Defining a Competency Framework: The First Step toward Competency-Based Medical Education

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Abstract- Despite the existence of a large variety of competency frameworks for medical graduates, there is no agreement on a single set of outcomes. Different countries have attempted to define their own set of competencies to respond to their local situations. This article reports the process of developing medical graduates' competency framework as the first step in the curriculum reform in Tehran University of Medical Sciences (TUMS). A participatory approach was applied to develop a competency framework in Tehran University of Medical Sciences (TUMS). Following literature review, nominal group meetings with students and faculty members were held to generate the initial list of expectations, and 9 domains was proposed. Then, domains were reviewed, and one of the domains was removed. The competency framework was sent to Curriculum Reform Committee for consideration and approval, where it was decided to distribute electronic and paper forms among all faculty members and ask them for their comments. Following incorporating some of the modifications, the document was approved by the committee. The TUMS competency framework consists of 8 domains: Clinical skills; Communication skills; Patient management; Health promotion and disease prevention; Personal development; Professionalism, medical ethics and law; Decision making, reasoning and problem-solving; and Health system and the corresponding role of physicians. Development of a competency framework through a participatory approach was the first step towards curriculum reform in TUMS, aligned with local needs and conditions. The lessons learned through the process may be useful for similar projects in the future.

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Introduction

Competency-based medical education (CBME) is very much the subject of discussion and debate at all levels in medical education (1). According to the "outcome-based education inventory" developed by Harden, the first dimension in developing outcome based education is "statement of learning outcomes" (2). Not surprisingly, then, much attention in the published literature on CBME is paid to organize framework around the exit learning outcomes (2,3).

There is a rich variety of competency frameworks in medical education at undergraduate and post-graduate levels, and also in different specialty areas (1,4). Some of the well- known examples are: the Can MEDS 2005 Project (5), the Dundee Outcome Model,6 the Outcome Project by the Accreditation Council for Graduate Medical Education (7), Tomorrow's Doctors by the UK General Medical Council (8), the Scottish Doctor document introduced by five medical schools in Scotland (9), the Global Minimum Essential Requirements published by the Institute for International Medical Education (10), the Educational Blueprint for the Brown Medical School (11), a core curriculum in

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nine domains by the European Medical Students' Association and the International Federation of Medical Students' Associations (12).

In spite of the large body of works dealing with the competency framework, almost certainly there is no agreement on a single set of competencies (1,4). Since an uniform standard framework cannot serve universal purposes worldwide, there is a great heterogeneity in terms of the number and the outline of the defined competencies. Albanese et al. claimed that it is the level of behavior measurement that represents the real differences between individual contexts; however, practically, even countries with similar background or comparable health care systems have developed their own sets of competencies (4). Considering the fact that the definition of competence is affected by local, political, social, and economic circumstances, it cannot be simply translated from the existing versions (4,13,14). Therefore, the attempt of different countries for identifying their own competency framework, which responds to the local situations and reinforces the sense of ownership among faculty members, is legitimate.

While there has been an international trend toward CBME over the past decades, Iranian medical schools have failed explicitly to define specific learning outcomes for their students. As a matter of fact, until 2005, all medical schools in Iran followed a centralized traditional curriculum. At this year, some schools initiated changes in the curriculum in line with the recommendations of Iranian Ministry of Health and Medical Education (MHME). However, none of them focused on defining the specific competencies.

Tehran University of Medical Sciences-School of Medicine (TUMS-SoM), as the oldest medical school in the country, offers a Medical Doctor (MD) Program in which graduates have license to practice as a general practitioner across the country. TUMS graduates, like those of the other universities in the country, pursue their professional career in one of the following tracks: some of them practice as primary care provider, some enter post graduate training and a minority takes research or administrative positions. A frequently expressed concern is that physicians who begin independent practice through National Health Service just after graduation, usually feel unprepared for work and complain about their insufficient training during school years. In order to find out and document the problem areas, a comprehensive evaluation of the MD program was conducted during 2005 to 2007 and major defects were revealed in the current curriculum. Consequently, discussions for a marked improvement were initiated, and it was planned to launch the new undergraduate medical curriculum in September 2011. The reform vision statement as a road map for curriculum revision, which was approved by Curriculum Reform Committee (CRC), stated that: "in order to achieve the new outcome-based program, after defining the competencies of the graduates of the program, all its elements will be designed and implemented according to these competencies. The task of defining competencies will be based on the societal needs as well as the unique role of TUMS in the national health system in all aspects of education, research, and service." This article reports the process of developing the graduates' competency framework as the first step in this curriculum revision. Experiences learned through this project might benefit future attempts across the country and beyond.

