Technical and Clinical Development of Indigenous Telecobalt - Bhabhatron

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Cancer is an increasingly important public health problem even in the developing countries. It is estimated that every year 0.8 to 1.0 million new cancer cases are diagnosed in India. With growing population, changing lifestyle and rapid urbanization in India, the incidence of cancer is expected to increase substantially over the next few decades. Radiotherapy along with surgery and chemotherapy is the mainstay of cancer treatment with almost 60% of all cancer patients requiring radiotherapy during the course of their disease. While in the developed world, 2-3 radiotherapy machines are available per million population, for the developing countries WHO has recommended a scaled down requirement of only 1 radiotherapy machine per million. Even against this scaled down requirement of 1100 teletherapy units for its 1.1 billion population India has a shortfall of almost 700 teletherapy units. The cost of the imported equipment and the quality of infrastructure and availability of regular power supply in remote areas are some of the deterrent towards fulfilling the huge shortfall of 700 teletherapy units required for effective cancer care services in India.

In order to tackle the impending crisis, DAE set up a special committee to develop indigenous telecobalt in 2003. The Division of Remote Handling and Robotics of BARC designed the 80cm SSD isocentrically mounted fully electronic operations and computerized control console telecobalt unit. For commercial manufacturing, the technology was transferred to the industry partner - Panacea Medical Technology Ltd., Bangalore. The prototype machine (Bhabhatron-I) was installed in 2004 at the Advanced Centre for Treatment Research & Education in Cancer (ACTREC). This indigenous unit was rigorously evaluated for electrical, mechanical, radiation safety, dosimetric and clinical utility features by the team of scientists, oncologists and physicists from BARC and Tata Memorial Centre. Bhabhatron–I fulfilled all radiation safety and dosimetric requirements and was given type approval and commissioning approval by the AERB. Between June 2005 to August 2007, 560 patients with diverse cancers were treated on this unit. Based on the technical and clinical evaluation and reports, improved features of clinical utility, versatility and advanced technical parameters were incorporated into the commercial unit, Bhabhatron - II. The prototype unit was replaced by the commercial model "Bhabhatron-II" at ACTREC in October

2007. Over the last 3 y at ACTREC we have treated 1700 patients with various cancer who were suitable for telecobalt therapy on Bhabhatron-II. As expected, the Bhabhatron–II has proved to be more versatile with more advanced features and has robust performance with minimum downtime.

With the cost effectiveness, advanced technical features and robust performance as found in rigorous testing at ACTREC, within few years Bhabhatron-II has penetrated the Indian market. Currently there are 24 machines installed or under the process of installation in different parts of the country. These include rural and semi-urban areas where Bhabhatron has the unique advantage of being operational even on generator as and when required due to erratic power supply. India has also donated one Bhabhatron to Vietnam under the IAEA PACT programme and has pledged to donate more Bhabhatrons to other developing countries under the PACT programme. Another Bhabhatron-II is being installed in Nigeria.

The DAE, manufacturer and TMC has now embarked on a programme of developing more advanced technological features like MLC in the Bhabhatron-II. MLC will further increase its clinical utility in terms of shielding normal tissue and Intensity Modulated Radiotherapy (IMRT). The newly developed MLC will be installed in the Bhabhatron-II in ACTREC in the near future for clinical validation and IMRT. This programme has demonstrated that with coordinated and goal oriented academia – industry partnership it is possible to develop high quality and cost effective indigenous technology in developing countries such as India which already have a significant technological base. It is hoped that the Bhabhatron experience would serve as a model for rapid indigenous development of high quality and cost effective equipment in major gap areas in the developing world.