

# The future balance between training and demand for radiologists in Iran

H. Esmailzadeh<sup>1\*</sup>, A.R. Delavari<sup>2</sup>, S.M.R. Kazemi-Bajestani<sup>3</sup>,  
S. Alikhani<sup>4</sup>, R. Tabibzadeh Dezfouli<sup>3</sup>, F. Alaeddini<sup>3</sup>

<sup>1</sup>Medical Informatics, Center for Academic and Health Policy, Tehran University of Medical Sciences, Tehran, Iran

<sup>2</sup>Digestive Diseases Research Center, Tehran University of Medical Sciences, Shariati Hospital Tehran, Iran

<sup>3</sup>Health Researchers, Research and Development Institute, Tehran, Iran

<sup>4</sup>Ministry of Health and Medical Education, No 58, Iranshahr St., Tehran, Iran

## ABSTRACT

### ► Short report

**\* Corresponding author:**

Dr. Hamid Esmailzadeh,

Fax: +98 21 66744339

E-mail: [m\\_h\\_sowlat@yahoo.com](mailto:m_h_sowlat@yahoo.com)

Revised: May 2013

Accepted: Jan. 2014

*Int. J. Radiat. Res.*, October 2014;  
12(4): 373-376

**Background:** The present study aimed to evaluate the balance between training and demand for radiologists in the Iranian health care system between 2008 and 2027. **Materials and Methods:** A total number of 250 clusters were randomly selected from urban and rural areas of Iran, of which 168 were selected from urban areas and 82 were selected from rural areas. In order to collect basic medical data and to determine the number of radiology visits in the last two weeks, questionnaires were prepared and sent out to the subjects' houses. Information on the number of radiologists as well as statistics on the Iran's population were provided by the Medical Council of the Islamic Republic of Iran (IRI) and the Statistics Center of IRI, respectively. **Results:** Radiologists were visited 245 times during a two-week time period, which resulted in an average referral to radiologists of 0.125 for each individual. Our results indicated a slight shortage of radiologists in 2008, which is expected to disappear till 2023. Afterwards, the training of radiologists is expected to slightly surpass the demands. **Conclusion:** Results from the present study suggested that an overall balance between training and demand for radiologists in Iran is likely to happen in near future.

**Keywords:** Radiologist, demand, training, Iran.

## INTRODUCTION

One of the most important responsibilities of medical workforce planning system is to set up the equilibrium between the training and demand for physicians all over the country. The prospect of the medical workforce has been the subject of inspection and discussion for years, not only in Iran, but internationally (all over the world).

In 1973, the American College of Radiology performed a research on manpower and facilities and reported that neither an excess nor a shortage of radiologists would take place in near future. They also concluded that the positions

for residents education should be preserved at the existing figures <sup>(1)</sup>. Dr. Hawkins (2001) reported that 45 percent of hospitals in Dallas, USA, were understaffed in the radiology section <sup>(2)</sup>. Rosenquist (2000) anticipated an increasing demand for radiologists by 18.5% in USA till 2010 <sup>(3)</sup>. The Workforce Committee of the Royal Australian and New Zealand College of Radiologists (RANZCR) (1998) reported a probably forthcoming shortage of radiologists in Australia, due mainly to a possible augmentation in the attrition rate of an ageing radiologists population, an increasing rate of female involvement in the workforce, and increased medical imaging consumption rates <sup>(4)</sup>. In 2002, RANZCR

also found the scarcity of radiologists in Australia <sup>(5)</sup>. Nakajima *et al.* (2008) revealed that if Japan were to train appropriate health care, 8614 diagnostic radiologists, 2.5 times the present number, would be necessary <sup>(6)</sup>.

As with many other countries in the world, currently, there is much concern about an imminent general deficiency or over training in the future of radiology medical workforce in Iran.

Predicting the training and demand for radiologists in Iran for the next decades is an imperative but complex task. Therefore, the aim of this study was to evaluate the balance between the training and demand for radiologists in the Iranian health care system between 2008 and 2027.

