Washington State Health Care Authority

Final Key Questions and Background

Use of Stereotactic Body Radiation Therapy

Background

Technology of Interest

Radiation therapy is a cancer treatment that uses high-energy X-ray or other particles to destroy cancer cells[1]. A radiation therapy regimen, or schedule, usually consists of a specific number of treatments given over a set period, and can be used to treat different types of cancer.[1] Radiation therapy can also be used in combination with other cancer treatments, such as chemotherapy or surgery.[1]

The most common type of radiation therapy is external-beam radiation therapy (EBRT), which delivers radiation from outside the body.[1] The different types of external-beam radiation therapy are[1]:

- 3-dimensional conformal radiation therapy (3D-CRT)
- Intensity modulated radiation therapy (IMRT)
- Proton beam therapy
- Image-guided radiation therapy (IGRT
- Stereotactic body radiation therapy (SBRT)

SBRT is defined as extracranial stereotactic ablative treatment delivery (which can include the spine) typically delivered in 1 to 5 fractions and is also referred to as stereotactic ablative radiotherapy (SABR).[2] SBRT can be used for a variety of clinical indications as primary treatment for selected early-stage cancers, as treatment for discrete tumors in patients with oligometastatic disease, for selected benign neoplasms in or near the central nervous system (CNS), or in recurrent cancer within previously irradiated regions.[2]

Other radiation-based therapies include implanted internal radiation therapy (or brachytherapy), intraoperative radiation therapy (IORT), systemic radiation therapy, radioimmunotherapy, and may also involve the use of radiosensitizers or radioprotectors.[1]

Clinical Need and Target Populations

In 2019, a total of 1,752,735 new invasive cancer cases were reported in the US: 863,830 among females and 888,905 among males.[3] For all cancers combined, the incidence rate was 439 per 100,000 standard population overall.[3] While cancer affects people of all ages, races, ethnicities, and sexes, it does not affect all groups equally.[3] Differences in genetics, healthy choices, environmental exposures, and other factors can lead to differences in risk among groups of people.[3] For most cancers, increasing age is the most important risk factor, with around 58% of cancers occurring in adults aged 65 years or older.[3]

Policy Context

The use of SBRT for various cancers is increasing in the US[4-6]; however, its effectiveness and safety in routine clinical practice for most cancers are unclear. This topic was originally selected

for the 2012 review because of medium-level concerns about the safety and efficacy of CMRA and high-level concern about costs. This topic was selected for re-review based on new evidence that could prompt potential coverage policy changes.

In 2012 the Washington State HTCC commissioned an evidence review on the effectiveness of stereotactic radiosurgery (SRS) and SBRT for treating various cancers.[7] On March 22, 2013, using that evidence review to guide decision making, the committee adopted the following coverage determination[8]:

- SRS for central nervous system (CNS) primary and metastatic tumors is a covered benefit for adults and children when the following criteria are met:
  - Patient functional status score (i.e., Karnofsky score) is greater than or equal to 50; *and*
  - Evaluation includes multidisciplinary team analysis (e.g., tumor board), including surgical input.
- SBRT is covered for adults and children for the following conditions when the following criteria are met:
  - For cancers of spine/paraspinal structures; *or*
  - For inoperable non–small cell lung cancer (NSCLC), stage 1; *and*
  - Evaluation includes multidisciplinary team analysis, including surgical input.
- All other indications are noncovered.

The objective of the health technology assessment (HTA) is to evaluate the effectiveness, safety, and cost-effectiveness of SBRT in adults and children with cancers not currently covered by the 2012 coverage decision (CNS and a subset of lung cancers). This evidence review will help inform Washington's independent Health Technology Clinical Committee as the committee determines coverage regarding the use of SBRT in adults and children with cancers not currently covered.

Key Questions

KQ1. What is the evidence of effectiveness for SBRT for patients with cancers not currently covered (CNS cancers and inoperable stage 1 NSCLC)?
KQ2. What are the harms of SBRT in patients with included cancers?
KQ3. What is the evidence that SBRT has differential efficacy or harms in subpopulations, including those defined by:
  a. Sex
  b. Age
  c. Site and type of cancer
  d. Stage and grade of cancer
  e. Setting, provider characteristics, equipment, quality assurance standards and procedures
KQ4. What is the evidence of cost and cost-effectiveness of SBRT?

