

Impact of Integration of Medical Education in the Health System of the Islamic Republic of Iran

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Abstract

Background: Following the Iranian Islamic revolution in 1979, two major reforms were implemented in the nationwide health system: Establishment of the Ministry of Health and Medical Education and the development of Primary Health Care Networks.

Objectives: This article aims to review the impact of integration of medical education in the health system.

Methods: We review here the birth and growth of the integration of the health care system and medical education, the successes, the aspirations and some of the obstacles and challenges found along this path, as well as the vision and strategies for the future. All articles on this issue published in international Journal and in Iranian medical Journals were reviewed.

Results: Health care and medical education in the I.R. Iran have undergone profound reform in the last four decades after integration of the Ministry of Health and all related schools and institutions of medical education. The newly formed Ministry of Health and Medical Education is responsible for every aspect of policy making, planning, leadership, stewardship, supervision and evaluation of health services, in addition to the training and educating of human resources for health, within the “Comprehensive Health Care Delivery System” that makes up Iran’s health infrastructure. From 1979 to 2020, the number of medical, dentistry and pharmacy schools have increased from 7 to 47, 3 to 35 and 3 to 22, respectively, with a rise in student yearly admissions in all programs of medical sciences from 1387 to 48120. There were no PhD or clinical subspecialty programs in 1979, whereas in 2020, annual student admission rates for such programs were 1038 and 219, respectively; these have been accompanied by marked improvements in the quality of education, clinical care and major health indicators such as increase in life expectancy, access to PHC in rural area, access to clean water, total number of rural health houses and vaccination coverage, on the other hand decrease in maternal, neonatal and under 5years mortality rates, decline in the number of patients sent abroad for treatment and also the number of foreign general physicians practicing in Iran. As a result of significant rise in research activities the number of scientific medical publications have increased from less than 2000 to over 70,000 yearly and Iran has achieved rank of 16 among all countries of the world in this regard.

Conclusion: Integration of medical education into the health care system has been an appropriate and economical strategy for achieving health promotion and the key point for the improvement of medical education for better social accountability in the Islamic Republic of Iran.

Keywords: Education, Health, Integration, Iran, Research, Social accountability

Background

The Islamic Republic of Iran, with an area of 1,648,195 km² is the sixteenth largest country in the world. It has a population of over 85 million, with approximately 70%

residents in urban areas. According to major development indicators, it is a typical country in the lower- to middle-income group.

Health care in the Islamic Republic of Iran has undergone major reform in the last four decades. Prior to the Islamic Revolution, there was barely a health care “system” in Iran. Preventive health care was limited, and fairly acceptable curative care could only be found in Tehran and in a few large cities where the vast majority of approximately fourteen thousand Iranian physicians were practicing. People living in small towns and villages had to seek the advice of foreign physicians speaking a different language. Residents of over 65,000 villages, in particular, had virtually minimal access to medical care. Following the Islamic Revolution in 1979, the imposed war began in 1980 leading to heavy daily civilian casualties and more difficulties in programing for an ideal health care system.

To achieve “Health for All”, the Ministry of Health launched an initiative to establish a primary health care system throughout the country, the main problem however was inadequate health manpower (1). Therefore, the most important intervention in the evolution of a national health system was the formation of the Ministry of Health and Medical Education (MOH and ME). Since the integration of medical education into the Ministry of Health in March 1986, the numbers of universities and university graduate have increased over ten folds, causing a surge in health manpower development. In addition, the training of local health personnel (Behvarz) enhanced the affectivity of rural health houses and the national mass campaign for children's health facilitated community participation, making intersectoral coordination easier and more feasible (2).

We review here the birth and growth of this integration, the successes, the aspirations and some of the obstacles and challenges found along the path as well as at the vision and strategies for the future, all of which may help readers to obtain a deeper insight into the fundamental role of the integration at medical education in health care delivery with the aim of promoting excellence in both fields of health care system and medical education

Iranian medicine in Islamic Era: Medicine achieved its paramount magnificence in the 10th to 15th centuries, with the works of Mohammad Zechariah Razi (Rhazes 865-925 AD), Ali ebne Abbas Majusi (Haly Abbas, 930-994AD), Ebne Sina (Avicenna, 980–1036 AD) and hundreds of renowned physicians and pharmacists. Avicenna’s Canon of Medicine, the first comprehensive textbook of medicine in the world, greatly influenced western European medicine; it was translated into Latin and printed and disseminated throughout Europe (3, 4).

