Original Article

Health Research System Evaluation in I.R. of Iran

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Abstract

Background: Several systems have been proposed to rank academic institutions worldwide. We aimed to introduce a new method of Health Research System (HRS) evaluation in Iran.

Methods: In this cross-sectional study, a specific questionnaire has been used to assess stewardship, capacity building, and knowledge production through annual evaluations of HRS in Iran. This article has explored the results of the 5-year evaluation (2003 – 2008) and aims to introduce this method to other developing countries.

Results: According to our study, in the stewardship axes, all medical science universities designed strategic plans by 2008 and 70% of the approved projects were based on priorities. In the domain of capacity building, the trend in the number of arranged workshops and held congresses is ascending. In the domain of knowledge production, the number of Iranian biomedical research articles increased from 2996 in 2003 to 8816 in 2008.The proportion of ISI Web of Science/Pub Med indexed articles per academic members also increased from 0.09 to 0.33.

Conclusion: We conclude that HRS evaluation in Iran has supported knowledge production and has strengthened evidence-based policy making. The adapted ranking system for evaluation of medical research activities is an effective strategy for HRS promotion.

Keywords: Evaluation, Health, research, system

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Introduction

Evaluation of the health research system (HRS) is an important issue in the growing world of science and technology.[1] In theory, objective and accurate evaluations of institutional excellence may help allocate funds rationally, prioritize research, and invest in education, and may assist institutions in self-evaluation and improvement.[2] In recent years, international ranking of universities and institutions has received wide attention.[3]

The most well-known international rankings of universities are: the Academic Ranking of World Universities (ARWU) designed by Shanghai Jiao Tong University (SJTU) in China,[4] the Times Higher Education Supplement [THES],[5] and Web Metrics Ranking of World Universities.[6] Most of these ranking systems focus on special research outputs such as the Nobel Prize and published articles in Nature and Science journals.

It is obvious that the main health, and hence research priorities in developing countries differ from those in the developed world. Hung believes that academic production varies in different countries according to their stage of development.[7] Another study by Hu et al confirms that Western and Eastern countries have differences in their intra- and interdisciplinary scientific activities.[8] Therefore, comparing research output between these two types of countries using an identical method is not accurate. Thereafter, the Statistics Institute at UNESCO designed alternative international indicators for developing countries. These indicators focus on inputs and outputs of science and technology activities.[9] In 2000, the World Health Organization defined certain research indicators for the evaluation of HRS. Based on this approach, the functions of an effective HRS include: stewardship; financing, creating and sustaining resources; and producing and using research.[10]

Accordingly, in 2001, the Ministry of Health and Medical Education, Research and Technology Division in Iran was assigned the task of monitoring research activities of medical universities and research centers as a pilot study by utilizing some of the indicators defined in the WHO/Health Research System and UNESCO Science and Technology through integrating stakeholders' opinions.[11] The evaluation criteria were modified and developed based on feedback received annually from key stakeholders and thus, the National Iranian Plan for Health Innovation and Science Development has been revised during the past 10 years. This article explored the role of this new HRS evaluation method in national knowledge production.

Materials and Methods

The current project was a recurrent cross-sectional study per-

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Table 1. List of indicators and their definitions

