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Health Workforce Planning: Designing a Specialty and Subspecialty Supply Model for Iran

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Abstract

Background: One of the approaches to health workforce planning is supply-based. It has been emphasized that countries should model health workforce based on evidence and their context. The objective of this study is to "design a supply health workforce planning model for specialty and subspecialty in Iran."

Methods: This is a study using Walker and Avant's (2018) theory synthesis framework to construct the model. This method has three steps. According to the viewpoint of the research team and the needs of the country, the focal concept is determined. Then, a literature review was done to determine related factors and their relationships. In the third step, according to the review, the viewpoint of the research team, the rationale of the connection between components, and the graphic model were presented.

Results: "Supply" was selected as the focal concept. In the literature review, 42 components were obtained from the systematic review, 43 components obtained from the study of other texts were combined with the opinion of the research team about the field of Iran, and the connections between them were determined. In the third step, the supply model was designed using the Stock and Flow method. Finally, by applying the "functional full-time coefficient", the number of full-time equivalent physicians was calculated.

Conclusion: The presented model is an evidence-based model that follows stock and flow design. Stock is the number of specialties or subspecialties that exist in the labor market. Flow includes inflow and outflow according to the educational pathway in the context of Iran.

Keywords: Health Workforce, Health Human Resources, Health Planning, Labor Supply, Health Policy, Physicians

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Introduction

The workforce is one of the important infrastructures in the field of human resources management, and the imbalance in its supply can increase or decrease the number of available human resources, which shows the effects of these imbalances when providing health services (1).

It is widely accepted that the general purpose of national attention to workforce planning in countries is to prepare a sufficient number of competent health professionals to provide services to the public and to ensure that public resources will not be wasted due to the large number of health professionals (2, 3).

Health workforce planning is a scientific field and the subject of theoretical and applied research that evolved from the lack of significant and serious efforts of private

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↑***What is "already known" in this topic:***
There are various supply models for physician workforce (human resource) planning that are specialized for specific contexts.

→***What this article adds:***
In this article, a supply model for medical specialties and subspecialties has been designed and presented for specific contexts and educational trends of Iran.

and public institutions tries to predict how many human resources there are. First of all, doctors are necessary to be able to maintain or even improve the quantity, quality, availability, and effectiveness of the provided medical services (4). Among the other benefits of workforce planning in the field of specialty and subspecialty is ensuring the availability of a sufficient number of competent workforces in the future and preventing the formation of long waiting lines for specialized services. Also, the duration of education to become a specialist or specialist doctor is very long between 11 and 17 years, which requires an abundant budget to be spent on their training. With proper planning in this area, it is possible to prevent the wastage of the budget for the training of the surplus physicians (5-8).

One of the approaches to health workforce planning is the supply-based approach, which focuses on the current and future health workforce (5), in other words, the number of employed and active workforce in the present and the future (9).

One of the human resource planning approaches is modeling, which includes forecasting and planning (10). There are divergent types of models used in workforce planning by different countries. Some of these models are designed to be used only in a specific context, and many organizations have developed models based on their context (6, 11). Forecasting the future health workforce depends on the selected forecasting model (12). factors, which are country-specific, include socioeconomic status (13, 14), level of education (15), population age structure, age and sex distribution, ethnic distribution and educational pathway (8).

Simkin et al. (2022) published a study with the aim of “determining who provides anesthesia services in Canada?”. Its methodology produced estimates of anesthesia providers that aligned with other sources. The process we followed was sequential, transparent, and intuitive and was strengthened by collaboration and iterative consultation with experts and stakeholders. For supply planning unique physician identifiers were used: the binary sex, birth year of the physician, the year the physician graduated from medical school, and the location of the physician’s undergraduate medical training (16).

Wishnia et al. (2019) performed a study with the aim of “The supply of and need for medical specialists in South Africa “. The model uses base data for the 2018/19 financial year that reflects the age, sex, sector of employment and full- or part-time status for each specialty. The model projects from 2020 to 2040 using actuarial population modeling methods to rigorously allow for entry to exit from and transitions between sub-groups within the model. The exits include emigration, retirement and death. The model uses in-migration (although this has initially been set at zero) and the specialist training pipeline (registrars) to estimate the supply of specialists going forward based on current university and fellowship examination dynamics (17).