Materials and Methods

A participatory approach was applied during a 4-year period by collaboration of more than 170 faculty members (more than 20% of all TUMS-SoM faculty members) from both basic and clinical disciplines and also by contribution of representatives of TUMS medical students and graduates. The whole process was guided by a steering committee in Educational Development Office of School of Medicine (EDO-SoM). The School of Medicine Dean and Associate Dean for Undergraduate showed their full support during the development of the competency framework. The project involved the following phases (Table 1).

Phase 1) Designing the project

A taskforce was formed in EDO-SoM and drew up the detailed design of the project aligned with the reform vision statement which emphasized that: "The goal of this program is to train doctors who are committed to professional and ethical standards, and confident and competent to play their roles as a primary care provider in the national health system."

Phase 2) Literature review

In the first place, the group reviewed related literature on national (ministerial) documents of MDs' responsibilities and then, collected the existing outcomes/competency frameworks developed by other institutions (Table 1).

Phase 3) Determining the competency domains

Two nominal group meetings with contribution of more than 60 faculty members (clinical and basic) were

held to generate a preliminary list of expectations from the TUMS medical graduate. A similar process was conducted by participation of recently-graduated doctors. Based on the collected data, the initial list of the domains was drafted. Afterwards, a comparative analysis was carried out by the project taskforce in order to compare this draft with previously-developed frameworks. The taskforce proposed 9 domains for TUMS competency framework and developed an applied definition for each of them.

Table 1. Developing competency framework in TUMS: project phases and their corresponding activities

Developing a taskforce in Education Development Office of School of Medicine Drawing up the detailed design of the project		
Phase 2) Literature review		
Reviewing national (ministerial) documents on MDs' responsibilities Reviewing existing outcome/competency frameworks		
Undergraduate (universities) Brown university Indiana university Dundee university Barcelona university	**Undergraduate** (national and regional) Scottish Doctors Tomorrow Doctors European Tuning project	**Postgraduate** ACGME outcomes project CanMEDS 2000
Phase 3) Determining the competency domains		
Meetings with participation of faculty members and recently-graduated doctors in order to generate a preliminary list of the expectations from general practitioners Developing the initial list of the domains of outcomes Comparative analysis of the domains of outcomes with other frameworks Developing the 9 domains of TUMS outcomes (including knowledge-based domain) Developing an applied definition for each domain by project task force		
Phase 4) Defining the competencies in every domain		
Holding a 1-day workshop with contribution of 40 faculty members Developing the sub-domains and final outcomes for each domain during workshop Removing the knowledge base domain and preparing an 8-domain framework Modification of the preliminary draft according to the workshop report-back session Holding the second 1-day workshop with more than 100 faculty members Finalizing the documents in the taskforce		
Phase 5) Approval and dissemination		
Sending a document to TUMS Curriculum Reform Committee (CRC) for approval Distributing the document to all faculty members via electronic and paper forms for further comments Approval by TUMS Curriculum Reform Committee Dissemination widely to all faculty members and students		
Phase 6) Implementation*		
Converting the competencies to learning objectives Determining the appropriate teaching methods and assessment procedures		

Phase 4) Defining the competencies in every domain

A one-day workshop was organized during which 40 faculty members reviewed and discussed each domain systematically and developed the sub-domains with the related competencies. The taskforce, then, revised the preliminary draft document and modified it according to the inputs provided in the workshop report-back session.

The knowledge-base domain was considered as the foundation for application of other competency domains, rather than a separate, independent category. So it was removed from the draft and an 8-domain framework was finally proposed.

With the purpose of fine-tuning, a second one-day workshop with contribution of more than 100 faculty members and also representatives from MHME was held. Participants were divided into 8 groups, each dealing with one of the domains. After thorough discussion, each group agreed on the definition of the corresponding domain and its subdomains. Ultimately, the taskforce finalized the document.

Phase 5) Approval and dissemination

The competency framework was sent to CRC for consideration and approval. The committee decided to pass on the document to all faculty members and ask them to provide further suggestions and comments. Electronic and paper forms were distributed, and feedback was requested from all TUMS-SoM faculty members. Following incorporating some of the faculty members' comments and making minor modifications, the document was approved by CRC.

