A Planning Model for Expansion and Stagnation of Higher Education in Iran

Aeen Mohammadi[1], Rita Mojtahedzadeh[1], Soheil Saadat[2], Abdollah Karimi[3], and Hossein Keshavarz Valian[4]

[1] *Department of E-learning in Medical Education, Virtual School, Tehran University of Medical Sciences, Tehran, Iran*

[2] *Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran*

[3] *Department of Pediatric Infectious Diseases, Mofid Pediatrics Hospital, Shahid Beheshti University of Medical Sciences, Tehran, Iran*

[4] *Department of Medical Parasitology and Mycology, Faculty of Public Health, Tehran University of Medical Sciences, Tehran, Iran*

Received: 3 Oct. 2013; Accepted: 11 Nov. 2013

Abstract- Iran universities of medical sciences have experienced a period of expansion in past decades. Now previous concerns are alleviated, and the former quantity-based policy has given a way to a more quality-seeking attitude. In this study, we developed a planning model for expansion and stagnation of higher education in Iranian universities of medical sciences based on workforce requirements of the country and capabilities of the universities. The plan provided an objectively documented base for the authorities to decide on developmental limits of universities. We devised guidelines for justifying existing programs within universities, assigning new undergraduate and postgraduate programs to universities, voluntary request of universities to cancel a program, and their request to offer new programs for the first time in the country, based on three factors: university educational status, each university-program educational status and the nation's need for each discipline. Related councils of the Ministry of Health and Medical Education legitimately approved the plan and guidelines. In this article, we introduced the methodology of developing the plan, described it and its related guidelines and discussed challenges and limitations we encountered in design and application phases.

Acta Medica Iranica, 2014;52(10):768-776.

Keywords: Higher education; Education expansion; Workforce; Development

Introduction

In many countries, there is a belief that increasing higher education opportunities for the society is a key factor for success and improvement in the competing world (1). Several studies have shown the expansion of higher education in different developed and developing countries in recent years (2-5). Two views present regarding this expansion: one is to expand higher education more, and the other is to control it. Therefore, there have been phases of expansion and stagnation of higher education in many countries (1-2).

Two main factors are discussed in the literature regarding the above-mentioned issue. One is a matter of over education and unemployment. Some evidences show that the rapid expansion would cause an increase in unemployment rates of university graduates' (4,6,7). As a result, many of these highly educated workforces are assigned to jobs that need fewer knowledge and skill than what they have obtained during their education (8) and this would be a waste of society's resources (4). Therefore, workforce requirement approach is one of the main approaches for educational planning (1).

The other factor found in the literature indicates that higher education expansion would worsen the quality of university graduates (4,9). Governments expect higher education to be accountable, productive and efficient (3). Governments apply different strategies to monitor its quality including accreditation and quality assessment systems, regulating admission policies (5), allocating resources, realigning new missions (3) and restricting and formulating quantitative expansion (1,2).

Furthermore, expansion and stagnation of higher education is a political issue and even in a governmental centralized system of higher education, it is difficult to shift to stagnation after a period of expansion (2). Thus,

Corresponding Author: R. Mojtahedzadeh
Department of E-learning in Medical Education, Virtual School, Tehran University of Medical Sciences, Tehran, Iran
Tel: +98 21 88978088, Fax: +98 21 88966486, E-mail address: r_mojtahedzadeh@tums.ac.ir

it is critical to prepare an objective and documented plan for this purpose.

Higher education in Iran

Education of medical sciences is integrated to health services in Iran. Universities of medical sciences are supervised by Ministry of Health and Medical Education (MOHME) that is the main responsible body that deploys a variety of systems for evaluation, accreditation and ranking of medical sciences universities. Moreover, MOHME should approve any plan for the establishment of new programs, schools and universities and changes in enrollment size of programs.

As seen in other countries, Iranian universities of medical sciences have experienced a rapid expansion. For example, the number of medical schools increased from 13 institutions in 1976 to 39 in 2000. Unfortunately, the growth was disproportionate to the facilities and equipment of the time. Then, after about two decades, the previous concerns were alleviated, and the former quantity-based policy is giving way to a more quality-seeking attitude. The most rational approach to this transformation is adjusting the number of post-graduate institutions, shrinking the size of the current institutions in proportion to their potentials, and finally reforming some centers to attain the highest possible quality (10).

