

**Washington State Health Care Authority, HTA Program
FINAL Key Questions and Background
Intensity Modulated Radiation Therapy**

Introduction

Approximately half of all cancer patients receive some form of radiation therapy. Radiation utilizes high energy particles or waves to destroy or damage cancer cells. Patients may receive radiation therapy alone or in combination with other treatments. Radiation can cause acute and chronic side effects that depend on the area of the body radiated and dose of radiation given. There are three main modalities for delivering radiation: 1) externally by a machine (external beam radiation therapy, EBRT), 2) internally via radioactive material placed in the body (brachytherapy), or 3) systemically through the use of radiopharmaceuticals that are swallowed or injected into the blood stream.

Current conventional or standard EBRT uses three-dimensional (3D) imaging technology from computed tomography (CT), positron-emission tomography (PET), and/or magnetic resonance imaging (MRI) for planning purposes and delivers photon beams of uniform intensity to the target tumor using a medical linear accelerator (linac). Conformal refers to the ability to precisely conform the delivery of the EBRT to the shape and size of the tumor, so current conventional EBRT is often referred to as 3D conformal radiation therapy (3DCRT). Over the past ten years, significant advances have been made in the techniques available to deliver EBRT including stereotactic radiation surgery (SRS) limited to the central nervous system and a single dose, stereotactic body radiation therapy (SBRT), intensity modulated radiation therapy (IMRT), and proton or particle beam radiation therapy. Intensity modulated radiation therapy uses multiple beams and angles (multi-leaf collimator) that can deliver varying intensities of radiation to the tumor to maximize the dose to the tumor and decreased or no dose to the surrounding tissue. For IMRT, the technical goal is to improve the targeting of the radiation to the tumor to minimize damage of normal tissue. The intended patient-important outcome from this technique is to reduce acute and chronic radiation side-effects since surrounding tissues receive less radiation. The focus of this report will be on IMRT. However, it should be noted that SBRT and IMRT are not mutually exclusive.

Policy Context

There is increasing use of IMRT for a variety of cancers. The impact of this technology on patient-important outcomes compared to current conventional (conformal or standard) EBRT is unclear. State agencies concerns about IMRT include: safety - High, efficacy - Medium, cost - High.

Population: Adults and children with malignancies where treatment by radiation therapy is appropriate

Intervention: Intensity modulated radiation therapy (IMRT)

Comparator: Conventional (conformal) external beam therapy (EBRT)

Outcomes: Survival rate, duration of symptom-free remission, quality of life, harms including radiation exposure and complications, cost, cost-effectiveness

Key Questions

- KQ1: What is the evidence of effectiveness for intensity modulated radiation therapy (IMRT) compared to conventional external beam radiation therapy (EBRT) for patients with cancer by site and type of cancer?
- KQ2: What are the potential harms of IMRT compared to conventional external beam radiation therapy (EBRT)? What is the incidence of these harms? Include consideration of progression of treatment in unnecessary or inappropriate ways.
- KQ3: What is the evidence that IMRT has differential efficacy or safety issues in subpopulations? Including consideration of:
- Gender
 - Age
 - Site and type of cancer
 - Stage and grade of cancer
 - Setting, provider characteristics, equipment, quality assurance standards and procedures
- KQ4: What is the evidence of cost and cost-effectiveness of IMRT compared to EBRT?

Public comment and Response

See *Key Question Public Comment and Response* document published separately.

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