Although the faculty members and students' active participation in the whole project played an important role in its distribution, the final version of the competency framework was widely disseminated to ensure that all faculty and students knew which outcomes are to be expected upon graduation.

Phase 6) Implementation

This phase has not yet been completed. The CRC is currently using the list of competencies, with the

cooperation of all disciplines involved in undergraduate medical training, to convert them into learning objectives. Afterwards, the appropriate teaching methods and settings and also formative and summative assessment procedures for each competency domain will be determined.

Table 2. TUMS competency framework: domains and sub-domains

Domain	Definition	Sub-domains
Clinical skills	The TUMS medical graduate must be competent in a wide range of clinical skills including taking medical history and clinical examination, recording and presenting the obtained medical information and also, performing practical procedures and laboratory tests on the basis of given standards.	Obtaining relevant medical history from the patient, family, companions, or other sources Undertaking physical examination Record and present the information Performing practical procedures Conducting diagnostic and laboratory tests establishing interpersonal skills in communication
Communication skills	The TUMS graduates must be able to communicate with patients, patients' companions and their colleagues effectively. He or she also must be able to demonstrate verbal, written, electronic or telephonic competence for communicating in all fields	Demonstrating effective communication with patients and their family/companions Communication with colleagues, medical staff & governmental organizations Others
Patient management	The TUMS graduate must be able to prepare a list of patient's problems and differential diagnosis, determine the most appropriate diagnostic investigation and, designate a management plan in order to achieve the desired objectives to show the patient's problems using a holistic perspective. He or she should also be able to notice special occasions where a patient needs to receive counseling or to be referred to the specialist doctors. He or she is expected to demonstrate his or her competencies in different aspects of patient care such as medical or surgical management; acute, chronic, supportive or palliative care; prescription of medicines; nutrition; pain control; and rehabilitation	General principles of patient care Prescription of medicines Nutrition Supportive and palliative care Patient's rehabilitation Alternative and complementary medicine (traditional medicine)
Health promotion and disease prevention	The TUMS graduate must be able to evaluate health status, determine risk factors, identify causes of diseases and recognize predictive factors in order to cooperate or lead other health care providers for the promotion of health among individuals and the population in the catchment area. He or she, as a member of health care team, must be able to choose and apply the appropriate health promotion strategies at the primordial, primary, secondary and tertiary levels.	Evaluating current and ideal health status of individuals and population in touch Applying and evaluating interventions in individuals and population in touch to identify risk factors Applying and evaluating health promotion strategies for early diagnosis and timely treatment
Personal development	The TUMS Graduate should accept and appreciate the importance of the personal growth including self-care promotion, and mental, psychological, social, economic and job-related abilities while know and use non-medical sciences affecting his or her personal and professional life; such as self-analysis, psychology of change, leadership and management principles and informatics.	Physical development Psychological development Social, professional and economic development Information technology Others
Professionalism, medical ethics and law	Knowing that The Devine is the only healer and he or she is granted by God the honor of healing patients, the TUMS graduate must acknowledge the values, characteristics, and behaviors that underpin the society trust to the medical profession and demonstrate commitment to them in his or her medical practice. He or she must adhere strictly to the medical oath and codes of ethics that are based on humanistic and Islamic values and understands that divine abstinence provides the foundation for the medical professionalism. The TUMS graduate must be able to recognize and analyze ethical issues while adhering to professional values and considering legal and ethical obligations with respect to culture and beliefs of beneficiaries.	Altruism Respect Responsibility Excellence Justice Honor & integrity (Professional commitment) Medical law Ethical reasoning and decision-making
Decision making, reasoning and problem-solving	When facing a problem, the TUMS graduate must be able to recognize the problem and its dimensions, search and collect relevant literature from the best available sources, identify and critically appraise different information and solutions, estimate their likely outcome, and finally select the best option considering the uncertainty principle during the process of decision making. In order to make the final decision, he or she must be able to integrate these abilities with inputs from other sources such as patient values and cost-effectiveness of possible solutions.	Critical thinking Problem solving Evidence Based Medicine (EBM)
Health system and the corresponding role of physicians	The TUMS graduate must be able to contribute effectively to healthcare system as a physician, researcher, teacher, manager of health service, and health advocate.	Primary care provider Training provider Researcher Head of health services unit Health advocate

Results

The complete competency framework comprises 8 domains, 40 sub-domains and 130 specific competencies (Table 2). The competencies expected from a TUMS graduate are structured in the following domains:

Clinical skills, Communication skills, Patient management, Health promotion and disease prevention, Personal development, Professionalism, medical ethics and law, Decision making, reasoning and problem-solving, and Health system and the corresponding role of physicians.

