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Making Radiotherapy Accessible by Leveraging AI

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Radiotherapy is an essential component in the management of cancer patients that is used either alone or in combination with surgery or chemotherapy. But the availability of quality and affordable radiotherapy services and skilled personnel is a critical requirement for the fight against cancer in countries such as India. In addition, would the implementation of artificial intelligence (AI) in radiotherapy bring about ease of operations or add up to the burden? Letâ??s dig deeper.



The global market for radiotherapy is expected to increase at a Compound Annual Growth Rate (CAGR) of 6.3 per cent from 2022 to 2031 to reach $11.9 billion. Out of which, the Indian radiotherapy market is projected to increase from $126 million in 2022 to $250 million in 2030, at a CAGR of 9 per cent.

Radiotherapy technology has advanced quickly in recent years, and high-income nations now have access to a wide variety of innovative radiotherapy treatment alternatives. Because radiation therapy can damage normal cells, medical imaging such as x-ray, computed tomography (CT) or magnetic resonance imaging (MRI), are being used to help precisely target the radiation dose to the cancer.

Compared to CT-guided radiotherapy, MRI-guided radiotherapy is more expensive. Because an MRI-linear accelerator requires more time per fraction than a standard linear accelerator, as well as more expensive equipment and skilled employees, it can only treat a few patients. The time per treatment fraction is anticipated to decrease as this technology continues to advance. Treatment on the MRI-linear accelerator will likely continue to be more expensive than on a standard linear accelerator, though. The World Health Organisation (WHO) recommends one medical linear accelerator per million population in developing countries.

At present, the key players in the Indian radiotherapy landscape such as Varian Medical Systems, Elekta, Siemens Healthineers, and Accuray, are mostly global but with extensive operations in India. These leading players have recently launched advanced technologies in the Indian market to take radiotherapy to the next level.

From linear accelerators (linacs), brachytherapy devices, and Gamma Knife radiosurgery, to oncology informatics, Swedish firm Elekta has been consistently pushing the boundaries of medical technology. The flagship in their lineup is Elekta Unity, an advanced MR-Linac system that seamlessly integrates a high-field MR magnet with a linear accelerator. This game-changing technology enables clinicians to visualise tumours in real-time during radiation therapy, ushering in a new era of precision treatment. Recently, the introduction of the first Elekta Unity MR-Linac in India took place at Yashoda Hospital, Hyderabad.

According to **Manikandan Bala, Managing Director, India and Senior Vice President, Intercontinental, Elekta**, “The changing shape, size and location of tumours and their surrounding structures requires adaptive treatment planning. Through personalised adjustments to treatment plans, advanced technology enhances treatment efficacy while minimising dose spillage.”

The company has also recently collaborated with American firm GE HealthCare to expand access to precision radiation therapy solutions in India.

Sharing a similar ambition to improve patient accessibility to advanced precision cancer therapy, Mumbai-based startup Karkinos Healthcare has partnered with Elekta to acquire more than ten linear accelerator (linac) systems to be strategically deployed across the country.

Addressing skill gap

Although newer technologies and precision care for cancer treatment are being introduced in India, a critical aspect of skilled labour still remains a challenge. The broad use of cutting-edge therapies is hampered by a lack of qualified radiation

oncologists and healthcare specialists educated in cutting-edge radiotherapy techniques. Improving patient outcomes requires addressing the skill gap and funding training programmes for healthcare personnel.

A recent initiative in this regard was announced by another Swedish medtech company C-RAD, the global leader in surface-guided radiation therapy (SGRT) solutions, with the establishment of its first-ever Experience Centre in India at Faridabad. Set up as a joint project with its India partner Marrsis Disha, the facility will train and upskill clinical professionals in precision radiotherapy.

“SGRT is a tattoo-free alternative for patients who require radiation therapy. The technology uses advanced 3D camera technology to track and monitor patient movements during set-up and treatment. We want to use this Experience Centre as a platform to promote cutting-edge technologies like SGRT. There is a huge unmet demand for radiation therapy equipment in India and not every patient is able to get treatment in time", said **Rohan Mehtani, Chief Executive Officer, Marrsis Disha**.

