

# Determining the Criteria and Their Weights for Medical Schools' Ranking: A National Consensus

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**Abstract-** Delphi as a consensus development technique enables anonymous, systematic refinement of expert opinion with the aim of arriving at a combined or consensual position. In this study, we determined the criteria and their weights for Iranian Medical Schools' ranking through a Delphi process. An expert committee devised 13 proposed criteria with 32 indicators with their weights, which were arranged hierarchically in the form of a tree diagram. We used the Delphi technique to reach a consensus on these criteria and weights among the deans of 38 public Iranian medical schools. For this purpose, we devised and sent a questionnaire to schools and asked them to suggest or correct the criteria and their weights. We repeated this process in two rounds till all the schools reached an acceptable consensus on them. All schools reached a consensus on the set of 13 criteria and 30 indicators and their weights in three main contexts of education, research and facilities, and equipment which were used for Medical Schools' ranking. Using Delphi technique for devising the criteria and their weights in evaluation processes such as ranking makes their results more acceptable among universities.

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## Introduction

In group decision making, the group is often dominated by the ideas of a few members. Consensus techniques are used to eliminate this problem and make sure that all the ideas are taken into effect equally. One of these techniques is the Delphi process that can be deployed both for consensus measurement and consensus development (1,2).

Delphi provides the opportunity for systematic refinement of experts' opinion anonymously to reach to a consensual position (2). It is widely used in health research, education, nursing practice, clinical medicine, prioritization and qualitative research (1-5).

In Delphi technique information and opinions of participants are gathered without their physical assembling to overcome geographical or time limitations. Instead, media like mail, Fax, or email are used. This reliable technique facilitates problem solving

and decision-making (1,6) and is a structured process held in several rounds for collecting and resending the opinions to a group of experts till a reasonable level of consensus is reached (7,8).

Delphi participants should be aware of its aim to be able to answer appropriately or keep their interest. This is considered to be the most important issue in a Delphi exercise. On the other hand, there is no need for high degree of expertise (2). However, the Delphi method has got some limitations too. The most important one is about its accuracy (9). The critiques declare that Delphi is suitable as the last solution for extremely complex problems for which there are no other better models (9). Also, some critiques express that in Delphi method the researcher makes participants believe that the predetermined outcome is their own. In this case, better defense would be provided for convincing a larger community (10).

On the other hand, transparency has become the

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main component of the recent education systems. There are a wide variety of tools available for increasing transparency in higher education. A well-known example is university ranking, which is useful for enhancing the quality of education (11).

Poorly-designed ranking systems may result in deceptive information so that an increase in an institution's rank may not indicate an increase in its quality (12). In spite of the criticisms, evidence indicates that rankings have an influence on academic decision-making and the structure of the educational organizations (13). Universities are supposed to take good advantage of the ranking as a tool that shows their educational and research strategic goals (13).

There is no agreement on the definition of quality in higher education because quality has different meanings from the perspective of various stakeholders. So university ranking systems for a measure of quality should consider the needs of all stakeholders and their participation (11).

Ongoing comparison of a university's operations, and performance against others provides the chance of identifying "best" practices and the university finds a benchmark for setting its own goals (14).

In Iran, the Ministry of Health and Medical Education (MOHME) as the central body of medical education is responsible for the evaluation of universities of medical sciences. It has adopted many short- and long-term strategies to establish efficient modern systems of evaluation and ranking. The product of the ranking process is useful both for the ministry as a guide for planning and for each university as a tool to recognize its position amongst all others. MOHME performed the first Medical Schools ranking in 2003 (1) and repeated the process for three times in two years intervals. Delphi technique was used to devise a set of criteria and their weights in this ranking process, which is going to be presented in this article.

## Materials and Methods

To rank the medical schools nationwide, we constituted a medical education expert committee, which devised a set of 13 criteria and 32 indicators in three main contexts of education, research and facilities, and equipment, and arranged them hierarchically in the form of a tree diagram.

The summary of mathematical procedures for calculating the scores of main branches of the diagram and consequently the trunk of the tree is as follows: Schools' scores in the end-branch indicators were

calculated based on the data gathered from the schools according to the devised guidelines. Then they were standardized, i.e. converted into a 0 to 100 scale before being multiplied by their weights. The weight of each criterion is a predetermined constant for each branch, which is applied to all the schools unanimously. The total weight of all the criteria is 100%. Finally, the resultant weighted scores for the similar criteria (pertaining to the same node on the tree diagram) were summed up to derive their parent branch's score. These steps are likewise repeated until the total scores of highest levels of the diagram were obtained. Eventually, the total scores of the schools were re-standardized, and schools were stratified based on their total individual scores. Furthermore, they were also ranked in each indicator (1).

