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Radiology in Turkiye's healthcare system

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ABSTRACT

Radiology is one of the key departments in healthcare services. To provide effective healthcare to patients, solutions must be developed for the problems in the radiology system. In Turkiye, the demand for radiology is increasing at a rate above the global average. The Turkish healthcare system, which lacks an adequate number of radiology specialists, faces a significant increase in workload. In Turkiye, there are 5 radiologists per 100.000 people, which is below the average of developed countries. According to a 2022 report by the Republic of Turkey's Ministry of Health, there are 295 computed tomography (CT) scans and 207 magnetic resonance imaging (MRI) scans performed per 1.000 people. When compared to organisation for economic co-operation and development (OECD) countries, Turkiye ranks first in the number of radiological examinations per capita. The increasing number of examinations means a higher workload for radiologists. Health policies aim to address these issues, but sufficient progress has not yet been achieved. In this review, we will attempt to identify the causes of this situation and propose solutions.

Keywords: Turkiye (D014421), radiologist (D000072177), health policy (D006291), teleradiology (D019112)

INTRODUCTION

Turkiye's growing population, increasing hospital admissions, efforts to provide healthcare services to more people, and rising healthcare investments are among the main reasons for the increase in radiological examinations. Additionally, clinicians' concerns about malpractice have increased the need and number of imaging studies. Recently, the time allocated per patient has significantly decreased, which is seen as the biggest obstacle to detailed patient evaluation. For all these reasons, the number of radiological examinations is progressively increasing under current conditions.

METHODS

Statistical data obtained from the databases of official institutions in Turkiye and worldwide were retrospectively analyzed. A literature review was conducted on education, healthcare services, and current operations in Turkiye and other countries.

FINDINGS

Healthcare services in Turkiye are provided by both public and private sectors. Until January 25, 2025, healthcare services obtained from public institutions were free of charge except for a $0.20 copayment. In 2022, there were 1.555 hospitals nationwide. Of these, 915 belonged to the Ministry of Health, 68 to universities, and 572 to the private sector. Healthcare services are primarily provided by institutions affiliated with the Ministry of Health. The facilitation of access to healthcare services by the government led to a significant increase in hospital admissions. The number of hospital admissions per capita was recorded as 4.5 in Ministry of Health institutions, 0.5 in universities, and 0.9 in the private sector.

According to the 2022 report, of the total 973 magnetic resonance imaging (MRI) devices, 480 were in the private sector, 379 in the Ministry of Health, and 114 in university hospitals. Similarly, of the total 1.331 computed tomography (CT) devices, 545 were in the private sector, 636 in the Ministry of Health, and 150 in university hospitals. Additionally, of the total 6.255 ultrasonography (USG) devices, 2.431 were in the private sector, 2.715 in the Ministry of Health, and 1.109 in university hospitals.[1]

Basic medical education in Turkiye lasts 6 years. Basic radiology training generally varies and is typically in the form of 1-2 week seminars. In some educational institutions, radiology rotations are not included in the curriculum. In

such cases, newly graduated physicians request unnecessary and incorrect examinations without awareness of radiological tests.

Radiology specialty training is generally provided by different institutions worldwide. As shown in a study conducted in 17 countries, it is provided by local hospitals (23%), universities (36%), national boards (36%), and ministries of health (6%).[2] In Turkiye, radiology specialty training is provided through state universities, foundation universities, and city hospitals.

In Turkiye, radiology specialty training is conducted within a systematic training program framework that defines general and discipline-specific components. The Turkish Radiology Association Competency Board has prepared a comprehensive guide aimed at regulating the quality of radiology specialty training in accordance with national and international standards. This guide specifies the objectives and goals of radiology specialty training.

In Turkiye, radiology specialty training has been implemented as a 5-year program since 2017.[3] This duration varies among countries. For example, in South Korea, this period is 4 years, while in the United Kingdom, it is 5 years.[4,5]

Examinations are a common element in the training process worldwide. Theoretical and practical exams are administered. Pre-specialty structured examinations are conducted, and competency is granted by the academic board.

