

Description of Healthcare Technology by Mahesh Raj Mohan

In India, 75% to 80% of all cancers are detected in the late stages, when a cure is not possible.¹

- There are nearly 1.5 million to 2 million cancer cases at any given point of time in India
- In India more than 700,000 new cases of cancer and 300,000 deaths occur annually
 - It is estimated cancer occurrence will increase to 1.4 million new cases by 2026
- Nearly 1.5 million patients requiring facilities for diagnosis, treatment, and follow up at a given time in India
- Fifty percent of the cancer deaths in India are mainly from:
 - Oral and lung cancers in males
 - Cervix and breast cancer in females
- There are only 11 regional cancer centers in India helping in detection and cure of cancer in their respective regions²

These statistics are alarming, considering the advancements in medicine over the past 40 years, but there is hope on the horizon. Not only is a stable middle class emerging in India – a class that can help make advanced health care available to more people – but nuclear medicine, the branch of the medical sciences that uses nuclear properties for diagnosis and therapy, is experiencing rapid growth in the world. More than 100 million nuclear medicine tests are performed each year in the United States alone. A comparable number of such procedures are performed in the rest of the world.

A technology that has been critical to the advancement of nuclear medicine has been the cyclotron – a particle accelerator that can create radioisotopes. Using an electrical field, a cyclotron accelerates particles around a semi-circular path until they gain enough “speed” to be directed into the nucleus of an atom, which creates the radioisotope. The major advantage of radioisotopes is their accuracy in non-invasive diagnostics. As technology in medical imaging continues to advance through the development of high-end scanners, the technology of radiopharmaceuticals has expanded far beyond cancer diagnostics, leveraging a multitude of radioisotopes for accurate diagnostics of multiple diseases, from cancer to others such as cardiovascular disease.

The making of radiopharmaceuticals requires the production of radioisotopes generally produced by a cyclotron. Hundreds of these machines have been installed in the western world and Asia. For instance, China has more than 80 cyclotrons.

Yet, there are only nine cyclotrons in India.

¹ National Cancer control program report, via Study on Radio Pharmaceuticals in India, May 2007, Tecnova India Ltd.

² Ibid.

Furthermore, these cyclotrons can *only* produce F18, the isotope used in the preparation of Fluoro-deoxy glucose (FDG)-18, the most commonly used radiopharmaceutical in cancer diagnostics. However, the production of high-end isotopes such as Thallium-201, Indium-101, Gallium-67, and Iodine-123 require a more powerful machine – specifically a medical cyclotron of 30 Mega Volts (MeV) – and such a machine is currently not available in India. (It should be noted that one project under BARC Kolkata was begun in 2000, but has yet to begin.) The radioisotopes unavailable in India are currently imported from Israel, Germany, the United Kingdom, and France, with the expected cost and transportation constraints that directly have an impact on patient care.

To solve this emergent crisis, Company X will bring comprehensive and integrated health care services to India – including a 30 MeV cyclotron with the ability to produce not only FDG, but also numerous high-end radioisotopes that are not easily available in India. Company X has created a plan in four phases that will implement a radical change in India's health care:

Phase One: Cyclotron Facility

This facility will cater to the demand for advanced services in diagnostic, investigative, and therapeutic fields in various disciplines and specialties. The Company will use a state-of-the-art cyclotron (already in the advanced design stage) to create radioisotopes currently unavailable (or ineffectively manufactured) in India. Radioisotopes³ are used to create radiopharmaceuticals⁴ which aid in the diagnosis and treatment in several diseases, particularly cancer.

Partnering with the world leader in building turnkey cyclotrons, and complying with stringent environmental and safety standards (including Six Sigma) to use Good Manufacturing Practices, the Company's management will work to ensure that this cyclotron will become India's premier defense against cancer.

Phase Two: Cancer Diagnosis and Treatment Center

This advanced medical diagnostic will use the most advanced diagnostic tools, including PET/CT, to full cancer patient treatment – from chemotherapy to tomo therapy to (potentially) proton therapy.

Phase Three: Joint Replacement & Cardiac Surgery Center

This facility will be devoted to full orthopedic joint replacement surgery including the manufacturing and distribution of implants across India and for export, as well as cardiac surgery

³ Radioisotopes are atoms containing an unstable combination of neutrons and protons. The combination occur both naturally and through artificially altering the atoms, often by a cyclotron. Radioisotopes are so named because they shed radioactive energy in order for the atom to regain stability. The radioactive decay process of each type of radioisotope is measured with a time period called a half-life.

⁴ A radiopharmaceutical is a molecule consisting of a radioisotope tracer attached to a pharmaceutical. The radioisotope undergoes decay and produce specific amounts of radiation that can be used to diagnose or treat human diseases and injuries. Information obtained at: http://ftp.ansto.gov.au/ari/brochures_misc/Isotopes.pdf

Phase Four: College of Pharmacy and Nursing

The nursing college and pharmacy college are adjunct to the health care services that are needed in India, because there is a shortage of these things, and are part of health care complex that they are trying to develop. Internal sales of VG Italian and radioisotopes into the Company's diagnostic center will guarantee a revenue stream, because the patient's market is there, and a portion of the market, which is between 10% and 25% of expected market, will be internal, because of the creation of the hospital and diagnostic center.