Stewardship indicators
***Assessment of priority setting process:**
Formal ratification of research priorities based on needs assessment by participation all of stakeholders that should be updated annually.
1) Designation of research priorities list by medical science universities.
2) The proportion of research projects compatible with research priorities.
*** Formulation of a 5-year strategic plan and monitoring achievement of goals:**
"An organization›s process of defining its strategy, or direction, and decisions made on allocating its resources to pursue this strategy." [12]
3) Designation of a 5-year strategic plan.
4) Evaluation of achieving objectives.
*** Establishment and performance of Ethics Committees:**
"A committee dedicated to the rights and well-being of research subjects."[13]
5) Formation of appropriate composition of Ethics Committee members.
6) The proportion of referred proposals to Ethics Committee based on their subjects.
Capacity building indicators
***Training workshops:**
Research Training Workshops held for researchers and other stakeholders by medical science universities with defined curriculum for at least 4 hours per day with attendance of at least 10-30 participants. These workshops should be approved by the University Research Council.
7) The number of workshops held for faculty members and other researchers.
8) The number of workshops held for students.
***National congresses:**
A scientific meeting for presentation of research results that must be held by specialists in related fields and must be confirmed by the Ministry of Health.
9) The number of national congresses held (If the congress is arranged through cooperation of scientific associations, it will gain more credit.)
***International congresses:**
A scientific meeting for presenting the research results that must be approved by the Cabinet in which, at least 5 foreign experts and 3 foreign countries should have collaborated scientifically.
10) The number of international congresses held.
***Prizes awarded at the Razi and Kharazmi International Festivals:**
A festival is a ceremony that brings the international and national researchers together to present the latest, most prominent, and outstanding results of research, in order to encourage the researchers.
11) The number of awarded researchers or health research system sectors.
Knowledge production indicators
***Indexed articles in ISI/Web of Science and Pub Med/Medline:**
"Science Citation Index (SCI) is one of the most reliable and recognized indexing databases developed by the Institute for Scientific Information (ISI). Medline/Pub Med is another indexing database in medical science research."[14,15]
12) The number of indexed articles in ISI/Web of Science and Pub Med/Medline.
***Indexed articles in other international indexing databases:**
Papers indexed in Scopus, Chemical Abstract, Biological Abstract, Embase, Index Medicus of Eastern Mediterranean Regional Office, and Index Copernicus.
13) The number of indexed articles in other international indexing databases.
***Non-indexed published articles in national and international scientific journals:**
All articles not indexed in any database.
14) The number of non-indexed articles.
***Articles presented in national and international congresses:**
Paper presentation, either in oral form or poster presentation, in national or international congresses.
15) The number of presented articles (Speakers that are invited to participate and papers published in ISI proceedings gain higher scores.)
***Compilation of books:**
Books written based on national research studies. At least 1% of references must be the result of authors› research studies.
16) The number of compiled books.
***Innovations and inventions:**
"An innovation is a new composition, device, or process. An invention may be derived from a pre-existing model or idea."[16]
17) The numbers of innovations and inventions that have been approved by peer review groups, based on which the research project and related article have been published in scientific journals.
***Citation to articles in textbooks:**
"Citation to a published article in textbooks."[17]
18) The numbers of citations to articles in textbooks.

formed through annual research performance evaluations of governmental medical science universities. In 2001, the key HRS policy makers collaboratively designed a number of criteria in the format of an evaluation form. Then, based on a pilot study upon participation of 8 medical science universities, the validity and reliability of the evaluation form was confirmed. The evaluation process was reviewed and renewed annually; based on certain policies, a number of indicators were developed in line with stakeholders' views and according to practicality of aims.

The evaluation form has been finalized during the past decade and the evaluation process expanded to all medical science universities in order to promote the quantity and quality of research.

Steps in the evaluation process consisted of: i) urging participation and coordination among medical universities; ii) team visits of all medical universities by inspectors; iii) completing the evaluation form based on available documentation; and iv) peer reviewing some of the documents, such as inventions and innovations.

The evaluation form that has been used in this process consists of two parts; inputs that include human resources and allocated research budgets, and outputs covering HRS evaluation indicators. In developing countries such as Iran, steward ship and capacity building are two main functions of an effective HRS evaluation. In the current study, HRS indicators have been scored in three axes based on effective HRS functions: stewardship, capacity building, and knowledge production. These 18 indicators and their definitions are presented in Table 1.

Therefore, in this article, we examined the results of research performance evaluation from 2003 to2008. We have explored the role of this new method in the promotion of HRS in Iran.