To devise above mentioned criteria and indicators, medical education expert committee suggested the criteria and their raw weights using the Focus Group Technique. In the next step, we performed the Delphi technique among the deans of all 38 public Iranian medical schools, as representatives of their schools' educational system. We invited them to participate in a workshop in which we introduced the project, explained all the indicators and criteria, and the methods of weighting, especially the Delphi technique. Then we gave them the first round Delphi questionnaire in which each level of the tree diagram was shown on a separate page, and the expert committee's proposed weight for each criterion was mentioned in a box. There was an empty box for schools' suggested weights and a blank space for their comments. On the next page, we prepared the schools with the detailed definitions of the same criteria. We designed these two pages for every level of the ranking tree diagram. According to our Delphi instruction, the deans had to constitute independently a committee in their schools, comprising the vice-chancellors of education, research, student affairs, and any other experts to discuss and express their comments on the importance of the criteria and finally suggest the new weights in prepared empty boxes with their related comments.

They returned the questionnaires by post in 20 days. We had emphasized that "no response" from schools at each round meant complete agreement with the proposed weights. However, the process of responding was encouraged by calling the schools' deans within 10 days after the workshop.

We calculated the means of the schools' proposed weights after discarding the lowest and the highest 5% (trimmed mean), and then organized the comments and

sent them for the second round of Delphi to be reviewed by schools. So they could change their responses based on the mentioned weights and comments, to reach more favorable consensus. In the second round, an acceptable consensus was reached.

MOHME has traditionally categorized the country's universities according to their size into three types: 1 (large), 2 (medium) and 3 (small). We compared the suggested weights by these three types of significant differences. We used Independent T-test for this purpose.

## Results

In the first round the response rate was 92% (35 schools out of 38) and in the second round the response rate was 89%; i.e. of the 38 school participating in the survey, 28 (74%) schools completed the questionnaire; and 6 (15%) schools agreed with all criteria and weights without completing the questionnaire.

Finally, schools reached a consensus on a tree diagram including a set of 13 criteria and 30 indicators with their weights, in three main contexts of education, research and facilities, and equipment. In this two rounded Delphi, four indicators were omitted, and two were added and the trimmed means for final weights were in the range of first rounds' weights +/- 2%.

The final criteria and indicators are as follows:

### Education

1- National University Entrance Examination (NUEE) score (school's admission): In Iran medical students are admitted through a national entrance examination. This indicator was determined by admitted students' average score at NUEE.

2- Ratios:

2-1- Faculty: class size in basic sciences and clinical settings, student/faculty ratios, full and associate professors to all faculty members' proportion, and board membership.

2-2- Educational facilities: Students/facilities ratios for laboratory equipment, and educational beds.

3- Educational activities:

3-1- Credits and courses: consist of core curricular credits, basic sciences' laboratory programs, extracurricular clinical training, extracurricular courses (computer and English language courses), and the frequency of delivering credits and courses, and summer courses.

3-2- Formative evaluation: including assessment of teaching references, exams' references and procedures.

4- Clinical training:

4-1- Inpatient setting: assessing scholarly activities such as teaching rounds, morning reports, journal clubs, and mortality and morbidity reports.

4-2- Outpatient setting: assessing clinics' training programs.

5- Administrative affairs:

5-1- Compliance with regulations: includes assessing prerequisites, conditional and dismissal regulations.

5-2- Orientation: new student orientation program, regulations and programs' guide book, and academic faculty advisor.

6- Students' output:

6-1- Graduation rate: the percentage of students who succeed in graduation within the assigned period of study.

6-2- Comprehensive examinations: including basic sciences and pre-internship comprehensive examinations that are held by MOHME.

6-3- Acceptance as resident: the percentage of graduates who are accepted into residency programs within two years after graduation.

### Research

7- Research grants: the total grant allocated to researchers.

8- Research activities:

8-1- Research projects and dissertations: including assessment of research activities, dissertations, and research related workshops.

8-2- Research centers: assessing human resources, equipment, research activities, output and publication in 3 types of research centers i.e. MOHME approved, the university approved and student centers.

9- Publications:

9-1- Journals and bulletins

9-2- Faculty books

9-3- Faculty articles: including articles published in ISI, Pubmed and Scopus journals, Iranian indexed journals and other journals.

10- Congresses and seminars:

10-1- National: number of events and their continuous medical education credits.

10-2- International: number of events and their continuous medical education credits.

### Facilities and equipment

11- Education and research:

11-1- Library: including reference books, journals, and physical spaces.

11-2- Audiovisual resources

11-3- Computer resources

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11-4- Educational facilities: including facilities in basic sciences laboratories and clinical wards, and paraclinical equipment.

12- Accommodation & Welfare:

12-1- Dormitory and pavilion: including the ratio of students/beds, and facilities.

12-2- Health services for students: including clinics for students and insurance.

12-3- Students' nutrition: including menus and restaurant facilities,

12-4- Sports facilities: including saloons and their equipment, and sports teams.

12-5- Faculty welfare: including clubs and housing facilities.