## MATERIALS AND METHODS

A total number of 250 clusters were randomly selected from urban and rural areas of Iran in a cross-sectional study. Of these, 168 clusters were selected from urban areas, while 82 were selected from rural areas. Considering that each cluster consisted of 20 families, our sample comprised 5000 families and 19629 individuals. Of these, 12792 subjects were living in urban areas, whereas 6837 individuals were living in rural areas. 50.8% of the subjects included in the present work were male, whereas 49.2% were female; additionally, the overall mean age of the subjects was  $31.0 \pm 19.2$  years. In order to collect basic medical data and to determine the number of radiology visits in the last two weeks, questionnaires were prepared and sent out to the subjects' houses.

Information on the number of radiologists as well as statistics on the Iran's population were provided by the Medical Council of the Islamic Republic of Iran (IRI) and the Statistics Center of IRI, respectively. The demand for radiologists in each coming year over the period from 2008 to 2027 was estimated based on the number of radiology writings per year and the referred patients' data. In addition, the future increase in the Iranian population was anticipated based on the data provided by the Center of IRI predic-

tions. According to the collected data, there were 1190 radiologists across the country in 2008 who were born after 1974. In order to predict the future training, both the retirement of the current radiologists and the admission of 83 new radiologists per year were also taken into account.

It is noteworthy that in the present work, radiologists were defined as those who work in the radiology department (those who interpret X-ray films and those doing ultrasonography). The statistical analyses were also performed using SPSS version 17.

## RESULTS

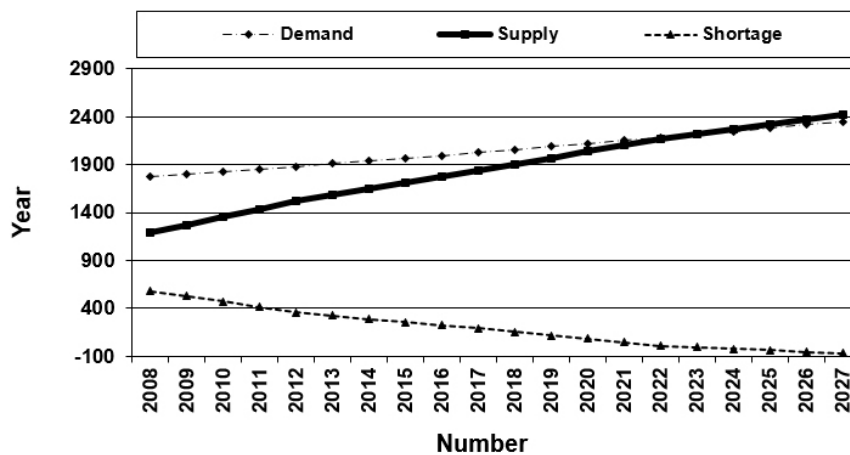
Radiologists were visited by the participants 245 times during a two-week time period. We divided this number by the sample population ( $n=19629$ ), which resulted in an average referral to radiologists of 0.125 for each individual. The number of radiology reports and the corresponding demand for radiologists during 2008-2027 were anticipated based on an annual average radiology report of 5000 for each radiologist, the results of which are presented in table 1. The training and demand for and the resulting shortage of radiologists per year over the period from 2008 to 2027 are illustrated in figure 1. As shown in the figure, there was a slight shortage of radiologists in 2008, which is expected to disappear till 2023. Afterwards, the training is anticipated to fairly increasingly outnumber the demand with a gentle slope.

## DISCUSSION

According to the results from the present study, it is predicted that there will be a relative balance for the radiology specialties in Iran until 2027. The most essential finding is that, currently, there is a minor shortfall of radiologists training in Iran, which is expected to diminish steadily with the increasing training rates; therefore, the increasing training rate of radiologists in Iran seems appropriate.

**Table 1.** Estimation of population, the number of radiology reports, and the corresponding demand for radiologists per year during 2008-2027.

Years	Population	Number of Radiology Reports per year	Radiologists demand per year
2008	70937173	8867147	1773
2009	72001230	9000154	1800
2010	73081249	9135156	1827
2011	74177467	9272183	1854
2012	75290129	9411266	1882
2013	76419481	9552435	1910
2014	77565774	9695722	1939
2015	78729260	9841158	1968
2016	79910199	9988775	1998
2017	81108852	10138607	2028
2018	82325485	10290686	2058
2019	83560367	10445046	2089
2020	84813773	10601722	2120
2021	86085979	10760747	2152
2022	87377269	10922159	2184
2023	88687927	11085991	2217
2024	90018247	11252281	2250
2025	91368521	11421065	2284
2026	92739048	11592381	2318
2027	94130134	11766267	2353