Results

The input and output measures presented here were based on research activities in all government medical science universities

Table 2. Classification of articles in 2008 according to their type and place of publication.

Indexing database	Published in Iranian journals	Published in Non-Iranian journals	Total
ISI /PubMed	893	3120	4013
Scopus/Biological and Chemical Abstract	1028	398	1426
Index Copernicus/Index -Medicus EMRO	2671	174	2845
Non-indexed	465	67	532
Total	5057	3759	8816

Table 3. Comparison of Iran HRS ranking system with world ranking systems

Criteria	Webometric(WR)	Shanghi(ARWU)	Times/QS(THES)	Iran
Quality of education		Alumni Nobel &field	Student/staff ratio	Awards
Internationalization			International students and staff	
Size Capacity building Stewardship	Web size	Instruction size		University type (educational level) Congress workshops Priority setting Strategic planning Ethics
Research output	Rich files (Google) scholar	Nature &science SCI&SSCI		ISI/WOS, PUBMED, Scopus, Embase, biological and chemical abstracts and other credible indexing databases, presentation in congresses, compilation of books, and citations
Impact	(Link) visibility	Highly cited researchers	Citation Academic reputation	Citation (research centers)
Prestige		Staff Nobel and field	Reputation Empl`ers	Staff awards, institute awards

during 2003 – 2008.

The total number of faculty members rose from 9086 in 2003 to 11569 in 2008. In 2003, faculty members were mostly employed as instructors (30.3%) or assistant professors (65.3%); only 4.4% were full professors. In 2008, instructors comprised 30.2% of faculty members, 61.8% were assistant professors and 8%were full professors.

In 2003, there were no academic research members in medical universities, while 105professionals were registered as academic research members in 2008.

In 2003, the research budget per faculty member was 17.76 million RI, which increased to 49.97 million RI in 2008(nearly tripled). The proportion of total university budget per faculty member was 981.6 million RI in 2003, which has increased to 2186.3 in 2008 (almost more than double). However, during the same time period, the proportion of the budget for total projects versus the global research budget decreased from 0.47% to 0.45% in Iran, while the proportion of global research budget to GDP has increased approximately 1%.

Students are a substantial potential in the HRS. The proportion of medical science students in master, doctoral, and PhD programs engaged in research to total medical science students was almost equal (25%) in 2003 and 2008, but the crude number of these students increased from 34180 to 44076 during this time period. The results of the HRS evaluation are presented below.

Stewardship

This study reveals that in 2003, priority setting has been conducted in half of the medical universities while in 2008, all had determined their priorities; around 70 % (5404 out of 7757) of the approved projects were based on priorities. Fortunately, the budget allocated to these projects has increased by 10% from 2003 to 2008. The percentage of research project budget to total university budget in 2003 was 0.8% which increased to 1% in 2008.

With the beginning of the evaluation program, medical universities were assigned to formulate their 5-year strategic plan. Currently, all have developed their strategic plans and have revised them annually through participation of key stakeholders.

Ethics Committees in all of the medical universities have been established and all submitted proposals reviewed according to guidelines. Thus, 50% (3853 out of 7757) of the research projects were referred to Ethics Committees based on their subjects.

Capacity building

In the second axis, the indicators related to capacity building showed that the annual trend in the number of held workshops has increased (419 to 1040). Furthermore, the number of workshops arranged for students rose from 114 to 549 during this period (2003 – 2008).