During the 15th and 16th centuries the Canon of Medicine was published over 35 times and taught to medical students in many European cities (5). Between 16th to 19th centuries, due to Mogul occupation of Iran and lack of proper programming, Iranian medicine stopped its progress.

Evolution of medical education in Iran: The history of the establishment of western style academic universities in Iran dates back to 1849 with the establishment of the school of Darolfonoon, which was founded by Mirza Taghi Khan Amir Kabir and aimed at training and teaching Iranian experts in many fields of science and technology (1).

The School of Medicine was established as a part of the University of Tehran in 1938 and Professor Oberlin from the University of Paris was invited to update the structure of medical education in Iran. The ministry of Health was established in 1941. In 1979, prior to the Islamic Revolution, there were nine medical schools in Iran, two of them fairly newly established. Two schools were located in Tehran, and the rest in the larger cities of Iran. Other health-related schools such as dentistry, pharmacy, nursing and midwifery were even fewer in number, again located mainly in Tehran and a few larger cities of Iran. The total number of health-related faculty members were 2552 (6).

The curricula and quality of medical education at the time was not sufficiently related to the health status and the needs of the community. Considering that medical students were being trained mainly in sophisticated university hospitals, they were not capable of responding to the everyday health needs of the country. The medical schools did not feel responsible toward health promotion, prevention and ambulatory care. The number of graduates from different schools of medical sciences could not meet the health manpower needed throughout the country (7).

The Health Care System Prior to 1979: Before the Islamic Revolution, there was barely a health care “system” in Iran. Preventive health care was very limited and services were not accessible to everyone, particularly the poor and underprivileged. A fairly decent curative care system could only be found in the capital city of Tehran and, to a lesser extent, in a few large cities where a great majority of the fourteen thousand Iranian physicians were practicing. A large number of Iranian physicians had migrated to the United States and European countries.

People living in small towns and large villages had to seek the advice of foreign physicians, who did not speak

Farsi and most of them held only MBBS degree. On the whole, poor people in general and the residents of over 65,000 villages, in particular, had very limited access to health care facilities. At that time the mean ratio of physicians to the population was 1/2800; median ratio was 1/4000, and in some areas, it was as low as 1/18000. A number of provinces did not even have a single practicing obstetrician, anesthesiologist, and some other specialists (2, 7). To achieve Health for all, despite a severe shortage of health manpower the Ministry of Health started to establish a primary health care network throughout the country.

Integration of Medical Education and Health Care Services: In 1979, among the major problems of the health system was the lack of an adequate work force and low-quality medical care. There was no collaboration between university hospital and health system of Ministry of Health (1). In 1981 the Medical Division of the Supreme Council of the Cultural Revolution Council headed by F. Azizi meticulously reviewed successful programs of medical education and health care delivery systems in the world. Following discussions with health authorities and faculty members of various schools of medicine, dentistry, pharmacy and allied paramedical schools nationwide, in 1983, the Medical Division of the Supreme Council of the Cultural Revolution proposed the integration of the Ministry of Health with all health-related schools and institutions which were under the ministry of higher education at that time (6, 7). The objectives of this proposal were to:

1. Improve the quality of health care delivery;
2. Increase the number of admissions in all branches and subdivisions of medicine, dentistry, pharmacy nursing and paramedical services using institutions of the Ministry of Health for education;
3. Involve and mobilize students in daily health care delivery in rural and urban areas;

4. Make schools of medical sciences responsible to the community.

These aims could only be achieved with unified organization, as many previous attempts for collaboration between the two systems had failed (8). The proposal which was first approved by the High Council of Cultural Revolution and then it was approved by cabinet, finally approved by the Iranian Parliament and in March 1986 and the new Ministry of Health and Medical Education (MOH and ME) was established. Thereafter, the chancellor of each provincial university became responsible for public health, preventive and curative medicine along with medical education, as well as research in the provincial capital and in all urban and rural regions (2).

