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Local Manufacturing of Radiotherapy and Imaging Equipment: Opportunities and Challenges

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It is often said that the 21st century belongs to Asia and in that specifically to South Asia in terms of economic growth and improvement in the standards of living. The reasons are not far to seek but the most obvious ones are the demographic advantage and the talented human resource that is available in this region. However, the success cannot be taken for granted despite the advantages. The onus is on the people living in this part of the world to make use of this window of opportunities. Medical and healthcare is one of the crucial sectors that is expected to play a significant role in not only directly contributing towards driving the economic growth but also act as a human resource enabler.

I have been part of the medical and healthcare sector for over three decades in India as a medical physicist engaged in clinical medical physics practice and in teaching & training of medical and para-medical radiation professionals. Planning and commissioning of radiation installations at government funded cancer centres also has been part of my professional work. The latter often involves choosing appropriate technology platforms for a centre within the existing financial resources. And almost always the suppliers of the technologies are based outside this part of the world. The imported medical technologies have been satisfactorily serving the interests of the patients over the years despite their high costs. Ruggedness and stability of performance of these radiotherapy and imaging systems have been responsible for providing reasonably adequate quality of care to the needy despite excessive patient load on them, especially in public hospitals. Of course, not without the well-trained and dedicated manpower. However, it is a fact that this level of care does not reach a large segment of population which is economically weaker and lives far away from the cities. There are over 800 medical linear accelerators including CyberKnife and TomoTherapy systems, two medical proton accelerators, about 160 telecobalt units including Gamma Knife and about 375 HDR brachytherapy units apart from some manual brachytherapy facilities presently available in India. In terms of diagnostic facilities, there are about 11,000 CT scanners, over one lakh x-ray machines including C-arms, O-arms and interventional radiology units, about 500 nuclear medicine centres with varying levels of equipment and devices among gamma cameras, SEPCT and PET facilities, and 24 medical cyclotrons facilities (1,2). Almost all of these facilities are concentrated in the cities. It is estimated that more than half of the 1.4 billion population of India still lives in villages where connectivity is not as good as in the cities. I must add that the information about radiation

facilities in India is expected to represent the scenario in the entire region with minor variations in terms of availability of the facilities per million population.

There is unanimity among healthcare policy makers that with increasing cancer burden and awareness among the population the demand for radiation therapy and diagnostic equipment is rapidly increasing. Meeting the demand from imported equipment may prove to be difficult and costly. That is where the opportunities and challenges for indigenous manufacturing exist. Opportunities because there is a market and an ever-improving manufacturing ecosystem, and challenges because quality of the product needs to be of international standards. Radiation safety is added concern with such equipment. Along with the treatment delivery and imaging equipment, the equally important segment is radiation measuring and monitoring devices, and treatment planning systems (TPSs). India has been designing and manufacturing radiation monitoring devices based on Geiger Muller counters for a couple of decades. Ion-chamber based dosimeters (thimble and well-type) and TPSs have also been developed and manufactured. X-ray imaging systems too are being manufactured locally.

For radiation generating or radioactive source-based equipment used for imaging and treatment, there are well laid down safety requirements and regulations mandating type approval or certification of the equipment and technology. Atomic Energy Regulatory Board (AERB) in India is engaged in such certification from radiological safety point of view. Other than radiation safety aspects such equipment need to pass regulations for electrical & mechanical safety and functional performance as well. However, as on today, there are no such requirements or provisions for radiation monitors, dosimeters, TPSs, etc., in India. This situation needs to change as radiation monitoring and measuring devices, planning systems and similar accessories play an equally important role in the safe, accurate and optimised patient care. Creating the infrastructure for certification processes need synergy between various stakeholders such as certification/regulatory bodies, laboratories/testing facilities to realize standards, and users.

Medical Physicists in this region have a great opportunity to expand their horizons beyond clinical practice and get involved with research and development (R&D) and testing and validation of indigenous technologies. They can become involved in supporting the concerned certifying agencies in formulating the standards and certification processes. The support can be at individual levels or as part of professional medical physicist bodies. AMPI has, of late, been involved with the concerned government agencies for the purpose. In near future, we would like to be more intensely involved in the development of local technologies and establishment of the standards and associated processes.

References

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