To fulfill above mentioned goals, MOHME needed to have a full comparative perspective of all schools and universities to determine the developmental limits and current stance of biomedical educational service providers nationwide, assess their productivity and finally modify their functions to meet the nation's needs.

In this study, authors introduced a planning model for expansion and stagnation of higher education in Iranian universities of medical sciences based on workforce requirements and capabilities of the universities. This study covered all biomedical programs that were under the supervision of MOHME, including medicine, dentistry, pharmacy, nursing, midwifery, health sciences, nutrition, allied health sciences, rehabilitation, management and medical informatics in all universities of medical sciences around the country.

Materials and Methods

Current study had three main parts:

a) Identifying capabilities and relative stance of each existing university-program and consequently the university's educational services as a whole.
b) Defining current nation's need for each program.
c) Allocating new missions to universities and justifying their current missions using an objective guideline.

Identifying capabilities and relative stance of each existing university-program

During the period of two years, the authors performed the academic ranking of medical sciences programs. Quality and quantity of educational services were the basis of such a comparison. The results of this step were rank-order lists of offering universities of each program and consequently a rank-order list of universities as a whole with their relative scores.

Initially, authors held several sessions to define the elements, objectives, methods and implications of the project. The core members of those sessions later formed the Project's Medical Education Expert Panel comprising of the project's executive members, specialists and experts on basic and clinical medicine, and experts on medical education. Then an expert panel was formed for each program comprising of specialists of the field and representatives from the core medical education expert panel. Finally, there were 10 expert panels covering medicine, dentistry, pharmacy, nursing, midwifery, health sciences, nutrition, allied health sciences, rehabilitation, management and medical informatics.

Devising the set of criteria

The Medical Education Expert Panel started to work as a prototype and devised a set of criteria and indicators as a decision tree template for evaluation of the educational service provision by medical schools. Thus, the panel thoroughly investigated medical education standards of various accreditation and quality improvement systems (11-13).

A list of the criteria was then further refined through brainstorming. Eventually, the panel sorted the listed items hierarchically in four levels of "Division", "Category", "Criteria" and "Indicators". Then the panel operationally defined each indicator and designed its scoring guideline to ensure reasonable accuracy of the scoring across different schools.

We introduced this template to other expert panels, where the specialists of each discipline adjusted the diagram to fulfill their situation.

Table 1 presents the general tree diagram template of the set of criteria and indicators of this study with their individual weights.

Table 1. The set of divisions, categories, criteria and indicators as a decision tree with their relative weights for ranking programs

Division	Division Weight	Category	Category Weight	Common criteria in all programs	Common indicators in all programs
Input	40.8%	NUEE[a] score	5.7%	N/A[b]	N/A
		Faculties	43.7%	Raw numbers	Full Professors, Associate Professors, Assistant Professors, Instructors, Nonfaculty teachers
		Facilities and equipment	50.6%	Ratios	Student/ faculty ratio, Senior faculty ratio
				Library	Facilities, Books and Periodicals
				Computer resources	Databases, Internet, Equipment[c]
				Educational spaces of the faculty	Classrooms, auditoriums, Basic sciences laboratories
				Clinical, field, lab or pharmacy training	Criteria related to each discipline, e.g. training hospital bed[e], Clinical wards[f], Clinics[f], Paramedical services[g] for medicine
Process	39.1%	Administration	80.1%	Students' affairs	Credits and courses[h], theoretical and non-theoretical instruction, curricula
				Faculty affairs	Faculty development[i], Evaluation of faculty's teaching skills[j]
				Administrative systems	Compliance with regulations[k], Examination assessment, Curriculum assessment, Syllabus design
		Support and counseling systems	19.9%	Students	Faculty advisors, New student orientation, Student guidebook, Educational notice board
				Faculty	Sabbaticals, Participation in international congresses, Orientation
Output	20.1%	Students	55.8%	National examinations	N/A
				Graduation rate	N/A
				Continuing education	Acceptance rate[l], Median score[m]
		Faculties' publications	44.2%	Original books	N/A
				Journal articles	Iranian approved journals, International journals