The proportion of Iranian international congresses to total con-

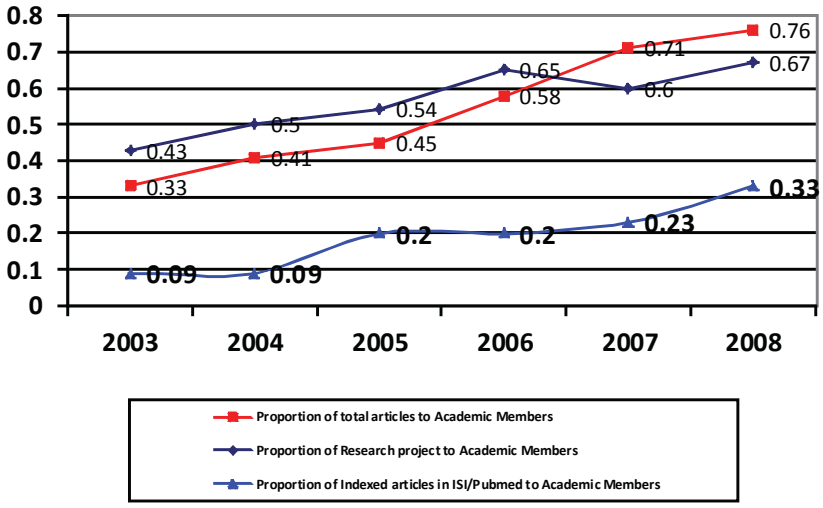

Figure 1. The number of research projects and papers per faculty member.

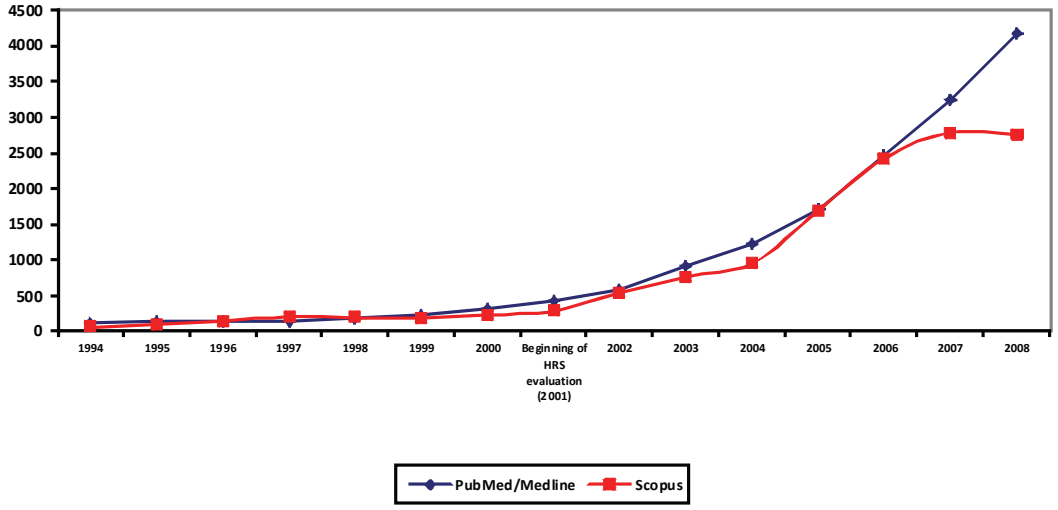

Figure 2. The trend of knowledge production before and after HRS evaluation.

gresses (national and international) in medical science universities was 0.04 (4: 93) in 2003, which increased to 0.09 (14: 149) in 2008.

Annually, top researchers, research centers, and top universities acquired prizes at the International Razi Festival. The total number of winners in both the Razi and Kharazmi festivals almost doubled during this time period. The total number of inventions and innovations also doubled from 2003 to 2008.

Knowledge production

In the third axis, indicators of knowledge production demonstrated that the proportion of Iranian medical science articles to global medical articles increased from 0.2 in 2003 to 0.5 in 2008. Data analysis showed that 31% of published articles in 2003 were indexed in the scientific indexing databases but this percentage rose to 94% in 2008. Table 2 classifies articles in 2008 according to their indexing type and place of publication. In 2008, 85% of assessed articles were original; the remaining 15% consisted of review articles (1.5%), case reports (7%), short communications (2.6%), and letters to editors (3.9%).