**Figure 1.** Estimation of supply, demand, and shortage of radiologists per year over 2008-2027.

Results from the present study are somewhat inconsistent with those of the previously conducted studies in other countries (2-4). In the United States, for example, there has been found a major shortage of academic radiologists (7), which is believed to exist in other countries as well. The overall condition of academic radiology suffers from insufficient financial resources and manpower; besides, one third to half of the academic radiology programs in the United States are under pressure for maintaining stable

academic environments (8). It must be realized that the private practice of radiology community is strongly dependent upon the researches performed the academic radiology departments, improvements in the imaging technologies, and instructing new generations of radiologists (9).

Predicting the right number of radiologists needed in Iran for the next decades might be of complexities. Previous efforts in the world have been characterized by incomplete data, conflicting results, and eventually, as the future exposed

itself, mistaken conclusions<sup>(10-12)</sup>. Workforce strategies that use forecasts according to the best attainable information at the time of planning inevitably deviate from reality. When this divergence takes place, it is necessary to recognize problems and drive a counteractive response from the system. Forecasts would then be taking the new characters of the system into account. There is a major concern that the proportion of Iranian trained junior doctors who prefer to become a radiologist has consistently increased in the recent years. However, although the intake of the medical schools and the number of individuals making an early decision for radiology have risen, it is unclear if adequate job positions will be available in Iran for radiologists to fulfill future service requirements.

Another important point in predicting specialists' demand in Iran is the maldistribution of the medical facilities over the country. Radiologists, like other specialists, prefer to practice in modern and big cities. Consequently, after finishing their national health service in small, remote cities in a short time period, they mostly return to modern cities. This has resulted in the over training of radiologists in big cities and, unfortunately, the deficiency of radiology services in small, remote towns. A tactical procedure should be planned to resolve the current imbalance between radiologists' training and demand all over the country. The strategy for this planning should be based on the following aspects: improving the living standards for radiologists in small, remote cities and providing the required radiological technologies in such cities.

## CONCLUSIONS

We believe that an overall balance between the supply and demand for radiologists in Iran is likely to happen. In addition, the training

programs seem to be sufficient during the next 20 years. However, paying sufficient attention to the rational distribution of radiologists all over the country is mandatory. Furthermore, constant monitoring of radiologists' supply and demand in addition to taking new circumstances into consideration could be very helpful in the forthcoming years.

**Conflict of interest:** Declared none.

## REFERENCES

1. Facilities. ACORTFoMa (1975) Report of the American College of Radiology task force on manpower and facilities. Reston, VA: American College of Radiology.
2. Hawkins J (2001) Addressing the shortage of radiologists. *Radiol Manage*, **23**:26-28.
3. Rosenquist C (1995) How many radiologists will be needed in the years 2000 and 2010? Projections based on estimates of future supply and demand. *AJR Am J Roentgenol*, **165**:1303-1305.
4. Jones D, O'Donnell C, Stuckey J (1998) Australian radiology workforce report. *Australas Radiol* **2000**, **44**:41-52.
5. Jones D (2002) Australian radiology workforce report. *Australas Radiol* **2002**, **46**:231-248.
6. Nakajima Y, Yamada K, Imamura K, et al. (2008) Radiologist supply and workload: international comparison--Working Group of Japanese College of Radiology. *Radiat Med*, **26**:455-465.
7. Applegate K (2005) The future workforce in academic radiology: gender, generational, and cultural influences. *J Am Coll Radiol*, **2**:133-138.
8. Dodd G, Fletcher T, Thorwarth W, Jr. (2006) The crisis in academic radiology: will we help ourselves? *J Am Coll Radiol*, **3**:229-230.
9. Levin D and Rao V (2007) Turf wars in radiology: the future of radiology depends on research--and on your support of it! *J Am Coll Radiol*, **4**:184-186.
10. GMENA Committee (1980) *GMENAC summary report*, **1**:81-651.
11. Feil E, Welch H, Fisher E (1993) Why estimates of physician supply and requirements disagree. *JAMA*, **269**:2659-2663.
12. Sunshine J, Evens R, Chan W (1992) How accurate was GMENAC? A retrospective review of supply projections for diagnostic radiologists. *Radiology*, **182**:365-368.