Discussion

This paper describes the process of developing a competency framework for medical graduates of TUMS. We believe that the lessons learned through this endeavor can be applied to similar projects in the future.

The very first concern, when the project was to be launched, was a necessity to develop a new set of outcomes in spite of many previously-developed frameworks across the world. The question was whether we should provide a framework for our own or we can simply choose from the existing templates. Albanese et al., in their review, address the question of whether it is possible to agree on a universal competency framework. It appears that even countries with similar medical education and health care systems, as the USA and Canada, do not use a single set of outcomes, let alone a country with many cultural, social, political and structural differences.4 McGaghie *et al*., pointed that "the definition of medical competence is bound to local political, social, and economic circumstances, to health needs, to the availability of resources, and to the structure of the health care system".13 In Iran, even though a general curriculum outline had been provided by MHME beforehand, and a number of universities in the country have initiated revisions in their programs, no document of the expected outcomes of the medical graduates had previously been published. In this regard, TUMS-SoM, as a pioneer of medical education and in response to local needs and conditions, launched an initiative to define its graduates' competencies in tandem with its curricular reform.

Comparing the TUMS graduate competency framework with other existing outlines, it can be noted that they all share some similarities, especially in terms of main domains. For instance, almost all templates, including TUMS framework, have mentioned "clinical skills" and "communication skills" domains. However, a closer look at sub-domains and competencies, particularly in the fields of "personal development" and "problem solving," would reveal some variations among different documents (15-17).

One of the greatest strengths of this project was its participatory approach. Many stakeholders including students, faculty members, and representatives from MHME were involved in the process. The appointed taskforce extensively benefited from their consultation at different points of the project. This strategy provided a unique opportunity to promote a sense of ownership among stakeholders. This process, however, did not formally include the opinions of general practitioners working across the country; nor did it take advantage of the participants from patients or lay people, who are the users of the health services. This limitation should be considered for revision of the framework in the future.

After approval of the complete list of competencies by CRC, it was published and distributed among medical students and faculty members to make them aware of the expected outcomes and encourage them to seek for teaching and learning opportunities even if there are deficits in the current curriculum. It has been stated that publishing and shared the competencies is a useful strategy and facilitates education (6,18). In a systematic review by Frank et al. on CBME, publishing graduate outcomes was found to be the main issue and extensively emphasized in the relevant literature (3).

However, it has been stressed that developing and publishing such a set of outcomes, per se, is not adequate. Besides distributing it among students and teachers, the published framework should be used at the institutional level for the purpose of curriculum design and evaluation. Otherwise, we would be like peacocks that, as Harden described, identify and display outcomes but in reality have a traditional curriculum.2 In TUMS, as well, the phase committees, who are responsible for revising the current courses and designing the new ones, are trying to use the competency framework document as a guide.

One important challenge in accomplishing this task is translating these competencies into the relevant knowledge content. This problem is specifically exposed in preclinical phase courses, where objectives are not directly competency-oriented, but the factual knowledge which is taught is necessary as a foundation for competencies that would be expected later. This is especially important because the process of formulating knowledge content is very prone to result in overloaded and detailed theory-oriented content.

While we believe that this first set of competencies needs revision in the coming years, we tried to evaluate it according to the recommended criteria. Harden et al. proposed 7 criteria for evaluation of the outcomes (19). Although it seems that there is not a well-defined objective tool to determine to what extent those criteria have been met, we believe that in TUMS project most of

them have been dealt with successfully: we tried to keep the number of outcomes within a manageable limit and to provide an appropriate level of generality, as well. It was also important for us to keep in line with vision and mission statements of the TUMS-SoM. Furthermore, Albanese et al. added other criteria to this set. According to their article, a competency should focus on the performance of the end-product. In the competency framework we proposed, this end-product is the medical graduate who is authorized to work as a general practitioner in the country. Secondly, competencies should not focus on recalling information but on the application of what is learned.4 The TUMS medical graduate competencies focus on the abilities that are expected from a doctor in the context of health care system, not on the factual knowledge which is certainly a pre-requisite for accomplishment of those tasks.

In this paper, we described the process of developing a common set of competencies for medical graduates of TUMS. This agreed-upon framework serves as a basis for developing a new curriculum.

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