Taba et al. (2014) designed a study with the aim of “a systems life cycle approach to managing the radiology profession: an Australian perspective “in a dynamic model over 40 years between 2010 and 2050. For modeling supply, they used inflow (number of graduates, international graduates immigration), stocks (number of health workers, FTE calculation), and outflow (exit rates calculated separately for each medical specialty) (18).

The development of human resources in recent years in Iran has also been considered. One of the crucial efforts in this field is developing a "comprehensive framework on human resource management in the health sector." The new pattern in this framework includes six major sections, one of which is to regulate the supply and demand of human resources (19).

Developing national policies and programs to achieve health workforce development goals requires substantial information and evidence (20), and evidence-based health workforce planning models are recommended (21).

One of the model-building methods is synthesis theory. The strategy of synthesis theory is an example of the process of transforming practice-related research into an integrated whole that puts pieces of knowledge together for a better understanding of the phenomenon. The theory can be expressed graphically(model), explanatory(theory) and, or through mathematical formula (22-24). One of the synthesis theory methods is the Walker-Avant method, which is easier for novice researchers to use (25) and is one of the most suitable methods for building prescriptive theories (26).

About the necessity of workforce management in the field of specialties, workforce planning in specialties is critical because an imbalance in the supply and demand of physicians in a given specialty cannot be compensated by other specialties (1).

Modeling of human resources both on the supply side and on the need and demand side should be performed according to the requirements of each country, and there is no holistic model in the fields of specialties and subspecialties in Iran (27).

It is necessary to explain that the present study is part of a comprehensive health workforce planning project, for which the “need-adjusted demand model” has already been designed and published (27).

" Having a model to estimate the supply can estimate the number of specialists and sub-specialists available in a certain period of time and from comparing it with the need and demand, the availability of a sufficient number of people at a certain time and preventing the wastage of funds for training students.

Considering the need to design a health workforce planning model based on evidence and context of each country, the need to correctly estimate the number of specialists and subspecialists available and ready to research health services in the country at any time, and not finding a comprehensive model to estimate the supply in previous researches in Iran, the present study was conducted with the aim of " design a supply health workforce planning model for specialty and subspecialty in Iran."

Methods

Designing the study is a model building using Walker and Avant’s (2018) theory synthesis framework to create a supply-side health workforce planning model for specialties and subspecialties according to the context of Iran.

This method consists of three stages.

Step 1 is determining the focal concept/s, identifying related factors and their relationships, and organizing concepts and phrases in an integrated and efficient representation of phenomena (24). In the stage of determining, the focal concept/s, the topic of interest, and the basic concept about a special topic are identified. In the current research, "supply" is selected as the focal concept.

In step 2, to identify factors related to the focal concept and the relationships between them, text reviews, observations, and opinions of researchers are used (24).To determine the associated factors and their relationships, a previous systematic review conducted by the researchers of the present study (8), a review of documents in the Secretariat of the University Development Council of the Ministry of Health and Medical Education of Iran(MOHME) (9, 28), books and articles review(11, 29-33), regional reports of the World Health Organization (34-41) and the logical form of these relationships based on the opinion of researchers were taken into account. It should be noted that the members of the research team included the two former and current secretaries of the University Development Council of the Ministry of Health and Medical Education and colleagues of this center specialized in health workforce planning(including one Ph.D.in medical education and one general surgeon specialized in health workforce planning and researcher in this field), the former director of the Education Development Center of Ministry of Health and Medical Education and former research director of the National Agency of Strategic Research in Medical Education (NASR); these experts were policymakers in field of the health system and also were theorists in the field of medical education with prolonged engagement with the subject of the present study and with work and executive experience in this field. This shows that the opinions of the research team in the field of health workforce planning can be cited.

In step 3 of Walker and Avant's theory synthesis, the components and the relationship discovered between them that were obtained in the second step were integrated and presented to a graphic model.

It is necessary to explain that in all stages of designing the model, Iran's educational laws and pathways are considered.

