93)
3	Adapting medical education to the real problems and needs of society	4.04(0.92)
4	Improving the quality of medical science education	3.78(0.95)
5	Development of educational services such as increasing specialized fields and developing other fields of medical groups	4.17(0.96)
6	Development of educational facilities such as educational space and related equipment	4.11(0.97)
7	Responding to real educational needs	3.48(0.93)
Educational Goals		
8	Quantitative growth of research in medical sciences	4.09(0.98)
9	Qualitative growth of research in medical sciences	3.38(0.90)
10	Conducting applied research based on the needs of society in various medical fields	3.80(1.06)
Research Goals		
11	Improving the quality of health services	4.10(0.96)
12	Better coverage and small expansion of healthcare services	4.52(1.00)
13	Development of medical services, including increasing hospital beds and increasing the ratio of doctor to patient	4.34(0.97)
14	Responding to the medical needs of the community	4.38(0.94)
15	Improving the quality of medical services (including reducing mortality and hospital infections)	4.28(0.99)
16	Technological development and scientific improvement of medical services	4.14(1.00)
17	Self-sufficiency in the field of human resources in the health sector	4.10(1.00)
Therapeutic Goals		
18	Improving health indicators such as morbidity and mortality	3.98(1.02)
19	Improving the coverage of health services and increasing people's access to health services	4.20(0.98)
20	Ease of access to health service centers and hospitals	4.42(0.87)
21	Improving the quality of health services	4.64(0.86)
Health Goals		
22	Improving the level of community health	3.75(0.91)
23	Transforming the vision of graduates toward serving society due to direct involvement with services	3.42(0.95)
24	Change and reform the attitude of academic faculty members from a mere university to an insight based on the needs of society	3.56(0.90)
Social Goals		3.58(0.83)
All Goals		3.98(0.79)

Table 5. Mean Defuzzified Scores of Experts

Expert number	Educational	Research	Therapeutic	Health	Social
1	0.8356	0.7185	0.8996	0.8278	0.7810
2	0.7748	0.5625	0.8122	0.8903	0.7498
3	0.8669	0.7185	0.8496	0.7731	0.7731
4	0.7622	0.7810	0.8622	0.6096	0.8669
5	0.7748	0.8356	0.9370	0.8278	0.7810
6	0.8496	0.7622	0.7748	0.7185	0.5468
7	0.7731	0.7622	0.8278	0.7810	0.7185
8	0.7185	0.8590	0.8996	0.7810	0.7263

These scores were the inputs of Visual PROMETHEE to rank the goals. According to the software output shown in Figure 2, therapeutic goals were the most important goals, followed by educational, health, research, and social goals.

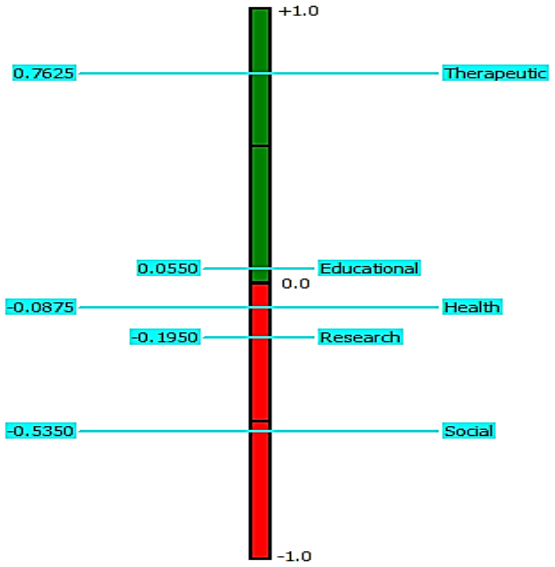

Figure 2. Visual PROMETHEE software output and ranking of integration goals

Discussion

This study analyzed the achievement of the objectives of the integration of medical science education and the health system and their ranking using the fuzzy-parametric approach from the perspective of academic staff members at Kerman University of Medical Sciences. We demonstrated that, overall, the goals of the merger have been achieved from the perspective of academic staff members (3.98). However, to fully achieve all educational, research, therapeutic, health, and social goals, sustained efforts and greater collaboration among all relevant departments are essentia.