[a] National University Entrance Examination score, [b] Not applicable, [c] Include indexing, reading rooms, seating capacity, seats per student, photocopying and printing, [d] Include number of books, journal titles, number of reference books, and reference books per student, [e] In total number and per student, [f] In total number and facilities, [g] Include diagnostic imaging, laboratory medicine and pathobiology, physiotherapy, occupational therapy, speech and language therapy, etc, [h] Include curricular credits, computer, English language and research methodology courses, [i] Includes development in medical education, research methodology and computer skills, [j] Consists of systematic evaluation of theoretical and clinical teaching, [k] Includes prerequisites, conditional status, dismissal, and automated system of registration, [l] Acceptance rate in the national postgraduate entrance exams of Iran related to each discipline, [m] The median of the students' scores in above-mentioned exams.

Weighting the criteria

To determine the weight of each criterion and indicator, medical expert panel used Nominal Group Technique (NGT) to define proposed weights. Then we performed a two rounded Delphi technique among medical schools' deans to reach consensus on proposed weights. The final weights of criteria for medical program were proposed to each expert panel to be modified accordingly. Table 1 shows the average weights of main branches of the tree diagram among all panels.

Data collection process

We designed a questionnaire to collect the required school information for scoring each criterion and indicator. Then we asked every school to introduce a representative who participated in an orientation workshop, received the questionnaires and completed them in collaboration with different divisions inside their schools. Finally, the project's representatives referred to schools to verify collected data.

Scoring process

The final score for each program was the weighted sum of the obtained scores for each separate indicator. The leaves (indicators) of the diagram were scored according to the data collected from the schools, based on the devised

guidelines. To maximize the reliability of the school's scores in each indicator, two individuals performed the calculations separately, and the results were compared to correct any mismatch. Then the highest gained score was given 100, and other scores proportionately gained a standard score between 0 and 100.

$$Score\ \ of\ \ the\ \ indicator\ \ = 100 \times \frac{Value\ \ of\ \ the\ \ indicator}{Highest\ \ value\ \ of\ \ the\ \ indicator}$$

Then, the standardized scores were multiplied by their weights. The resultant weighted scores for the similar indicators (pertaining to the same criterion on the diagram) were then summed up to derive their parent branch's (parent criterion) score. These steps were likewise repeated until the total scores of highest levels of the diagram (main divisions and the university-program) were obtained. As a result, we had a rank-order list for each program and their relative scores among offering universities.

Calculating the total score of each university

We needed to have a rank-order list of universities based on status of their offering programs to have a comprehensive view of their capabilities as a whole. As shown in table 1, there are seven categories in a tree diagram which we used their gained scores in each university-program to calculate the whole university's score.

For calculating the mean scores of each category, the authors considered a coefficient regarding programs' levels, which were 1, 2 and 4 for associates, bachelors, and practical doctorate, respectively. Table 2 shows the sample university scores. Finally, the authors had a rank–order list of universities of medical sciences with their relative scores.

Table 2. Scores of seven main categories in a sample university

Disciplines	Coefficient	NUEE1 score	× Coefficient	Faculty	× Coefficient	Facilities & equipment	× Coefficient	Administration	× Coefficient	Support & counseling	× Coefficient	Students	× Coefficient	Faculty publications	× Coefficient
Medicine	4	88	352	9	36	27	108	45	180	53	212	73	292	10	40
Nursing	2	95	190	13	26	39	78	73	146	40	80	45	90	28	56
Midwifery	2	93	186	22	44	35	70	50	100	34	68	17	34	50	100
Health	1	95	95	14	14	47	47	58	58	81	81	40	40	4	4
Allied health	1	94	94	24	24	56	56	66	66	64	64	50	50	24	24
Sum [a]	10	917		144		359		550		505		506		224	
Mean [b]		91.7		14.4		35.9		55		50.5		50.6		22.4	

[a] The sum of coefficient multiplied scores
[b] The sum divided by 10 (sum of coefficients).