The total number of articles per faculty member rose from 0.3 in 2003 to about 0.76 in 2008. Figure 1 shows the trend of the proportion of research projects, total articles, and ISI/Pub Med indexed articles to faculty members during 2003 – 2008.

Accordingly, Figure 2 shows the ascending trend in the number of Iranian Biomedical articles indexed in Medline/Pub Med and Scopus.

Data also revealed ascending growth of published articles in Iranian journals (1792 to 5057). Of note, in 2003, only one Iranian medical journal was indexed in ISI/Web of Science and it had no impact factor (IF). In 2008, 17 medical journals in Iran were indexed in ISI/Web of Science, one of which had an IF = 0.25. In the same year, 30% of ISI/Web of Science indexed articles were published in Iranian biomedical journals.

The mean IF of Iranian published articles in ISI/Web of Science was 0.46 in 2003 which rose to 1.98 in 2008.

Another indicator in the knowledge production axis is the number of articles presented at national and international congresses

that have risen from 4511 in 2003 to 14357 in 2008. Presented articles in international congresses had a 10% growth rate during the mentioned time period.

In 2008, the proportion of presented articles in international congress by Iranian researchers to total number of international congresses that were held worldwide was 5.82 (4419 to 758). Unfortunately, we were unable to compare this indicator with 2003, because there was no data related to international congresses held during that year.

A comparison of compilation books based on domestic research studies in 2003 versus 2008 showed a 46% growth rate. In this evaluation process, innovations and inventions were reviewed by special scientific committees. Based on this review, the number of approved innovations and inventions increased from 8 to 241 during the mentioned time period. This study also showed that during the same time period, the number of papers published by medical science universities that were cited in textbooks rose from 4 to 165.

Discussion

The evaluation framework offers a basis to identify and contrast research needs, projects and products, and to identify the action agendas and their influence.[18] In the Eastern Mediterranean Region, HRS are not well developed to produce and use knowledge for health promotion.[19] Therefore, strengthening HRS in developing countries is essential for health promotion.[20]

In the evaluation method designed in Iran, as a developing country, capacity building and stewardship have been considered as pre requisites for knowledge production. Table 3 compares known university ranking systems with the ranking system in Iran.

The strengths of this new method of evaluation are as follows:

1. Process orientation: Stewardship and development of human recourse are 2 main components that have been taken into account in this method.
2. Dynamism: The method has been annually revised according to policies.
3. Participatory process: The evaluation forms were improved according to feedback received from key stakeholders, who consisted of authorities in research centers and medical science universities, and research experts.
4. Ownership: The evaluation process was stable despite the turnover in policy makers.
5. Document orientation: All outputs were assessed based on reliable documentation.

Our study has certain limitations. A number of indicators could not be measured in 2003 and thus could not be compared with those in 2008. Secondly, due to the lack of a comprehensive research infrastructure in Iran, it was impossible to evaluate the distal outcomes and impacts of HRS evaluation as a whole; this limitation was not a defect of our study per se.

Finally, manual assessment of documents was costly and time-consuming which slowed down our project.

The result of implementing the evaluation system in Iran is noticeable. Our experience has shown that stewardship is an important indicator for improving the knowledge production which directs research strategies. Inclusion of these indicators in the evaluation system can be introduced to similar developing countries.

In the stewardship axes, priority setting, integration of needs in the approval of projects, preparation of guidelines for ethics in research projects, and strategic planning all assist with evidence-based policy-making.[21] As universities have been evaluated by their strategic plans, they were urged to develop these plans and have been capable of defining their objectives and matching them with their potentials and activities. Strategic planning has helped the universities better achieve their goals.