Universities of Medical Sciences and Health Services: There were nine medical, 4 dentistry and three pharmacy schools in Iran in 1979, before the Islamic Revolution. By the end of 1994, the number of schools increased to 34 schools of medicine, 14 dentistry and 9 pharmacy (7). Table 1 shows the number of various medical and health related schools from 1969 to 2021. A significant rise in the number of student admissions to universities occurred in 1986, following the establishment of the new Ministry (9).

Table 1. The number of the schools of medicine, dentistry and pharmacy in the I.R. Iran in the last 5 decades

Year	Medicine	Dentistry	Pharmacy
1969	7	3	3
1974	9	4	3
1989	28	7	7
1994	34	14	9
1997	35	15	9
2008	36	15	11
2015	42	19	21
2020	47	35	22

Table 2 shows the increase in student admissions to the universities of medical sciences and health services from 1970 to 2021.

Table 2. The number of the student admissions to of the universities of medical sciences and health services in the years 1970-2021, in the I.R of Iran

Year	Medicine	Dentistry	Pharmacy	Others	All
1969	632	132	219*	404	1387
1974	1207	159	117	2880	4363
1989	1287	240	203	3883	5613
1994	2049	311	255	6423	9038
1997	3515	425	550	8949	13439
2008	3630	753	459	13299	18141
2015	6177	850	590	19352	26969
2020	6670	2023	1507	33840	44040
2021	8182	2190	1580	36168	48120

The rise in the number of admissions in medical schools and health related schools clearly emphasizes that the rise, which occurred in the mid-80s and 90s, has continued through recent years (10). The percentages of female students range from 52% (medicine) to 100% (midwifery).

The number of teaching staff has increased approximately nine-fold over the last thirty years (Table 3) whereas the ratio of students to faculty members has declined in the last 3 decades from 22:1 to approximately 8:1.

Table 3. The number of teaching staff in the universities of medical sciences and health services in the I.R of Iran: In1993 and 2021

Scientific Grade	1993 No (%)	2021 No (%)
Distinguished professor	0 (0)	21 (0.1)
Professor	26 (2.1)	2552 (12.1)
Associate professor	200 (4.9)	4485 (21.2)
Assistant professor	1030 (48.4)	12164 (57.4)
Instructor	866 (40.6)	1954 (9.2)
All	2122 (100)	21176 (100)

The council of the community- oriented medical education had designated a curriculum for each discipline in 1980, based on the general objectives and health needs of the country, placing more emphasis on preventive and community medicine with two months of field training, and at least 50% of the clinical training hours being spent in ambulatory care services (11).

Number of Physicians: There has been a rapid rise in the number of graduates of all schools of medical sciences in the last four decades. The number of registered physicians increased from less than twenty thousand in 1981 to 130616 in 2020 (Figure 1). Similar rises have occurred in the number of other health related

manpower training resulted in having adequate manpower, which led to self-sufficiency in the number of health member (12).

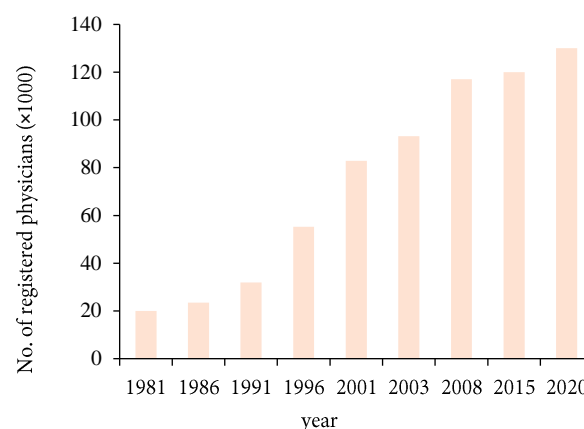


Figure 1. Physician registration number in I.R. Iran, 1981-2020

Postgraduate Training: There were no PhD or subspecialty programs in this field of medicine before the Islamic Revolution. The subspecialty programs were introduced in 1987 and training in all subspecialty fields of internal medicine, pediatrics, and surgery are currently being offered in many of the universities of medical sciences and health services. The number of yearly MSc and PhD admissions have increased in the last four decades from 110 to 3150 and from zero to 1038, respectively. Concomitantly, as shown in Figure 2, there has been an increase in yearly admissions of subspecialty fellows from zero to 219 and of various clinical specialty residents from 401 to 2830 between 1975 to 2020 (10, 12).