The research findings showed that among the goals of educational goals, goal 2 got the lowest mean score, indicating that the goals integration (improving the quality of medical science education), is a goal that is less achieved. Additionally, comparing the values of the educational goals with Figure 1 reveals that all the educational objectives of integrating medical education with the health system have been achieved from the perspective of academic staff members. Among these, goal 1 (enhancing coordination between various healthcare and educational service departments nationwide), with an average score of 4.21, has been fully realized.

Goals 8, 9, and 10 are related to the research goals of the integration plan. Based on the average goals as a whole from the point of view of academic staff members, the integration plan has achieved the desired research goals (3.76). However, in these goals, the goal (qualitative growth of research in medical sciences) with an average of 3.38 and according to Figure 1 has not been achieved. In other words, the integration plan has not been able to improve the quality of medical science research, and more attention should be paid to this issue.

According to Table 4, goals 11 to 17 are related to the therapeutic goals of the integration plan. The academic staff members of the university believe that these goals have been well achieved, and the values above 4 for these goals are an indication of this. Also, the average of the total therapeutic goals, with a value of 4.27, confirms this. In fact, the members of the academic staff believe that with the creation of the integration plan for medical education and the health system, the therapeutic goals of the plan have been fully achieved. Meanwhile, goal 12 (better coverage and small expansion of healthcare services) has the highest value with an average of 4.52.

Goals 18 to 24 are related to health goals of the integration plan. Academic staff members believe that these goals have been well met. Faculty members believe that, with the integration plan, the quality of health services has become very appropriate (4.64). Although the goals of improving health indicators, such as mortality, have been achieved among these goals, more work is needed.

According to Table 4, goals 22 to 24 are related to the social goals of the integration plan.

It seems that from the point of view of the academic staff, the social goals of the integration plan of medical education and the health system have been achieved. Among these goals, the average goal 23 (Transforming the vision of graduates toward serving society due to direct involvement with services) has a lower value, which should be more focused on.

The second and third questions of this research seek to investigate the relationship between the educational group and the academic rank of the faculty members of Kerman University of Medical Sciences with their attitude toward the achievement of integration goals. As the findings showed, the attitude of academic staff members has no significant relationship with the education group and academic rank. In other words, there is no difference in the attitude of academic staff members in different faculties, as well as academic staff members, lecturers, assistant professors, associate professors, and professors, regarding the level of access to the goals of the integration plan in Kerman University of Medical Sciences.

Ranking factors using expert opinions and fuzzy PROMETHEE showed that the therapeutic goals were the most important goals for integration plan. This indicates that, with the integration plan, it is expected that therapeutic goals will be considered more. Given that the people of our country face numerous treatment challenges, including high therapeutic costs, limited access to timely and accurate care, and widespread issues with obtaining certain medications, achieving therapeutic goals is of utmost importance.

On the other hand, the findings of the present study have made it clear that the social goals related to the integration plan, which played an important role in the initial formation of this plan, have had the least amount of success. The integration plan was established with the belief that medical education cannot be confined to a closed environment but must be connected to society. However, it appears that due to the vast expansion of other activities within the new system, effectively implementing this concept has become challenging. In other words, the results indicated that social goals were the least successful. In fact, this plan has made the least progress in achieving one of its primary objectives. This finding, related to a key element of the integration plan, suggests potential structural issues within the current system, and further studies in this area appear to be necessary. Therefore, according to the results of the present study and other reports, additional studies are suggested regarding the inadequacies of the current system in achieving some of its goals.

Conclusion

In general, considering that the integration of medical education and the health system has been the subject of much debate and disagreement, with occasional proposals to separate medical education from the Ministry of Health, the findings of the present study-based on a survey of academic faculty members-deserve attention and emphasis. What was done in this research was in order to understand part of the existing conditions and the degree of achievement of the goals, and it was discussed in the form of five goals (therapeutic, educational, health, research, and social goals) from the perspective of the academic staff of Kerman University of Medical Sciences, and it was concluded that the overall goals of integrating medical education and the system Health have been achieved. A comprehensive understanding of the facts, conditions, and achievement of the goals requires the use of additional tools that can be explored through further studies. Given the importance of the topic, it is recommended to conduct the study on a larger scale at other universities and address the weaknesses in the current structure to correct them.

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Conflict of interests: There is no conflict of interest.

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