Capacity building is another essential component of HRS that prepares and enables the environment for agile knowledge production in developing countries. Capacity building provides appropriate human resources needed for health research.[22] As success of efforts for capacity building in developing countries depends on political will, importing related indicators in the HRS evaluation system would be beneficial for attracting the attention of policy makers to this issue.[23,24]

Based on data analyzed in the knowledge production axes, the total number of faculty members and postgraduate students increased by 27% from 2003 to 2008. The total number of Iranian biomedical articles tripled. Indeed, the total number of articles per faculty member has risen from 0.3 in 2003 to about 0.76 in 2008. In the comprehensive scientific plan of Iran, it was determined that the number of faculty members should be increased to 2000 per 10^6 people and the proportion of research budget to GDP be increased to 4%. Thus, the HRS evaluation can be an essential and even vital asset for the support of policy makers, to facilitate employment of researchers, and to attract additional attention toward allocation of funds for health research.

A closer look at the trend of published indexed articles shows that the trend is rising, especially after 2003. Obviously, the universal will for knowledge production partly explains this ascending trend, but the role of the HRS evaluation system cannot be ignored. Implementation of the HRS evaluation has motivated universities to participate in this competition, consequently improving knowledge production. The scant outputs of some departments and universities should be scrutinized and positive feedback given to more productive sectors.[25] Evaluation systems are particularly effective in improving the accountability of health research outputs. Improving the quality of research projects is essential for the achievement of acceptable prestige in the world of science.[26]

Moin et al have believed that most ISI/Web of Science indexed journals accept articles from developed countries as the number of acceptable articles in developing countries is low.[27] Accordingly, researchers in our country have been encouraged to publish their articles in domestic journals as these journals have been promoted and are fortunately indexed in credible indexing databases in recent years. In the past year, 22 Iranian biomedical journals have been indexed in ISI/Web of Science among which, 12 journals have an IF. The mean ± SD of their IF is 0.374 ± 0.3.[28] The expanded scientific infrastructure in Iran and the abundance or even a surplus of educated personnel offers a good opportunity for the flourish of knowledge production. In addition to fundamental reforms in the scientific system, short-term management will improve the Iranian share in the worldwide production of science.[25]

In the knowledge production axes, the probable reasons for improvement in relevant indicators are as follows:

1) Capacity building for researchers and students;

2) Needs assessment and priority setting through participatory research in universities;

3) Increase in research budget allocated by the government; and

4) Creation of evaluation systems to encourage researchers and

support the enabling environment.[29]

These inspiring elements should be strengthened as knowledge dissemination and translation in developing countries requires more attention in order to utilize generated knowledge in the health system. The results of the HRS evaluation should be communicated with all stakeholders and used in local and national policy making. Clinical Trial Magnifier Journal has discussed the growth of medical publications in various countries during the past decade. It has been revealed that the world's top 5 countries that have the highest growth rate in medical knowledge production are Iran (1826.5%), South Korea (614.7%), Taiwan (542.1%), Turkey (468.7%), and China (395.1%).[30] It should be mentioned that the scientific output of Iran in the field of medical sciences has doubled during the past 2 years. At the moment, Iran ranks 26th by medical article publications worldwide; it is the main competitor for other countries in the Eastern Mediterranean to achieve the top position in this region.

In order to maintain progress in our HRS, a national strategy should be adopted, health research policies should be developed, and resource mobilization should be facilitated. Motivating HRS will lead to improvements in both the quality and quantity of medical publications.

In light of the need for supportive policies, conducting HRS evaluations in Iran will lead to:

- Knowledge production promotion;
- Increase in indexed journals;
- Reinforcement of documentation;
- Facilitation of research policies communication;
- Implementation of participatory research projects;
- Design of a new evaluating method for developing countries; and
- Building a research network.

In the future, we plan to promote the present evaluation system and use an online assessment in this process. Promoting the current position needs a reliable and feasible evaluation method that should be adopted in our country and it would enable us to compare our situation with other countries.[31]

Finally, based on our experience, establishment of an adapted evaluation system can be useful for HRS promotion that can be introduced to other developing countries.

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