Continuing Medical Education: A law was passed in 1990 by the parliament of the Islamic Republic of Iran, which they made continuing medical education (CME) at compulsory.

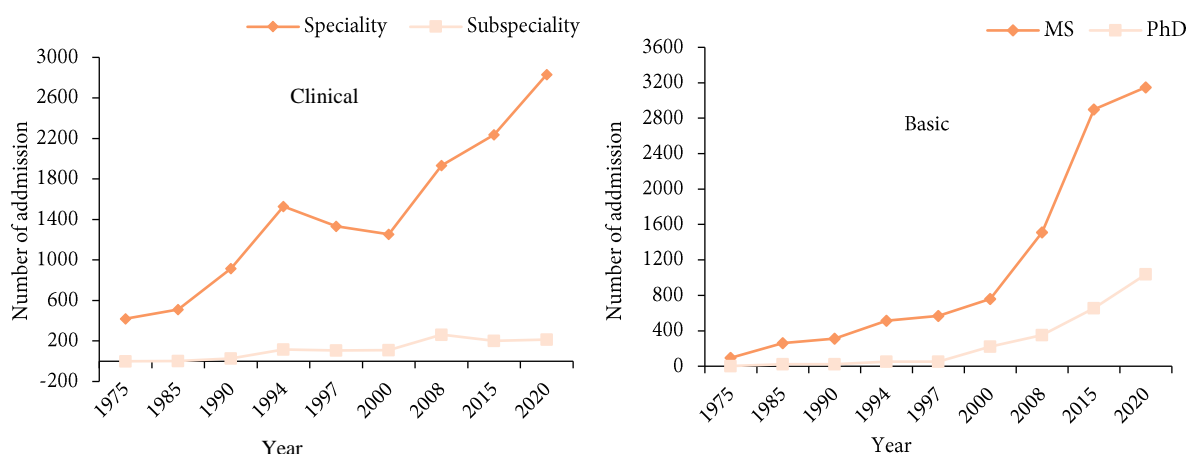


Figure 2. Number of admissions in post graduate levels in faculties of medical sciences in Iran, 1975-2020

In 1997, the continuing medical education act was revised, requiring all physicians to undergo courses in continuing medical education, in order to continue practicing in the I.R of Iran (1).

Research: There has been a rapid rise in scientific publications in the last 3 decades (Figure 3).