Using this method, the number of programs had no effect on the total score of the university and it was possible for a university with fewer offered programs to gain a higher score than a larger one. In addition, high-quality delivery of educational services for each program (regarding the level of the program) leads to a higher total score of the whole university and vice versa.

Defining nation's need

As no valid data presents on nation's need for each program in the country, we collected the viewpoints of stakeholders. We performed this part of the project with cooperation of universities of medical sciences, hospitals, and national health networks.

The authors designed a questionnaire asking nation need for each programs and posted it for three groups: deans of hospitals and national health networks (selected by systematic randomized sampling), faculty members for each program all over the country (selected by systematic randomized sampling) and outstanding faculty members in each program.

Deans of hospitals and national health networks filled the completed questionnaire, but faculty members received and filled the part of the questionnaire related to their own discipline. Authors followed the participants by telephone. The process lasted for three months.

The questionnaire covered these topics for each discipline: estimation of number of job opportunities for graduates, income of practitioners compared to owners of the same degree in other disciplines, need for new graduates and finally recommendation for increasing or decreasing the annual enrollment of students. We emphasized that the responses would be based on a

regional situation of where the responder was working in. The response rate of the survey was 46% for faculty members and 25% for outstanding faculty members (919 individuals) and 94% for deans of hospitals and national health networks (1157 individuals).

Analysis was based on the median of responses. The responses were derived from a visual analogue scale of questions in five categories (severe shortage, shortage, balanced, surplus, and severe surplus), but for attaining more reliability, they were recorded to three categories (shortage, balanced, and surplus).

If the responders had given the same responses to the questions "job opportunities in the region for new graduates" and "income of practitioners compared to owners of the same degree in other disciplines", or had just answered one of these questions, we considered the responses as "demand index". However, if the responses to above-mentioned questions were different, the response to the question "recommendation for increasing or decreasing the annual enrollment of students" was considered as "demand index".

Finally, we determined one of the categories (shortage, balanced, and surplus) for each program based on participants' opinions: the country had a surplus of workforce in medicine, nursing, midwifery and public health. A shortage of workforce presents in emergency medical technician and social worker. The survey showed a balanced situation for other disciplines.

Allocating new and justifying current missions of the universities

We devised a planning model based on objective guidelines to determine the developmental limit, assign new programs, and justify current programs of universities of medical sciences. We considered three main factors:

Total university score: We classified 52 universities as follows:

Level I: universities that gained the score of 80% or more of the best university's score (9 universities).

Level II: universities that gained the score of 60% to 79% of the best university's score (29 universities).

Level III: universities that gained the score of 59% or less of the best university's score (14 universities).

Each program score: We classified each program among offering universities as follows:

Group A: university-program that gained the score of 80% or more of the best score of the same program in all offering universities.

Group B: university-program that gained the score of 65% to 79% of the best score of the same program in all offering universities.

Group C: university-program that gained the score of 64% or less of the best score of the same program in all offering universities.

The nation's need for each discipline: As discussed before, we had three main categories: shortage, balanced and surplus. Then we devised decision-making guidelines based on the above-mentioned factors for justifying existing programs within universities and assigning new undergraduate and postgraduate programs to universities.

Guideline for justifying existing programs within universities

Regarding three above-mentioned factors hierarchically, there were 27 statuses for decision-making shown in table 3. For each existing university-program, three main decisions could be made:

- **Permitted:** It means that the program would be considered within the developmental limit of the university, and if approved by accreditation systems, the university could continue offering the program.
- **Restriction of enrolment:** it is just the same as "permitted", but the annual acceptance number of students should be reduced.
- **Not permitted:** it means that the program would not be considered within the developmental limit of the university, and it should be canceled regardless of being accredited or not.

Guideline for assigning new undergraduate programs to universities

If a university would apply for a new undergraduate program (practical doctorate, bachelor's and associate's), decision should be made according to guidelines shown in table 4. It is worth mentioning again that if the university was "permitted" to establish a certain program, it would become eligible to go through accreditation process to be approved.

