

IN BRIEF A Summary of the Health Technology Assessment Proton Beam Therapy for the Treatment of Cancer in Children and Adults

Key Messages

- Proton beam therapy (PBT), alone or in combination with photon radiotherapy, appears to be as effective as other types of radiotherapy to treat most types of cancer.
- The safety of PBT appears to vary by type of cancer.
- The quality of the evidence is mostly low or insufficient to make definitive conclusions about the benefits or harms of PBT.
- A single-vault PBT facility in Canada could, after nine years of operation, end up being a cost-saving option compared with sending patients out-of-country for treatment.

Context

In Canada, cancer is the leading cause of death, with approximately 196,900 new diagnoses made each year. More than half of all patients diagnosed with cancer receive radiation therapy (also called radiotherapy) as part of their initial treatment, either alone or in combination with surgery, chemotherapy, or both. Radiotherapy delivers a dose of radiation to tumour cells to irradiate and kill them. With conventional radiotherapy, a beam of photons is used to deliver the radiation; however, as the photons irradiate the tumour, they can also damage the healthy tissue surrounding it.

Technology

PBT is a newer type of radiotherapy that uses protons rather than photons and, therefore, represents an alternative to conventional photon therapy for the treatment of cancer. It has been developed to deliver a more targeted dose of radiation to the tumour, thereby minimizing the radiation to the healthy tissue around it. Reducing the radiation dose to healthy tissue is especially important in children, who are more sensitive than adults to radiation and are at an elevated risk of long-term side effects, including incurable secondary cancer.

Issue

PBT is an expensive technology. With the exception of one specialized research facility in Vancouver, PBT is not yet available in Canada. Canadian patients are referred out of the country to receive this treatment. An assessment of the clinical effectiveness and safety, budget impact, patient perspectives and experiences, ethical issues, and implementation issues of PBT for the treatment of cancer in children and adults will help guide policy decisions regarding whether to install PBT facilities in Canada or continue sending patients to PBT facilities in other countries for treatment.

Methods

CADTH conducted a health technology assessment (HTA) of the clinical effectiveness and safety of PBT compared with other types of radiotherapy for the treatment of cancer in children and adults. A budget impact analysis was also undertaken to assess, from a Canadian health ministry perspective, the budgetary impact of investing in the construction and maintenance of a PBT facility in Canada compared with the current approach of out-of-country treatment referrals. A review of the evidence on patient perspectives and experiences, ethical issues, and implementation issues of PBT was also included in the HTA.

Results

A review of the clinical evidence from nine systematic reviews found that PBT, alone or in combination with photon radiotherapy, is comparable to other types of radiotherapy for most types of cancer. Exceptions include meningioma and subgroups of malignant meningioma, and poorly differentiated tumours of prostate cancer in adults, for which greater benefits were found with PBT; some intramedullary spinal cord glioma in both children and adults, for which lower benefits were found with PBT; and eye cancer in adults, for which both greater benefits and lower benefits, depending on the specific type of eye cancer, were found with PBT.

The clinical evidence also found that the safety of PBT, alone or in combination with photon radiotherapy, varies by the type of cancer it is used to treat, compared with other types of

radiotherapy. It was found to be associated with greater harms in breast cancer and prostate cancer in adults; lower harms in retinoblastoma in children and medulloblastoma in adults; and both greater harms and lower harms in adults depending on the specific type of the following cancers: esophageal cancer, optic nerve sheath meningioma, and lung cancer.

The budget impact analysis suggests that, over the next five years, it would be less expensive to continue referring patients out of the country rather than to construct and maintain a single-vault PBT facility in Canada. However, if the time horizon was extended beyond nine years, investing in a Canadian single-vault PBT facility could be cost saving.

The HTA also uncovered several other important considerations through reviews of patient perspectives and experiences related to travelling for PBT, the ethical issues of providing PBT within Canada versus referring patients out of country, and the implementation consideration of installing and operating a PBT facility in Canada.

Read more about CADTH and its review of proton beam therapy for the treatment of cancer in children and adults at:



cadth.ca/proton-beam-therapy-treatment-cancer-children-and-adults

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