Elekta has also initiated a similar approach by launching a collaborative educational facility in Mumbai, with Bengaluru-based HealthCare Global Enterprises (HCG). The training centre will focus on providing radiation oncologists, radiotherapy technologists and medical physicists with the necessary skills and training on the latest treatment techniques and technological advancements in radiation therapy (RT).

Dr B S Ajaikumar, Executive Chairman, HealthCare Global Enterprises says, “Through these training programmes we hope to move the needle from basic radiotherapy techniques to high precision radiotherapy treatment strategies such as image-guided radiation therapy (IGRT), adaptive RT, stereotactic ablative body radiotherapy (SABR) and stereotactic body radiation therapy (SBRT). Equipping medical professionals through effective learning solutions can significantly improve efficiency and patient outcomes.”

Besides generating a skilled workforce, another issue in India is the lack of knowledge and instruction on radiotherapy as a possible treatment for cancer and other illnesses. Radiotherapy-related myths and misconceptions can be dispelled by promoting public awareness campaigns and carrying out educational programmes. The bulk of modern treatment facilities are concentrated in urban areas, making it difficult to ensure an equitable distribution of radiation facilities and services across the nation's many regions. To ensure that everyone has fair access to healthcare, radiation services must be made more widely available in rural and distant areas.

How would AI help?

Adoption of Artificial Intelligence (AI) is a leading trend in the global radiotherapy devices market and is gaining significant popularity. The incorporation of AI innovation in disease care is expected to improve the exactness and speed of analysis, help clinical dynamics, and lead to better results. Ethos therapy is the first AI-powered personalised cancer care delivery system in radiation oncology, developed by US-based Varian Medical Systems, now a part of Siemens Healthineers.

Back in 2022, HCG Cancer Hospital, Bengaluru, announced the launch of India’s first Varian Ethos therapy. The Ethos Radiotherapy applies Artificial Intelligence and Machine Learning to generate adapted plans within minutes to guide doctors while the patient is still undergoing treatment. Radixact X9 Tomotherapy by US-based firm Accuray is another advanced AI-based cancer treatment technology available in India. And these adoptions are gradually increasing.

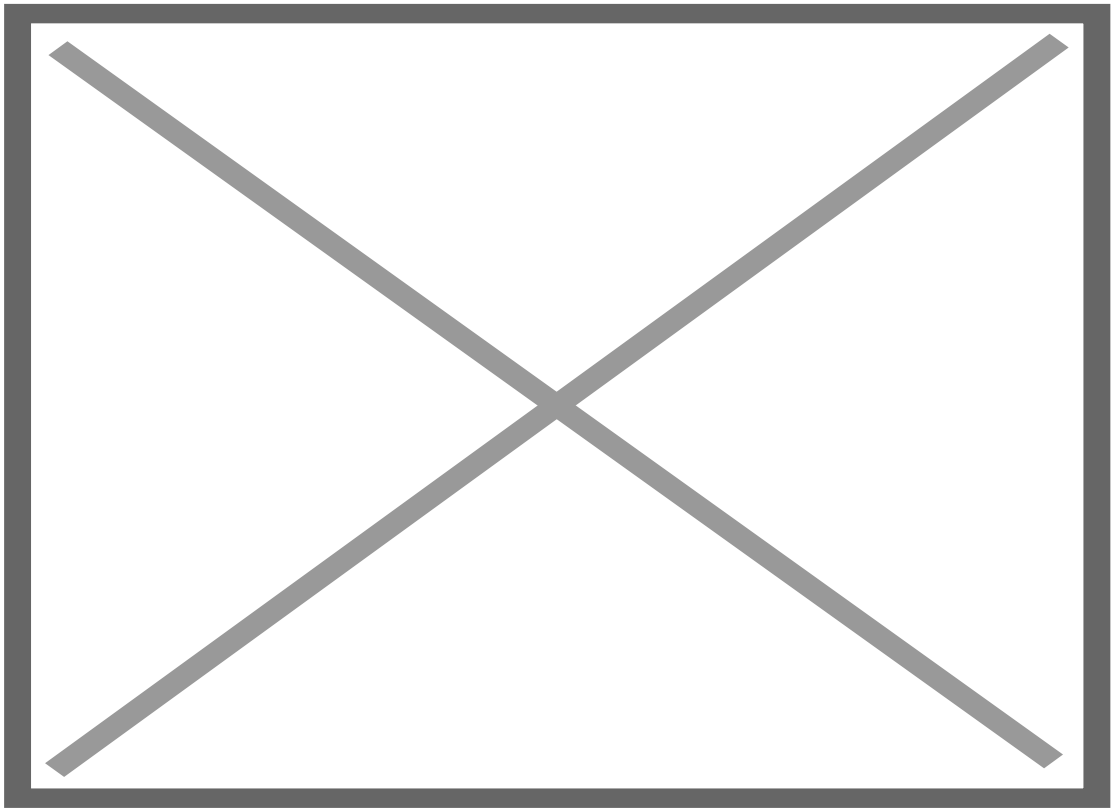
But then arises the question that people from low-income families may find it difficult to get treatment because of the expense of sophisticated radiation equipment and procedures. For many people seeking radiation treatment, affordability is still a problem, which causes inequalities in access to high-quality care.