Results

Step 1- Specifying focal concepts

"Supply" was selected as the focal concept.

Step 2- Reviewing the literature to identify factors related to the focal concepts

42 related factors were obtained from the systematic review; 43 related factors obtained from the study of other literature were combined with the opinion of the research team. From the existing list, some items were selected based on the field and educational paths of Iran. The relationships between the components were determined based on what was explained in the methodology section.

Step 3- Organizing concepts and statements into an integrated and efficient representation of the phenomena of interest

In the third step, the supply model was designed using the Stock and Flow method. The model is presented and described below:

• ***General description of the supply model:*** The general description of the model is shown in Figure 1. The resulting model follows the stock and flow method. In any given year, there are many active physicians in the health labor market, called stock. In the same year, people are added to the stock through new graduates or immigration, called inflows, and some people leave this stock for various reasons, which are called outflows.

The calculation unit for stock, inflow, and outflow is considered as headcount (person). Full-time functional rate converts stock to functional stock.

• ***Description of the supply model:*** The model designed for supply is shown in Figure 2.

Before going into the model's description, it is necessary to explain that there are two sources of medical labor supply in Iran: educated people in Iran and Iranians who studied abroad. According to the educational laws of the MOHME of Iran, several situations may happen to Iranian students studying abroad:

1. The first category returns to the country while studying, which is added to the number of "domestic students" (studying) based on the conversion rate of foreign students