12-6- Special services: including all other facilities

for faculty members and students.

13- Educational Spaces:

13-1- School: including classes and spaces.

13-2- Hospitals: including wards, operation rooms, and clinics.

Four indicators were omitted through Delphi process: "granting facilities for faculty members", "spin-off companies", "recruitment process" and "special exams". On the other hand, two criteria of "health services for the students" and "formative evaluation" were added.

Table 1 demonstrates the final criteria and indicators designed for ranking medical schools, and their related weights.

**Table 1. The set of criteria and indicators with their weights for ranking medical schools**

Division	Division Weight	Criterion	Criterion Weight	Indicator	Indicator Weight		
Education	51%	NUEE <sup>1</sup> score	4%	N/A <sup>2</sup>	N/A <sup>2</sup>		
		Ratios	24%	Faculty	60%		
		Educational Activities	16%	Clinical Training	22%	Educational Facilities	40%
						Credits & Courses	55%
						Formative Evaluation	45%
						Inpatient Setting	45%
		Administrative Affairs	14%	Students' Output	20%	Outpatient Setting	55%
						Compliance with Regulations	54%
		Research	23%	Research Grants	16%	Orientation	46%
						Graduation Rate	34%
Research Activities	46%			Publications	26%	Comprehensive Examinations	56%
						Acceptance as resident	10%
						N/A <sup>2</sup>	N/A <sup>2</sup>
						Research Projects & Dissertations	68%
Congresses & Seminars	12%			Education & Research	51%	Research Centers	32%
						Journals & Bulletins	25%
						Faculty Books	32%
						Faculty Articles	43%
Facilities & Equipment	26%	Accommodation & Welfare	28%	National	49%		
				International	51%		
		Educational Spaces	21%	Educational Spaces	21%	Library	30%
						Audiovisual Resources	20%
						Computer Resources	20%
						Educational Facilities	30%
						Dormitory/ Pavilion	39%
						Health Services for Students	10%
						Students' Nutrition	20%
						Sport Facilities	11%
Faculty Welfare	11%						
Special Services	9%						
School	49%						
Hospitals	51%						

National University Entrance Examination score (Konkour); 2. Not applicable

Type 2 and 3 universities had suggested lower weights for the criteria relating to faculty ratios, including faculty per student ratio, class size and full and associate professors to all faculty members' proportion ( $P$ .value=0.002). In addition, type 1 universities, tended to increase the weights of criteria related to clinical training ( $P=0.01$ ). This trend was

obvious in the research center criteria as well ( $P=0.001$ ). These universities had given higher weight to "publications" criteria ( $P=0.03$ ). Another significant difference was seen in "board membership" criterion, and Type 1 universities had suggested significantly higher weight for this criterion ( $P=0.000$ ). No significant differences were observed in other criteria among these

three types of universities.

## Discussion

Nowadays, rankings provide the chance of comparing medical schools regarding academic, education, research, or other special (e.g. social) missions (15-17). The ranking process has a competitive nature, which makes it somehow unacceptable for some schools. So as a national project, the cooperation of schools in every defined step of the process, e.g., determining the weights of criteria as one of the most important steps is critical (13).

We had no better choice than the Delphi method for consensus development on determining the criteria and their weights; because:

- There were 38 school deans nationwide who had to make expert committees within their schools. So they constituted a large number of experts who could not be gathered physically for consensus development.

- As a national project, we had geographical limitations for gathering experts in different meetings.

We made our Delphi process more effective by letting the participants be informed of other schools' comments and explanations about the proposed weights. Universities' proposed weights showed the bias of their status. There are fewer full and associate professors in small universities; so, type 3 universities suggested lower weight for this criterion. In addition, the lack of research centers and a low number of academic publications in small universities has led them to decrease the weights of these criteria too. On the contrary, large universities suggested more weights to these criteria, as well as "board membership" and "clinical training" criteria. During this two-round Delphi technique, 4 indicators were omitted, and 2 were added to the tree diagram. The main reasons for these changes were:

- 1- The main objective of this ranking was comparing Medical Schools in training medical students. The schools omitted the criteria that they believed were not relevant to this purpose, such as "spin-off companies," "granting facilities for faculty members" and "faculty recruitment process."

- 2- Schools omitted the criteria which were not uniform among all schools, such as "special exams".

They also added "formative evaluations" and "health services for students" to the diagram.

By performing the Delphi technique, we reached to the weights on which all the schools had a consensus. Starting the first round of the Delphi with experts'

proposed weights facilitated the participation of the schools. We assumed that providing proposed weights in the first round and universities' comments for their peers in the second round were the main reasons for achieving consensus in only two rounds. On the other hand, this participating process caused the project to be feasible and made the results more reliable and suitable for further planning in the MOHME, motivated the schools to get involved and cooperate actively in the project, and encouraged them to make advances based on each criterion.

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