

**NATIONAL INSTITUTE FOR HEALTH AND CLINICAL EXCELLENCE**

**Health Technology Appraisal**

**Intensity-Modulated Radiation Therapy for treatment of specific cancers**

**Draft scope (Pre-referral)**

**Draft remit/appraisal objective**

To appraise the clinical and cost effectiveness of Intensity-Modulated Radiation Therapy for the treatment of specific cancers.

**Background**

Intensity modulated radiation therapy (IMRT) can be used in a variety of malignant conditions for which radiotherapy is currently the recommended treatment. These include head and neck cancers (including intracranial tumours), prostate cancer, breast cancer, lung cancer, liver cancer and cancers of the spine. The modulation of the radiation beam in IMRT allows precise delivery to cancerous tissue while sparing surrounding normal tissue from exposure. It is therefore suitable for the delivery of radiation to locations where diseased tissue is located close to vital structures. It can also be used in total body irradiation that precedes bone marrow transplants where the technique is used to selectively deliver radiation to the bone marrow.

Currently radiotherapy is delivered using 3-dimensional conformal radiotherapy (3D CRT). It is delivered by non-modulated beams, which can be shaped geometrically to avoid irradiating normal surrounding tissue. Not all tumours would be suitable for or necessitate IMRT and many respond well to conventional radiotherapy.

Between 2001 and 2003 there was an average of 275,000 newly diagnosed cases of cancer in the U.K. An average of 154,000 people die each year from cancer. Radiation is an important treatment in the management of many, but not all, cancers.

**The technology**

Intensity modulated radiation therapy (IMRT) is the term applied to any radiotherapy where the beam of radiation is not uniform across the field to be irradiated, but consists of beamlets of varying intensity. IMRT is delivered by attaching a multileaf collimator (MLC) to a linear accelerator. There are multiple manufacturers of linear accelerators as well as the MLC (e.g. Elekta Synergy system, Varian On-Board imager system). The system is supplied with software that allows the physician to determine the dose and distribution of radiation.

IMRT makes use of ‘inverse planning’ where the clinician determines the dose and distribution of radiation and computer software works backwards from this to determine the direction and intensity of the beams required to achieve this. Systems that combine the ability to simultaneously image can improve the accuracy of targeting of radiation by allowing for the movement of body structures. Imaging also allows verification of the actual dose delivered and allows for compensation for any deviation from planned dose in subsequent sessions.

The Hi-ART system is used to deliver one form of IMRT called helical tomotherapy. Helical tomotherapy combines a helical computed tomography (CT) scanner for online imaging with a linear accelerator that delivers intensity modulated radiation therapy (IMRT). There is one Hi-Art System (delivering helical tomotherapy) in use in the UK at present. Currently there are no helical tomotherapy systems available in the NHS. The availability of other IMRT systems is not known.

<b>Intervention</b>	Intensity-Modulated Radiation Therapy
<b>Population(s)</b>	People with specific cancers (to be decided after consultation). Initial suggestions include cancers of the prostate, head and neck, breast and lung.
<b>Standard comparators</b>	3-dimensional conformal radiotherapy (conventional radiotherapy)
<b>Outcomes</b>	The outcome measures to be considered include: <ul style="list-style-type: none"> <li>• adverse effects of treatment</li> <li>• disease-free survival</li> <li>• overall survival</li> <li>• health-related quality of life.</li> </ul>
<b>Economic analysis</b>	The reference case stipulates that the cost effectiveness of treatments should be expressed in terms of incremental cost per quality-adjusted life year.  The time horizon for the economic evaluation should be based on life expectancy.  Costs will be considered from an NHS and Personal Social Services perspective.

<p><b>Other considerations</b></p>	<p>If evidence permits, the appraisal will explore the relative clinical and cost effectiveness of different technologies used for IMRT.</p> <p>If evidence allows, the appraisal will seek to identify subgroups of individuals for whom the technology is particularly clinically and cost- effective.</p>
<p><b>Related NICE recommendations</b></p>	<p>Related Technology Appraisals:</p> <p>Related Guidelines:</p> <p>To be detailed after consultation.</p>

**Questions for consultation**

In which cancers would the appraisal of IMRT be of highest priority? Initial suggestions include prostate cancer and head and neck cancer.

Which components or combinations of components used in IMRT should be appraised? What IMRT systems, if any, are in use in the NHS?