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Technical Management of Hadrontherapy Facilities: What can be Learned from the Last 15 Years

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Introduction

The rationale on potential advantages for using protons or carbons ions in radiation oncology was formulated in1946. However, the size and cost of accelerators required has postponed the launching of this field to the end of the 20th century. Since the last 15 years, many facilities have been projected, built and are now in operations [1]. After a first set of large facilities, comparable to research facilities, the general trend is going to compact and more effective-cost facilities. The therapy facilities have to conciliate several issues: pressure to treat the patients during the slots scheduled, safety of the treatment process, and requirements to upgrade the beam delivery systems and the associated software.

Materials & Methods

The Centre de Protonthérapie d'Orsay (CPO), was primarily based on an old Nuclear Physics facility with a synchrocyclotron. First treatments start in 1991. During the period 2006-2010 a project of modernization and extension of the facility was achieved by an industrial consortium IBA-BESIX. Since 2010, the facility includes an industrial cyclotron (230 MeV) and a modern gantry treatment room. This project was achieved in close cooperation with many other Particle Therapy centres (as PSI in Villigen-CH or MGH in Boston-USA).

The project and the operations has been built and lead in relation with several national authorities: ARS (Agence de Santé Régionale) for medical issues, ASN (Autorité de Sûreté Nucléaire) for radiation protection and Quality Assurance of the treatment process.

Many methods and task forces have been deployed to this manage this multi-constraints field: method LEAN to improve the workflow of patient and the associated process, upgraded monitoring to promote adaptive maintenance, SCRUM for the development of software, ….

Results

In term of medical results, Protontherapy has now clearly shown its advantages for some eye treatments and for some head&neck tumours. The pertinence of this modality for pediatrics [2] is recognized by the community and must be now confirmed by the results of trials. Many others protocols (breast, lung, …) are presently opened and in evaluation.

In term of technical management, the majority of the projects has faced tremendous difficulties to reach the milestones (delays, budgets) previously scheduled. Projects previously based on P.P.P. (Public-Private Partnership) have been cancelled or reshaped.

A significant number of facilities (50) are now in operations worldwide and a new generation of compact solutions is now coming.

Discussions

In term of technical management, the case of Particle Therapy facilities open several questions: level of innovation admissible for a high-availability facility, long-term cost and management of service contracts, interface with medical users, management of staff with mixed activities operations/maintenance/R&D, interface with industrials, …

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