Guideline for assigning new postgraduate programs to universities

We had assessed universities and programs' status based on their associate's, bachelor's, and practical doctorate degrees. For a decision making for offering postgraduate degrees (clinical specialties, PhDs and Masters), we devised another guideline. According to this guideline, universities that would be categorized as level I or II, and their offering relevant undergraduate programs (i.e. relevant to the applied postgraduate program) would be grouped as A or B; were given the permission to establish the program.

Table 3. Guideline for justifying existing programs within the universities

University Level	Discipline group	Nation's need	Decisions
Level I [a]	Group A [d]	Shortage	Permitted
		Balanced	Permitted
		Surplus	Restriction of enrolment
	Group B [e]	Shortage	Permitted
		Balanced	Permitted
		Surplus	Restriction of enrolment
	Group C [f]	Shortage	Permitted
		Balanced	Restriction of enrolment
		Surplus	Not permitted
Level II [b]	Group A	Shortage	Permitted
		Balanced	Permitted
		Surplus	Restriction of enrolment
	Group B	Shortage	Permitted
		Balanced	Permitted
		Surplus	Restriction of enrolment
	Group C	Shortage	Permitted
		Balanced	Restriction of enrolment
		Surplus	Not permitted
Level III [c]	Group A	Shortage	Permitted
		Balanced	Permitted
		Surplus	Restriction of enrolment
	Group B	Shortage	Permitted
		Balanced	Restriction of enrolment
		Surplus	Not permitted
	Group C	Shortage	Not permitted
		Balanced	Not permitted
		Surplus	Not permitted

[a] Universities that gained the score of 80% or more of the best university's score
[b] Universities that gained the score of 60% to 79% of the best university's score
[c] Universities that gained the score of 59% or less of the best university's score
[d] University-discipline that gained the score of 80% or more of the best score of the same program in all offering universities
[e] University-discipline that gained the score of 65% to 79% of the best score of the same program in all offering universities
[f] University-discipline that gained the score of 64% or less of the best score of the same program in all offering universities.

Table 4. Guideline for assigning new undergraduate (practical doctorate, bachelor's and associate's) programs to the universities

University Level	Nation's need	Practical Doctorate	Bachelor's	Associate's
Level I [a]	Shortage	+ [d]	+	+
	Balanced	+	+	-
	Surplus	- [e]	-	-
Level II [b]	Shortage	+	+	+
	Balanced	-	+	+
	Surplus	-	-	-
Level III [c]	Shortage	-	+	+
	Balanced	-	-	+
	Surplus	-	-	-

[a] Universities that gained the score of 80% or more of the best university's score
[b] Universities that gained the score of 60% to 79% of the best university's score
[c] Universities that gained the score of 59% or less of the best university's score
[d] The request will be assessed
[e] The request will be rejected

Other guidelines

We also devised guidelines for voluntary request of universities to cancel a program, and their request to offer new programs for the first time in the country.

Results

Office of Medical Education Development and High Council of Medical Education Planning of MOHME legitimately approved the planning model and its guidelines and applied the model for decision-making. In addition, they decided that the information used for decision making should be revised in five-year intervals.

Discussion

Other countries that have experienced expansion of higher education, encountered the problem of unemployment (6). It seems that considering the work force status alongside with capabilities of higher education institutions would prevent this challenge. The results of this study provided a documented basis for the authorities in MOHME to determine the schools' missions considering their national potentials and workforce assessments. For example, when there is an excess of medical workforce in the country, the guidelines suggest strategies for modifying the total enrolments, altering universities' missions and preventing the establishment of new medical schools based on universities' capabilities.

In this model, a university with fewer offered programs could attain a better stance than a larger one regarding its developmental limits. That made the model acceptable for the universities and provided the chance of their development.