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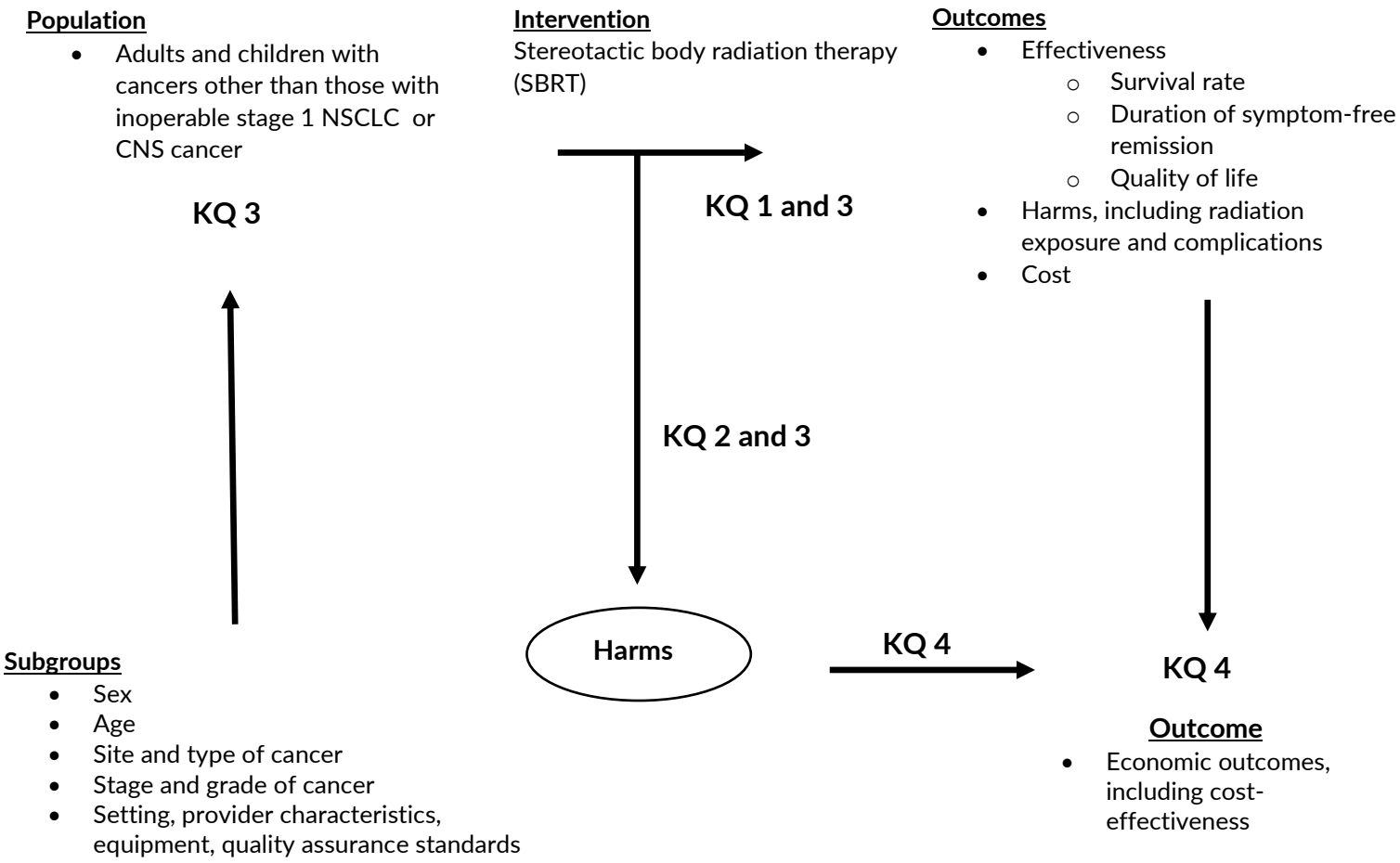
Analytic Framework

Figure 1. Analytic Framework



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Detailed Inclusion and Exclusion Criteria

Study Component	Inclusion	Exclusion
Populations	• Adults and children with non-CNS and non-NSCLC (inoperable, stage 1) malignancies where treatment by radiation therapy is appropriate	• Studies in people with noncancer conditions (e.g., trigeminal neuralgia)
Interventions	• SBRT, with devices such as Gamma Knife, CyberKnife, TomoTherapy, delivered in 10 or fewer fractions	• Treatments delivered in 11 or more fractions • Interventions used for treatment planning or treatment delivery assessment only
Comparators	• Conventional (conformal) external beam radiation therapy (EBRT) • Other forms of radiation (e.g., brachytherapy) • Chemotherapy • Surgery • No treatment	• Comparators other than those stated

Outcomes	• Effectiveness
	  ○ Survival rate
	  ○ Duration of symptom-free remission
	  ○ Quality of life
	• Harms, including radiation exposure and complications
	• Cost
	• Cost-effectiveness
		• Studies that do not report outcomes of interest
		• Data for treatment planning (e.g., dosing) or treatment delivery (e.g., accuracy)
		• Economic outcomes from studies performed in non-US countries
		• Economic outcomes from studies performed in the US that were published more than 5 years ago

Timing	• Any point in the treatment pathway	• None stated
Setting	• Any outpatient or inpatient clinical setting in countries categorized as very high on the UN Human Development Index	• Emergency use settings • Nonclinical settings (e.g., studies in healthy volunteers, animal models of disease) • Countries categorized other than very high on the UN Human Development Index

Study Component	Inclusion	Exclusion

Study Design	• For KQ1, KQ2, and KQ3
	  ○ Comparative study designs (prospective, retrospective, and randomized or controlled clinical trials)
	• For KQ2
	  ○ Comparative study designs
	  ○ Noncomparative study designs (≥ 100 participants)
	• For KQ4
	  ○ Comparative cost data and relevant economic evaluations
	  ○ Cost-effectiveness analyses
	  ○ Economic simulation modeling studies
		• Abstracts, conference proceedings, posters, editorials, letters
		• Studies without a comparator (unless for harms only)
		• Proof-of-principle studies (e.g., technology development or technique modification)
		• Studies without extractable data

Sample Size	• Minimum sample size of 50 participants for comparative study designs • Minimum sample size of 100 participants for noncomparative study designs	• Studies that do not meet the minimum sample size
Publication	• Published, peer-reviewed, English-language articles	• Studies reported only as abstracts that do not allow study characteristics to be determined • Studies that cannot be located • Duplicate publications of the same study that do not report different outcomes or follow-up times, or single site reports from published multicenter studies • Studies published in languages other than English

Abbreviations. CNS: central nervous system; KQ: key question; NSCLC: non–small cell lung cancer; SBRT: stereotactic body radiation therapy; UN: United Nations.

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