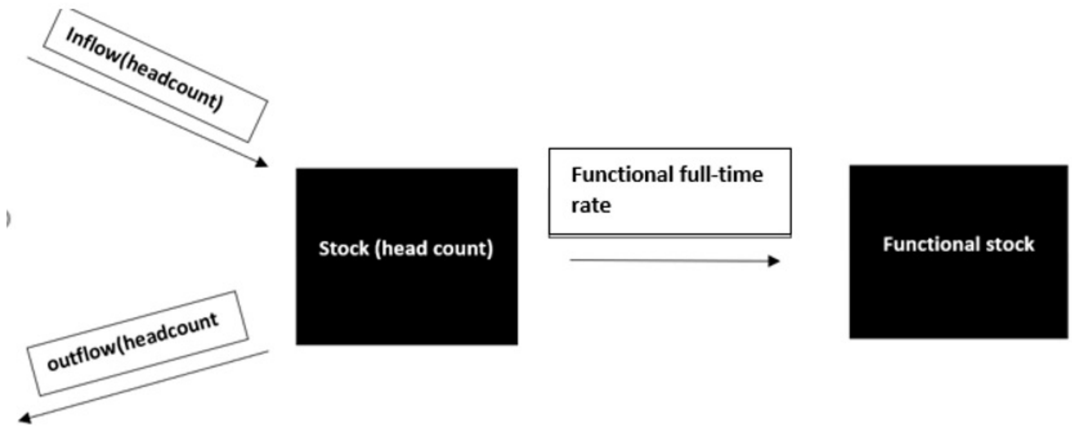

Figure 1. General description of the model

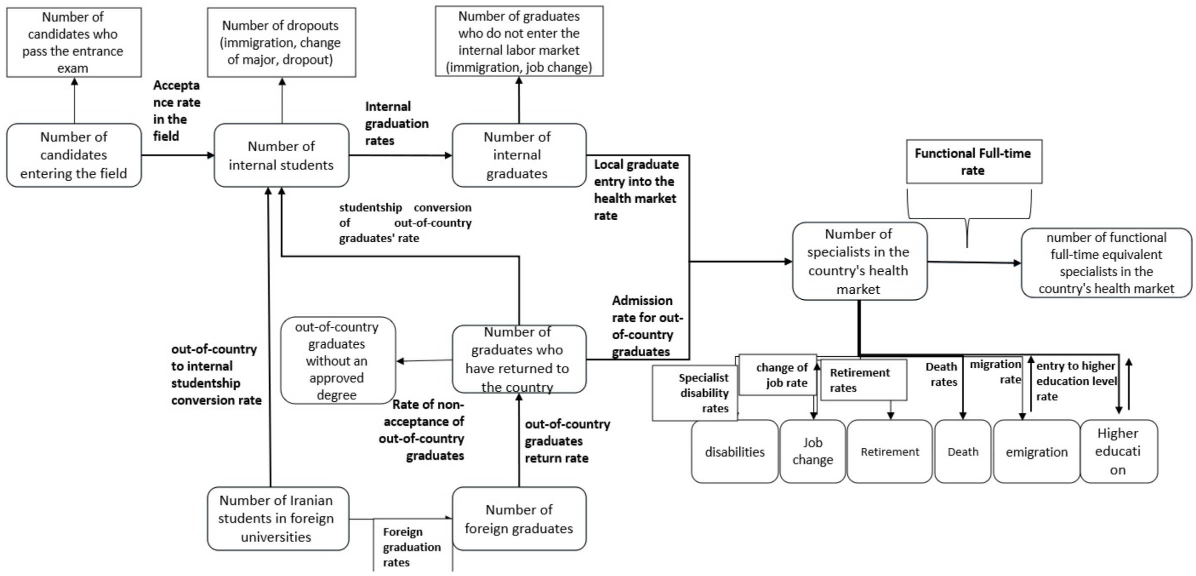

Figure 2. The supply model

to domestic students.

2. The second category, based on the "return rate of foreign graduates to inside," returns to Iran after graduation. For this category, several cases may occur: a) In the first case, a number of these graduates are required to retake a number of university courses in domestic universities, which is also based on the "rate of conversion of foreign graduates to students"; these students are added to the number of domestic students (studying). b) The second case relates to graduates from abroad who do not need to take additional units or courses in domestic universities. They must participate in the certificate verification test and, if accepted, will be added to the number of "domestic graduates". Considering the above premise, we describe the model:

At any given time, there are a number of students studying in the country. Some people will be added to this number through the entrance exam and the entry of students or graduates from abroad based on Iran's educational laws. Moreover, the number of students may be reduced due to various reasons, such as dropping out of school, changing majors, and emigrating. The sum of the aforementioned factors makes up the "number of domestic students." In this way, the "number of domestic students" is calculated with the following formula:

The number of domestic students = (entering students through the entrance examination + the number of foreign medical students or graduates + the number of students currently studying) - (the number of emigrating abroad + dropping out + changing majors)

Out of the "number of domestic students" based on the "graduation rate," some people will graduate. In addition, based on the "degree acceptance rate of graduates from outside Iran," a number of Iranians who have graduated from medicine abroad at any level and specialty are approved. The total number of new graduates each year is determined from the sum of these two, "domestic graduates" and "graduates outside Iran whose degrees have been approved."

The number of doctors in the country's health market at each level and specialty is calculated as follows:

The number of doctors in the country's health market = (the number of existing doctors + the number of new graduates) - (the total number of exits from the labor market due to reasons such as immigration, death, retirement, disability, job change and acceptance into higher education)

On this number, the "full-time functional rate" is applied, which will calculate the "full-time equivalent number of physicians in Iran."

Discussion

The model presented in this study is a model for forecasting labor supply and the relevant effective factors, which is suitable for dynamic system modeling. In this model, the input and output are shown along with the detailed relationships between the influencing variables in the supply. The relationships between the model components are determined with the existing logic in the relationship between them and with the inspiration of several models examined by the research team.

Considering that the development of policies at the national level requires solid evidence, evidence-based health workforce planning is recommended. In addition, evidence should be used for correct, excellent, and principled planning. The present model also follows the same principle in such a way that it has studied and utilized labor supply models worldwide, so it can be considered an evidence-based model.

There are many supply models worldwide (1, 42-56). In the current model, an attempt has been made to include the components of those models, encompassing graduates (48, 50, 52, 53, 56), people with activity licenses (1, 48, 56), announced capacities, and the number of program entries (1, 49, 51, 53), and factors related to academic dropout (43,

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51).

In other countries, some models have been presented to estimate the supply of specialty and subspecialty doctors. Some of them presented a holistic model (57, 58) but most of these models have only focused on a specific field of expertise, such as radiology (18), cardiac surgery (59), or anesthesia (16, 60). Current stock, inflow and outflow are used in these models, but it should be noted that the process of student admission, educational path, description of duties and interference of duties in Iran is different from other countries. For example, in Iran, the entry of foreign specialists into the country is almost zero. On the other hand, the years and educational paths are completely different.

