



The Growing Problem of Radiologist Shortage: Mongolia's Perspective

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Radiology plays an essential role in modern healthcare and public health, ranging from disease prevention to surveillance, while also providing crucial diagnostic insights and guiding treatment decisions. However, the global healthcare landscape faces a daunting challenge: shortage of radiologists. This issue is not limited to developed nations; even emerging economies such as Mongolia are grappling with the consequences of a diminishing radiologist workforce. In this article, we explore the growing problem of shortage of radiologists from Mongolia's perspective, highlighting their causes and implications.

Radiology landscape in Mongolia

The Mongolian Society of Radiology was established in 1995 to include all physicians and technicians of Mongolia in the field of Radiology. Radiology was first introduced in Mongolia in 1934, with the establishment of the first radiograph at the First Central Hospital of Mongolia. Since

then, the field has been continuously developing and is dedicated to serving the healthcare needs of the general public through qualified radiological service. Between 1955 and 1960, the first generation of radiologists and nuclear medicine doctors was trained in the Union of Soviet Socialist Republics. Currently, Mongolia has central administration-(Center for Health Development) and hospital-based 2-year radiology residency training programs.

Administratively, the country is divided into 21 provinces (aimags) and the capital city is composed of nine districts. Each provincial and capital secondary hospital is equipped with a radiology department staffed by to 2–3 radiologists. Furthermore, there are four regional diagnostic and treatment centers, each supported by to 5–6 radiologists. In the capital city, there are tertiary and specialized centers, each with a radiology department employing 8–12 radiologists. Currently, there are 756 registered radiologists; however, almost half of them are in practice. In 2009, the number of practicing radiologists was 104, which will increase to 482 by 2022 [1]. Although we are 1.25 radiologists per 10000 people nationwide, it is different in provinces (0.38 radiologists per 10000) and city centers (0.87 radiologists per 10000) [2], showing disparities in radiology service coverage in urban and rural areas.

The Mongolian health sector has adopted modern radiology technologies to provide radiology services that meet international standards. Currently, there are 35 computed tomography (CT) scanners, 22 magnetic resonance imaging (MRI) machines, 15 digital subtraction angiography (DSA) machines, 2-3D linear accelerators for radiotherapy, one cyclotron, two positron emission tomography (PET)-CT scanners, and several artificial intelligence-based software packages.

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The Evolving Radiology Workforce in Mongolia: Overcoming Hurdles and Embracing Best Practices

Mongolia shares similar challenges with other low- and middle-income countries, particularly regarding factors such as salaries, number of radiology studies per doctor, rapid technological advancements, and radiologist burnout. However, its vast geographical landscape, nomadic population, and citizen count of 3.4 million spread across the country give rise to distinctive and unique challenges.

First, Mongolia's relatively low doctor salaries can be partially attributed to its modest gross domestic product (GDP), because economic constraints affect healthcare funding and resource allocation. Secondly, the number of studies assigned per radiologist has increased since the introduction of the first CT scan in Mongolia in 1996, and the number of patients undergoing radiology services has also increased. Even though the number of CT slices and MRI protocols has increased and become more qualified, more time and attention are required to read all of them and accurately diagnose the disease. Third, the Mongolian medical education system features a two-year radiology residency program. Post-residency fellowship opportunities are offered in the fields of ultrasonography, computed tomography, magnetic resonance imaging, and interventional radiology. Nonetheless, there is a notable absence of a dedicated curriculum for specialized body sections such as thoracic radiology. In addition, given the population and hospital resources, establishing separate workspaces for each subspecialty is not a viable solution owing to its inefficiency. Consequently, the scarcity of sub-specialties poses distinctive challenges.

These challenges could potentially impact patients. Delays in diagnosis and treatment can lead to increased healthcare costs, decreased patient satisfaction, and potentially compromised quality of care. Addressing this issue requires a multifaceted approach involving investment in medical education, retention strategies for healthcare professionals, and infrastructure enhancement. To overcome these challenges and mitigate risks, hospitals in Mongolia have adopted appropriate measures. First, radiology departments tend to operate on a rotational basis, allowing everyone to interpret all imaging sections, such as musculoskeletal, neuroimaging, and cardiovascular imaging, from the toe to the head. This approach enables radiologists to learn from each other and work effectively in solving complex clinical

conditions. As a result, we have over 22 subspecialty societies, leveraging radiology services across the country and partnering with international societies such as Korean Society of Radiology, The Asian Oceanian Society of Radiology (AOSR), Japanese Society of Radiology and other international and national societies.

Second, remote workstations not only allow radiologists to work remotely but also contribute to the development of teleradiology enterprises. As the legal environment in Mongolia permits, for example, Grandmed Hospital recruits and partners with experienced radiologists to fill the workforce gap during the shortage of radiologists. Several teleradiology companies have worked with public, private, and provincial hospitals to fill this gap in radiology service coverage. Although 319 out of 321 soums (administrative division) have fiber optic Internet connections, we hope that the recently developed partnership between Mongolia and Starlink will enable a higher-speed Internet for radiology image exchanges and enhance teleradiology services.

Finally, Artificial Intelligence has significantly contributed to addressing the radiology workforce shortage by improving the efficiency of radiology department workflows, image analysis, and interpretation [3]. This supports radiologists by swiftly detecting anomalies and flagging potential issues, allowing them to focus on more complex cases and reduce their workload. In this sense, the Mongolia-Japan Teaching Hospital under the Mongolian National University of Medical Sciences and Intermed Hospital piloted and utilized artificial intelligence-based software for routine work.

Despite Mongolia's unique challenges stemming from geographical considerations and its small population, it shares a common issue with other low- and middle-income countries: a shortage of radiologists alongside the rapid expansion of radiology technologies and service demands. To address these challenges, the implementation of efficient resource utilization, innovation, teleradiology, and artificial intelligence emerged as a feasible measure to mitigate these obstacles.

Conflicts of Interest

The authors have no potential conflicts of interest to disclose.

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