Eventually the results of the first part of the study (i.e. determining capabilities, performances and the relative stance of each university-program and the university), by itself, was a good benchmarking tool to identify the points of strengths and weaknesses of university-programs compared to peer ones. As mentioned in the literature, the expansion of higher education has increased the need for information on quality of educational services, so in many countries, university rankings are developed (14). These rankings have a great impact on universities, so universities deploy strategies to optimize their ranks (15). In Iran, there was no comprehensive, detailed information about universities' performance. The results of this study helped the universities have an overview for their internal evaluations and planning. Universities actively participated in the ranking process; so ranking results became a part of universities' monitoring process and authorities used the detailed reports for decision-making.

It is worth mentioning that since MOHME manages universities centrally, they cooperated for gathering the detailed information. That was the point of strength that made this study feasible. In addition, we verified the information by a site visit, which is another point of strength of this study, compared to some other ranking systems where there is no verification strategy for schools' self-reported data (14).

In Iran, when a university applies for the establishment of a program, a team of related outstanding faculty members would perform a site visit to assess university's capability to deliver the program. For some programs especially postgraduate ones, an accreditation process is defined for their establishment and existing programs pass an accreditation process in intervals too. Anyhow, accreditation by itself cannot meet the goals of this study because of ignoring nation’s needs. Accreditation systems devise institutional and program standards to approve a program in a specific school regardless of its stance among other peer schools. All assessed universities and programs in this study have been accredited or approved and here we compared their educational services to verify their strengths and weaknesses and provided a documented base for further planning. Of course, these new programs should undergo accreditation process to be established.

Current study had several limitations. For estimating nation's need for workforce in each discipline, we randomly selected the survey's participants all over the country to ask their opinion. In surveys, there is the challenge of respondent bias (16). Therefore, this survey was performed to reach a consensus, and field studies are needed to determine the accurate need and demand for disciplines.

We performed the study among 52 public universities of medical sciences. Only one private university delivers biomedical degrees in Iran. In fact, MOHME is not the responsible body for approval of the establishment of new programs and size of enrollments of this university. Therefore, we determined not to consider this university in the study.

We tried to design a complete set of criteria and indicators that would cover all aspects of biomedical education quality, as is focused in literature. Authors believe that the consensus method we used to devise the set of indicators helped us reach this goal, but some

challenges exist. We had some limitations in collecting data for some aspects. For example, many other ranking systems have put less attention on assessment of teaching quality (14). In the present study, it was not feasible to collect information about quality of teaching in each university. Therefore, we determined not to neglect the criterion and assessed the existence of an evaluation system for faculties' teaching skills and its strategies within the university instead of directly assessing teaching quality.

In addition, there is a criticism about quantitative assessment of quality of educational services (14). On the other hand, the rankings measures along with their relative weights would somehow stand for educational quality (15,17). We are aware of this debate, but in macro management, which was the main goal of this study, MOHME needed to have an objective general view of educational services delivered by the universities. MOHME deploys other evaluation and accreditation systems to assure the quality of universities' performance more. Moreover, as discussed before, permitted programs based on this study's guidelines should go through accreditation process to assure the quality of education.

We had the same challenge mentioned in the literature about the political aspects of expansion policies of higher education and decision-making in this area (2, 18). Related councils of MOHME legitimately approved this planning model for expansion and stagnation of universities of medical sciences and had used the guidelines for about two years. Then political pressures forced MOHME to approve the establishment of new university-programs beyond the developmental limits of the universities based on this plan. In addition, there was a great resistance to cancel a university-program. This shows that there would be enough reasons for rationale of expansion because stagnation policies after a period of expansion are hard to achieve.

Finally, we assume that authorities would apply strategies to develop a more documented basis for expansion and stagnation of higher education. The authors' experience showed the feasibility of providing an objective plan for this purpose.

Acknowledgment

This work was granted by Iran's Ministry of Health and Medical Education. The authors thank Dr. Shahram Yazdani, Prof. Kamran Soltani Arabshahi, Dr. Masoud Naseripour, Dr. Mohammad Reza Sabri, Prof. Hassan Hosseini Toodashki, Prof. Farshad Roshanzamir and Dr. Hassan Abolghasem Gorji for their support and insightful comments and suggestions. The authors wish to express their appreciation to all members of expert panels, deans of schools, hospitals, national health networks and faculty members for their participation in the study.

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