The innovation of the model is that all the components used in this model are more detailed and localized according to the educational paths, policies, and educational rules of Iran, including the paths available for abroad students and graduates and the prevailing conditions of emigration inside and outside the country.

Another innovation in the supply model is the adjustment by the factor of "full-time functional rate," which includes factors such as age, gender, full-time equivalent, and individual productivity. The full-time functional rate is the average ratio of a person's effective work according to the above factors in each specialization and specific level to the expected work (full-time equivalent work). The expected function can be calculated based on the norm, national or international standard.

Outflows in this model include disability, retirement, job change, death, emigration abroad, and admission to higher education. For each of these, there are separate rates, or instead of calculating each of these, a general attrition rate can be used.

Regarding admission to a higher level, based on the education system of Iran, these people practically do not leave the healthcare market, as during residency, subspecialty, and fellowship, these people work and study full-time under the supervision of their professors to provide health services in hospitals and public sector centers; so the only thing that can potentially happen is moving from the office or private sector to the governmental sector or one province, city or hospital to another.

Regarding the temporary exit, the arrows can be placed in two directions, which means that these people will return to the health labor market after a while, but their entry and exit rates are not necessarily the same. For outflows such as maternity and military leave etc., instead of including them in the outflow, the researchers preferred to include the effect of these factors in the full-time functional rate. For example, in a field such as urology, the number of women is almost small, but in specialties such as gynecology and obstetrics, it can be considered to what extent the number of people who are temporarily out of work due to childbirth and child-rearing can reduce the average effective work in the entire working period of the person. It should be pointed out that including these as outflow with two-way flash is also unimpeded.

It should be noted that for the rates specified in this model if there is an actual number, that number should be used for calculations, but in cases where there are no complete and reliable statistics, the estimation of experts or the consensus of experts can be taken into account. This method has been used in other research as well (61-63), and can be referred to until the completion of research, local surveys, and the creation of an accurate database in the country to solve the problem of parameter calculation; however, it should be noted that if this method is used, we cannot expect to obtain very accurate numbers in the measures. However, according to Tomblin Morphy et al., the purpose of labor force planning is to identify trends and not estimate exact numbers (53). At the same time, it is recommended to have stronger estimations that are closer to reality, countries start creating and enriching data sets in which the information of the health workforce is carefully recorded, the need for which is also felt in Iran.

The current model can be used to estimate the supply related to general practitioners with a slight modification.

One of the limitations of this model is that it is designed based on the educational paths of Iran, and adjustments should be made when using it in the context of other countries and disciplines. Another limitation is that, despite its comprehensiveness, the factor of immigration of foreign professionals is not included in it; in other words, according to the conditions, the number of foreign professionals who enter Iran from other countries to work in the health sector is considered zero, so it is not included in the model. On the contrary, in other countries, based on their context, this item can be added to the model as inflow. Moreover, the use of this model is not extended to fields other than medicine.

Conclusion

This study presented a model for supply specialty and subspecialties workforce planning. There are criticisms of existing health workforce planning models, which are based on their methodologies, factors that should be included, and important factors related to the context of any country or organization. Therefore, it is necessary to design a model considering the important factors and conditions of the country, which are discussed in this study.

The model presented in the study provides a holistic model which considers all the factors affecting the supply. The model has been considered the context and educational pathway of Iran. This model establishes current stock, inflow, and outflow at every determined time and is appropriate for use in system dynamic modeling. It can be a valuable tool for predicting the supply specialty and subspecialties workforce in the coming years and helping policymakers make decisions about the estimation of the health workforce.

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Authors' Contribution

"S.B, Sh,Y and MH designed, conceived, acquired, and analyzed the study. All authors contributed to the interpreting, drafting and final review of the manuscript. The authors read and approved the final manuscript and are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Ethical approval

The ethical code is IR.SBMU.SME.REC.1400.036.

Conflict of Interests

The authors declare that they have no competing interests.

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