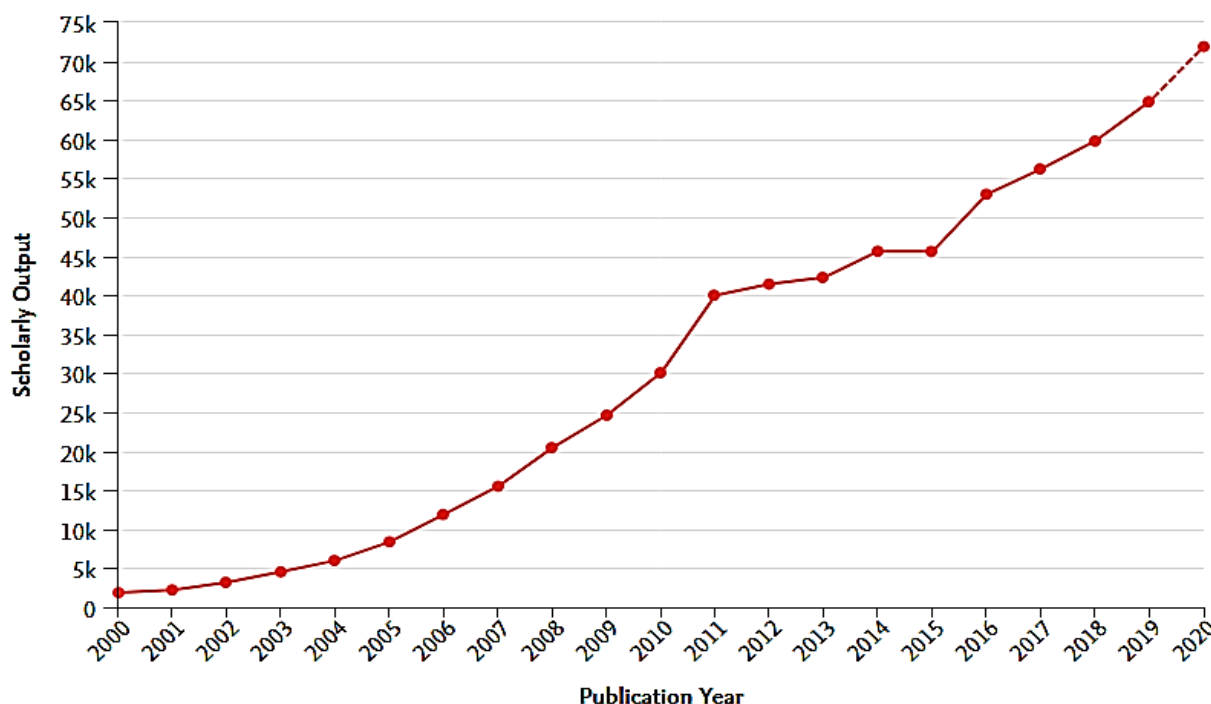


Figure 3. The trend of increase in scientific medical publications (2000-2020, SCOPUS)

Table 4 shows a rapid rise in the numbers of research centers, and scientific journals from 1979 to 2020 (12, 13). Increases have occurred in the number of peer reviewed journals published in Iran. In fact, the Islamic Republic of Iran achieved global rankings between 15 and 16 in the Web of Science for the number of published medical articles, indicating an increasing trend of publishing papers in journals with higher impact factors in the last decade (14, 15).

Health Care and Management

As faculty members became more knowledgeable and more aware of the national health situation and its challenges, MOH and ME developed many different scientific committees related to a variety of health-related issues. The faculty members were invited to become members of these committees, making the committees more sound, scientific, and decisive in their discussions and decision-making. Different health-related departments in the MOH and ME benefited

from the active participation of faculty members. In this process, faculty members became more supportive, advocating health-related programs and interventions at the national level; the very successful program of family planning and population control is a good example of cooperation between faculty members and health care providers. The integration of medical education in the health system has made decision-making and coordination in the areas of health care and health manpower training much easier and has led to many achievements such as adequacy in health manpower, increase in social accountability, community leadership, intersectional collaboration, and partnership building for health improvement (12, 16), also improvement in all health indicators and the elimination of endemic disorders such as iodine deficiency and some other endemic diseases (17).

Table 4 shows the main achievements of the integration of medical education into the health care delivery system.

Table 4. Trend of self-sufficiency in medical education in Iran, 1979-2020

	1979	1985	2000	2008	2015	2020
Medical university (No)	0	28	36	41	42	69
Faculty of medicine	9	28	35	36	42	47
Faculty of dentistry	4	7	15	18	19	35
Faculty of Pharmacy	3	7	9	20	21	22
Hospital beds (No)	50760	-	105716	-	118829	150281
Educational hospital beds (No)	9558	10759	52089	-	59414	-
Faculty members	2908 (26)	3153 (33)	8396 (36)	12500 (41)	13621 (42)	20080 (42)
Female %						
Students in medical sciences (No)	25848	32604	94280	124500	188859	233836
Graduated residents (No/year)	420	510	1332	1760	2237	2832
Subspecialty graduates (No/year)	0	2	106	190	203	219
PhD graduates (No/year)	2	21	51	250	656	1038
Research centers (No)	3	5	100	315	684	737
Center of excellences (No)	0	0	18	26	50	61
Scientific journals (No)	5	14	80	120	387	71
Total number of physicians	12000	14000	86000	100000	119459	130616
Physician / population/ ratio (1/1000)	2998	2915	955	760	657	643

These include an increase in the number of medical universities, an increase in numbers of the health workforces, curriculum development through education development centers, initiatives like community oriented medical education, the decentralization of health management system, improvement in PHC coverage and health outcomes, promotion of research on PHC, population health labs, improvement in the referral system, technical support to PHC and medical guidelines, as well as self-sufficiency in postgraduate training and development of research institutions and centers of excellence (12).

