

Teleradiology: Geography is now History!

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Picture this scenario: An intensivist from Chennai, India providing Tele-ICU services to hospitals in the United States of America (USA) orders an urgent CT scan and MRI past midnight there. About 45 minutes later receives a call from the hospital's telephone operator connecting to the radiologist who would like to discuss an abnormal report. And guess what—the Tele radiologist is calling from Bengaluru, India through the USA to get connected to the Tele-intensivist in Chennai! Sounds like fantasy but is reality since Telehealth services are now being provided across geographical locations to different parts of the world.

Tele-ICU has been an accepted delivery model in the United States for over two decades.¹ The time-zone advantage and availability of qualified critical care specialists have helped to serve the unmet need for providing critical care coverage at night for the United States from countries such as Australia, New Zealand, and India.² In this issue of the *Indian Journal of Critical Care Medicine* (IJCCM),³ describe their experience with the utilization of teleradiology by intensive care units (ICU). They demonstrate a quick turnaround time for interpretation which in turn reduces the interval to intervention and improves quality and efficiency in managing critically ill patients. The authors in a different article have also successfully demonstrated the value of the Teleradiology system for the evaluation and management of early ischemic and hemorrhagic stroke.⁴ Their experience aligns with Tele-ICU experience where it has been observed that the request for assistance and interventions is more at night when there is a shortage of bedside physicians and care providers. However, it must be noted that the ability to scale these services is limited by the availability of American Board-Certified specialists living outside the USA who have appropriate licensure and privileges. Some enterprises in India provide preliminary reporting for subsequent validation while others provide Teleradiology support for 3D reconstructions thus speeding up the work for Radiology teams in the United States.⁵

Countries such as the United Kingdom, United States, and Singapore reportedly have a higher percentage of radiologists in the population.⁶ Interestingly, these are the main markets open for Teleradiology as the time advantage and cost differential make economic sense. Australia, New Zealand, and India have been successful in leveraging these advantages to become hubs for outsourcing. Countries such as Malaysia report a shortage, particularly in rural settings and are exploring Teleradiology solutions.⁷ Countries in the Middle East including Saudi Arabia have explored image informatics, vendor-neutral archive (VNA) isolates image presentation, and storage systems as a repository. With the growing demand for data sharing, data security and privacy challenges also need to be addressed.

Now picture this scenario in India: A small hospital in a semiurban area in India requiring urgent interpretation of imaging to decide

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on further care. Doctors managing the ICU, even if not qualified intensivists may be comfortable reading common images such as X-ray of chest. However, it would be essential to quickly review these and look for malposition of tubes and any complications of procedures such as pneumothorax. While the doctor in ICU is busy managing the critically ill patient, it would be of great help to have these images reviewed and reported quickly and more importantly, receive a call with any significant abnormality requiring immediate attention. The authors in this study demonstrate that they had identified a large number of such key findings. Point of care ultrasound (POCUS) training is now an integral part of training for Intensivists but it may still be essential to plan further studies based on the findings. Many district hospitals have CT scanners, MRIs, and the ability to perform musculoskeletal, vascular, and neuroimaging but qualified and competent radiologists may not be available around the clock. If distance is not the real barrier, it would be intuitive to assume that Teleradiology services should be widely provided to hospitals in India, particularly those without round-the-clock availability of radiologists. In particular, larger academic centers could be the hub to provide this service and enhance the care provided at district and rural hospitals.

The benefits and advantages of Telehealth solutions were readily apparent during the COVID-19 pandemic not only for emergency care but also to provide routine care for chronic diseases.⁸ The release of Telemedicine guidelines by the Ministry of Health in March 2020 provided a clear direction on the scope, mechanisms, and delivery of remote care. In an earlier editorial, we had proposed Tele-ICU as one of the models to improve critical care services in India.⁹ However, there have been several barriers to Telehealth in India including technology, cost, and user end expectations.¹⁰ Since digital imaging and picture archiving systems are increasingly available, this may be easier and more accepted with Teleradiology, but the time advantage would be lost and it would be challenging to have radiologists available all night working on a quick turnaround time. Having a network of radiologists who could promptly be available at any time, to provide remote interpretation of studies

from many countries and a private public partnership in India would be ideal, but licensure to interpret overseas studies may be a limiting factor. While radiology has been an attractive specialty for doctors seeking good work life balance, it is noted that digital advancements and a perpetually connected life have changed the career landscape.¹¹ Interestingly, a survey among Tele-radiologists in Turkey highlighted the lack of licensing and accreditation, insufficient reimbursement resulting in poor overall satisfaction.¹²

Large data and artificial intelligence (AI) go hand in hand. The utilization of AI relies on clinical radiology, data science, and information technology.¹³ User-friendly Teleradiology services have been deployed directly through a web browser.¹⁴ This may help to efficiently apply deep learning models and facilitate the application of AI in interpreting medical imaging. Workflow integration of AI has its challenges and may initially appear laborious but would become essential for successful radiology practice and Teleradiology in particular.¹⁵ In addition to the speed of interpretation, AI tools have also, interestingly, demonstrated higher accuracy than the average radiologist.¹⁶

Healthcare is now heading towards a dramatic digital transformation. Starting from using electronic medical records, placing orders, and viewing results digitally, we are now moving to the era of remote care and AI. While acceptance by clinicians currently may be variable, it would not be an option in the future!

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