In Turkiye, residency training includes daily shifts and on-call duties. On average, a resident works 5-8 on-call shifts per month in addition to weekday shifts. Post-call leave is utilized. In other countries, shift durations range from 5 to 26 hours, while the number of monthly on-call shifts ranges from 3 to 6.[2]

Significant differences in radiologist salaries have been observed among countries. Annual salaries range between $8.000 and $75.000 US dollars.

In Europe, there are 13 radiologists per 100.000 people, while in the United Kingdom, this number is 8.5. In Turkiye, there are only 5 radiologists per 100.000 people.[6]

Population growth is one of the reasons for the increase in imaging numbers. According to the address-based population registration system, the country's population was 76.667.864 in 2013, while by the end of 2022, this number was recorded as 85.279.553.[7]

In 2013, the number of USG examinations was 24.819.662; Doppler USG , 8.098.999; CT, 11.039.694; and MRI, 9.073.582. In 2022, these numbers were 20.224.312 for USG, 21.163.138 for Doppler USG, 25.178.827 for CT, and 17.634.202 for MRI (**Table**).[1,8]

The negative effects of increasing examination intensity include rising radiation exposure, increased malpractice risks for radiologists, and higher frequency of contrast agent side effects.

Table. Changes in radiological examination numbers between 2013–2022

Imaging modality	2013	2022	Change
USG	24.819.662	20.224.312	-18.52%
Doppler USG	8.098.999	21.163.138	+161.31%
CT	11.039.694	25.178.827	+128.08%
MRI	9.073.582	17.634.202	+94.35%

USG: Ultrasonography, CT: Computed tomography, MRI: Magnetic resonance imaging

Due to this high demand increase, the Ministry of Health has felt the need to implement various methods. The first of these was to increase the number of radiologists. While the number of research assistants starting radiology specialty training was 1.191 between 2016 and 2021, this number increased to 2.770 during the 2022–2024 period. Another method is to provide radiology services in regions without radiologists through teleradiology. The Teleradiology System enables access to patients' radiological examinations via the internet, remote interpretation of images, exchange of ideas among radiologists, evaluation of image and report quality, transfer to the e-Nabız personal health system, and sharing with citizens and physicians via web and mobile platforms 24/7.[9]

Artificial intelligence (AI) applications, seen as a solution source worldwide and in our country, have gained momentum. Organizations such as the Radiological Society of North America (RSNA), medical image computing and computer-assisted intervention society (MICCAI), and aviation, space and technology festival (TEKNOFEST), or online platforms like grand-challenge, are undertaking various initiatives in this regard.[10] Countries with aging populations, such as Singapore, are integrating AI and deep learning models into their healthcare systems.[11] Our Ministry of Health has recently implemented mammography computer-aided detection (CAD) applications for calcification and early breast cancer detection in mammography.[12]

CONCLUSION

The role of radiology in healthcare services is of undeniable importance. To provide effective healthcare services to patients, solutions must be developed for the problems in the radiology system. The radiology crisis in Turkiye reflects broader healthcare system issues, such as increasing demand, inequalities in resource distribution, and delays in workforce policies.

Although recent steps such as teleradiology and AI pilot applications are promising, a sustainable and multi-stakeholder approach is essential. Access to previously performed radiological examinations should be facilitated through digital platforms. Future studies should evaluate the cost-effectiveness of AI and teleradiology in Turkiye. Teleradiology use should be user-friendly at the national level.

Increasing health literacy in society may reduce the number of hospital visits. Enhancing clinicians' knowledge about examinations and implementing malpractice reforms to create suitable working conditions for clinicians could decrease workload. Reducing the number of visits would

increase the time clinicians allocate per patient. A freer working environment should be provided where clinicians do not feel the need to request radiological examinations for defensive purposes.

Radiology-focused education should be increased in medical curricula, and awareness of radiological tests should be raised. Studies targeting physicians receiving basic medical education suggest that educational activities in radiology can improve the clinical use of imaging.[13]

The number of radiologists per capita should be increased. However, the number of scientific meetings and studies should also be increased to enhance radiologists' qualifications. Existing AI applications should be encouraged, and their integration into the system should be accelerated.

ETHICAL DECLARATIONS

Referee Evaluation Process

Externally peer-reviewed.

Conflict of Interest Statement

The authors have no conflicts of interest to declare.

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Author Contributions

All of the authors declare that they have all participated in the design, execution, and analysis of the paper, and that they have approved the final version.

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