Table 5 shows trends of major health indicators over a 30-year period (1985-2020). The integration also sought to provide a better response to the health needs of the community while broadening learning, teaching and research activities. These include increase in life expectancy, access to PHC in rural area, access to clean water, total number of rural health houses and vaccination coverage, on other hand decrease in mortality rates in neonatal and under 5-years, decline maternal mortality ratio, number of patients sent abroad for treatment and foreign general physicians practicing in Iran (18, 19).

Evaluation and Monitoring of the Integration

As happens with many major reform programs, the integration was very controversial from the very beginning. Its opponents tried more than once to disintegrate the MOH and ME through the parliament, but with no success. By and large, the main arguments voiced by the opponents of the integrations seem to be

unscientific and often based on rumor. Some of those opposing the integration, believe that if health manpower training be moves back to the Ministry of Higher Education, then all financial, managerial, and educational problems will be solved. In 1997 a newly appointed minister of health and medical education who was one of the major opponents of the integration conducted three different evaluations regarding this issue, and the results of all three were very convincingly in favor of continuing the integration.

In 2002, MOH and ME requested the WHO Eastern Mediterranean Regional Office (EMRO) to carry out a comprehensive and impartial evaluation of the integration. An evaluation team was formed, including a national advisory team and a group of international consultants, with the aim of assessing the following:

- Health services governance, delivery, resources and partnership
- Medical education governance, process-output-outcomes, resource management, and partnership
- Interests and expectations of major stakeholders

Over 200 major stakeholders, including opponents and supporters participated in this evaluation, which entailed the use of different methods, including open discussions, focus group discussions, site visits, individual approaches and questionnaires. At the end of the evaluation, the concluding statements by the international team was that the strengthening of the existing system along with performance improvements will more likely benefit the country and population at large. They also stated that “the separation of medical

education from health services will exert a huge negative impact in strategic, technical, financial and logistic terms” (20), and strongly recommended that the government support the system of integrated health

services and medical education, and urgently review and upgrade the current curriculum through the introduction of community oriented, problem-based and other effective learning strategies”.

Table 5. Trends of major health indicators in Iran, 1985-2020

Variable	1985	2000	2008	2015	2020
Mortality rates					
Neonatal	51	19.3	13.9	10	8.3
Under-5	60	37	22	17	13
Maternal Mortality Ratio (death per 100000 live births)	140	44	33	20	22
Life expectancy					
Male	67.7	70.7	71.1	74	76
Female	71	73.4	74.2	77.0	79
Access to PHC in rural area (%)	20	90	95	98	94
Clean Water Access (%)	71	95	98	98	98
Annual population growth rate (%)	3.59	1.34	1.28	1.32	0.84
Total number of rural health houses	11000	16281	22000	24500	27200
Vaccination coverage (%)	20	95	98.8	99.1	99
Patient sent abroad for treatment (No)	11000	200	0	0	0
Foreign General physicians (No)	3153*	0	0	0	0

*In 1979, number of foreign general physicians in Iran was 6000 and there was no rural health house.

Iran's Ministry of Health and Medical Education has drawn considerable attention worldwide and has been cited by the WHO, UNICEF, UNESCO, the World Bank, the World Federation of Medical Education (WFME) as a model appropriate for the 21st century; many leading academics and international figures have spoken highly of the integration of medical education and health services.

Discussion

History has repeatedly acknowledged the contributions of Iranian scientists to mankind. Between the seventh and the fifteenth centuries A.D, the advent of Islam and its teachings underscored the vitality of knowledge to progress and fostered advances in various fields of sciences. In the first half of the 20th century, with the return of Iranian graduates from Europe much progress was made along modern lines in the development of modern medicine and the availability of trained manpower and specialized faculties of medicine (21).

Reforms in medical education have been ongoing over the past four decades. After the integration of the health sector and medical education, which resulted in the establishment of the Ministry of Health and Medical Education in 1985, there was a notable rise in the number of medical and other health-related schools in

the last three decades. The quality of medical education was improved, using new teaching methods and tools based on student centered problem-based learning, community medical education, faculty development, the extension of ambulatory care teaching, new methods of evaluation, establishment of education development centers, emphasis on teaching preventive medicine and the development of postgraduate courses (2, 7, 12). Further development of postgraduate education played a main role in the extension of research in various fields of basic sciences, epidemiological and clinical sciences.