On the other hand, the global shortage of radiologists is a pressing concern impacting patient care worldwide. And AI is apparently revolutionising radiology by expediting diagnoses, enhancing efficiency, and serving as valuable decision support.

While spending on AI in India is anticipated to reach $11.78 billion in 2025 and add $1 trillion to the country's economy by 2035, AI might be able to offer more than just financial advantages. Access to care can be increased and made more egalitarian with AI-enabled medical technology but in an affordable manner.

“PPPs hold immense potential to accelerate AI implementation in radiotherapy across India”

Dileep Mangsuli, Executive Director and Head of Development Center, Siemens Healthineers



In 2022, there were an estimated 1,461,427 new cancer cases in India. Artificial intelligence (AI)-driven innovations can make radiotherapy more accessible and efficient, attracting both healthcare providers and patients. It can enhance treatment accuracy, reduce side effects, and optimise resource allocation by harnessing AI for treatment planning, precise dose calculation, and real-time tumour tracking. This technology can also address the shortage of skilled radiation oncologists by assisting in treatment decisions.

Challenges faced by AI applications in the radiotherapy market in India:

- Infrastructure disparities: Limited access to advanced radiotherapy equipment and expertise, especially in rural areas, hinders the widespread adoption of AI in healthcare.
- Data privacy and security: Protecting sensitive patient information is crucial, necessitating robust measures against unauthorised access or data breaches.
- Education and training: Specialised training for healthcare professionals in AI utilisation is essential for effective implementation.
- Moreover, accurate contouring of organs-at-risk (OAR) is a critical but challenging step in radiation therapy planning. AI and technological advancements offer automated solutions, reducing workload and standardising CT simulation steps. These automated OAR contouring solutions provide clinically usable results, with over 95 per cent of contours being accurate. They enhance efficiency, accessibility, and integration in clinical environments, expediting the treatment process.

Private-public partnerships (PPPs) hold immense potential to accelerate the implementation of AI in radiotherapy across India. Over 95 per cent of cancer centres are concentrated in urban areas, leaving rural regions underserved. While 70 per cent of the population still lives in rural regions, the majority of cancer treatment facilities are located in urban centres. This scenario indicates a critical need for such collaborations. Moreover, AI-driven automation of organs-at-risk contouring, a pivotal aspect of treatment planning, can significantly benefit from technological advancements. AI's ability to process complex

data efficiently addresses the challenge of accurate OAR contouring. This, in turn, streamlines the treatment process, making it more accessible and effective. By combining resources and expertise, private-public partnerships can play a pivotal role in revolutionising radiotherapy in India, ultimately leading to improved patient care and outcomes.