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Methodology for acquisition of appropriate technology for radiation therapy in developing countries

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Introduction

It has been estimated that about 60 % of all cancer patients in the world can benefit from radiotherapy treatment. Unfortunately, not all patients can get access to this effective treatment modality because of lack of radiotherapy facilities and associated resources. Driven by improving economy and with supports provided by international and professional organizations in recent years, radiotherapy services are becoming more accessible to patients in the developing countries. At the same time, major advances in technologies and treatment techniques have taken place in the field of radiation oncology. A full range of innovative and effective new treatment modalities such as IMRT, IGRT, SRS, helical Tomotherapy, particle therapy, etc. have been developed and becoming standard treatments in the clinics in some countries. Such sophisticated treatment modalities are also gradually being introduced in developing countries. Implementing advanced radiotherapy treatment service in the public hospital system can be costly and hard to sustain. Furthermore, such investments may not always achieve the expected clinical outcomes for various reasons. The common reasons may include inadequate QA due to lack of staff, inadequate staff training, service bottle neck due to inconsistency in standard of service amongst the supporting clinical services, inadequate supporting infrastructure needed for proper and efficient implementation and operation of advanced treatment service. Implementation of a cost effective and sustainable radiation therapy service, particularly in public healthcare system requires careful planning & implementation of appropriate technologies. The latter should be determined and selected based on a set of country specific criteria and conditions such that service capacity & quality can be maximized to meet service needs with limited resources. A methodology is described which may be used to develop a set criteria for technology acquisition.

Methodology

An important consideration in technology acquisition in medicine is maximizing radiation therapy service to cover clinical needs with the allocated resources. The aim is to balance between service demands, service quality and resources limitations. The question is how to determine the right balance and what standard and yardstick should be used in guiding decision making, particularly on selection of high cost radiotherapy technologies. Optimizing the effective use of budget on high cost RT technologies is a complex issue and there is no simple solution that works for every country or for different regions of a country. A possible approach to resolve the problem is to establish a radiotherapy technology advisory panel within the national framework for planning and implementation of radiotherapy service to research and develop a set of technology acquisition criteria and strategies. Figure 1 shows an example of a national framework for public radiotherapy service. A mechanism should be established within the national framework for radiotherapy service to research and develop a set of criteria, conditions and strategies that can be applied for guiding the planning and selection of the RT technologies that are most appropriate and cost effective in meeting national service demands within constraints.

Figure 1: Typical framework for management of public radiotherapy services.

Building an appropriate set of the technology selection criteria should take into account the key parameters and baseline conditions of the country and different regions of the county, including the following:

- 1 Compatibility with national policy on quality of healthcare service, including scope and quality of service of other clinical specialties.
- 2 Consistent with clinical needs, including case load, and type and staging of diseases.

- 3 Compatibility and consistency in quality and scope of service provision amongst all supporting clinical services, including diagnostic imaging and laboratory test services.
- 4 Compatible in quality and connectivity amongst all radiotherapy technologies within service clusters, e.g. simulators, TPS, QA, dosimetry, treatment record and verification system.
- 5 Compatibility with local infrastructure and environmental conditions, e.g. reliability of electricity supply, adequacy of building and building services on such issues as temperature and humidity control, and availability and reliability of IT infrastructure.
- 6 Manpower status and conditions, including requirements on headcount, professional knowledge and competence, and resources on staff training for implementation of each type of technology.
- 7 Compatible with level of expertise in local maintenance service standard and available manpower. Availability and reliability of local supply of replacement parts to secure service reliability with minimum equipment down time.
- 8 Sustainability of the treatment service within resources constraints.
- 9 Compatibility with existing quality and risk management system.

Development of a set of meaningful country specific technology selection criteria requires a good understanding on the strength and limitations in existing practice and service and a correct interpretation on the implications of all the research findings. To achieve this objective, a panel of experts who are familiar with national radiation therapy services should be established to performed this important task and to update the criteria if found necessary. Members of the expert panel should include key healthcare professionals practicing in radiation therapy, including radiation oncologist, medical physicists, therapists, and nurses as well as some supporting personnel including IT expert and engineers.

Conclusions

In resources limited countries, selection of radiotherapy technologies in public healthcare system could be optimized for cost effectiveness in meeting service needs within budgetary constraints. The optimization process is aimed at acquiring the technologies that best meeting a set of criteria which is developed based on the principle of balance and consistence in radiotherapy practice and facility. The objective is to implement the 'best' or most appropriate technologies that meet clinical needs within given resources. A methodology is proposed to develop a country specific optimization criteria.

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