As defined by the World Health Organization. “Health is a state of optimal physical, mental, social and spiritual well-being, and not merely the absence of diseases and infirmity.” According to this definition, health personnel are responsible for health protection, prevention and health promotion along with the promotion of health for the individuals as well as the community. However, graduates of medical schools traditionally see themselves as only responsible for curative medicine. This is not necessarily an individual choice, but is largely related to how medical doctors are trained. Usually the trend is, the sicker the patient, the more sophisticated the equipment, and the more unusual the circumstances, the higher the pride and prestige for the physician. The main reason for this is that almost the entire training program for medical

students and residents takes place at the bedside in the hospitals. Very little, if any, takes place at appropriate ambulatory care facilities and none at the community level. After being cured, patients regularly return to the same conditions they faced before their illness. They are ill-informed as to how to take care of themselves, and unprepared on how to prevent similar situations in future, let alone how to live and enjoy a better life and how to promote their health along with that of their families and the community. Under such circumstances, mental social and spiritual aspects of health are neglected to a large extent, and social well-being is not seriously considered.

If this global picture is to be changed, among other important steps, the curricular of health-related education in general, and that of medical students in particular should be revised, and training should take place under different settings. To bring about such a major change, universities and health services must work together in harmony.

The experience of the I.R. of Iran shows that the integration of medical education and health services has not only made the country self-sufficient in health human resources, but it is also an appropriate, durable and at the same time economical method of promoting community health to the highest level. It is worth mentioning that before the revolution, the main number of health manpower, particularly, the physicians were expatriate, MBBS and M.Ds. therefore, the government had to pay for all expenses of medical and surgical management of huge number of patients who required those types of health care, which were not offered in the country, such as organ transplantations, infertility, some kinds of cardiac surgeries and many of complicated cases which required high number of foreign currencies. As the number of health manpower and, particularly the physicians, specialties, subspecialties increased, and the quality of healthcare improved, not only there is no need for any patient to travel abroad for any kind of health care, but a large number of Iranians living outside of the country and also foreign patients are traveling to I.R of Iran for their own health care. Although integration has not yet evolved completely, especially in the periphery, and the situation is still far from perfect (22, 23), results are very encouraging. Even limited exposure so far has helped faculty members and students to become more familiar with the state of health in the community; their realistic understanding of the environment, culture, traditions, problems, needs and potential has created an environment for better management and opportunities

for solving health-related issues. It is therefore anticipated that longer and better-structured exposure of the students as well as faculty members to community needs, revision of the curricula, along with the creation of proper motivation for full-time faculty members, will bring about more progressive changes in incentives among faculty members as well as students, which, in turn will lead to a more community oriented medical education, and help resolve a multitude of the country's health problems.

A comprehensive review of evolution in medical education and research in the last 4 decades show that the Islamic Republic of Iran has achieved successful progress in medical education and research. In the first 20 years (1980-2000), there had been a remarkable rise in quantity and quality of medical education and also a rapid improvement in all health indices throughout all 31 states of the country. Number of universities and their student admission, both undergraduate and postgraduate, including PhD courses and clinical residency programs increased and many new clinical subspecialty programs were established. Research centers and institutes in various fields of medicine were developed (10).

In the second 20 years (2001-2020), research output increased extraordinary, leading to fastest growing number of articles amongst countries of the world in 2010, with concomitant increase in the number of citations of Iranian medical articles despite embargoes (15, 24). For the next 20 years, efforts should be focused toward directing medical research to resolve many issues in the health sector. Promotion of young, talented and distinguished researchers (25), appropriate support and evaluation of scientific output, impact and effectiveness, rise in the research share of GDP for enhancement of targeted research programs (26-28). All those helps to reach strategic objectives of Iranian medical research activities (29).

Conclusion

To conclude the I.R. Iran has been successful in its reform program of medical education over the last three decades. Adequate medical training, the upgrading of postgraduate education and the development of health-related research and publications, with simultaneous improvement in numerous health indicators demonstrate the success and benefits of the integration model of the health system and medical education. Needless to say, it is vital that effective monitoring and evaluation be a continuous and integral part of the system.

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