Topic Exploration Report

This report summarises the results of a brief exploration to establish the quantity and quality of existing high-level evidence on the procedure of interest.

<table>
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<th>Topic:</th>
<th>Daily online Image-Guided Radiotherapy (IGRT) for people undergoing radical bladder cancer treatment</th>
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<tbody>
<tr>
<td>Topic proposer</td>
<td>Jake Tanguay</td>
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<tr>
<td>Report identifier</td>
<td>RT09</td>
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<td>Topic exploration report number:</td>
<td>TER037</td>
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<td>Prepared by</td>
<td>Cedar (Cardiff &amp; Vale University Health Board)</td>
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<tr>
<td>Report date</td>
<td>8 March 2019</td>
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Purpose

On behalf of Health Technology Wales, Cedar researchers conducted a rapid review of evidence on the implementation and use of daily online image-guided radiotherapy (IGRT) for people undergoing radical bladder cancer treatment. This exploratory summary will inform the prioritisation of radiotherapy procedures to be introduced at Velindre Cancer Centre (VCC), alongside expert opinion and other considerations. It could also be used to clarify the scope of an evidence appraisal. Some of the background information and resource impact considerations was submitted by clinical teams at VCC.

Background

The main objective of radiotherapy treatment is to destroy tumours without harming the healthy tissues which surround them. Imaging in radiotherapy is used to establish accurate diagnoses and staging by evaluating the growth rate and malignant potential of a tumour. Imaging is also used to accurately identify the specific location of the margins of a tumour to inform treatment planning. Radiotherapy procedures are therefore improved when there is an increased certainty in the anatomical location of the tumour margins, and in the precision of treatment delivery. The primary outcome measure is a reduction in the Planning Treatment Volume (PTV). This refers to the volume of the anatomical area of the tumour being targeted for treatment, and includes both the Clinical Target Volume (CTV) and an additional safety margin. The size of this safety margin (indicated by the CTV to PTV ratio), depends on positional uncertainties.

The use of daily online imaging ensures that the treatment can be more accurately targeted and may allow higher doses of the radiation to be delivered to the target site while keeping radiation of the surrounding tissues as low as possible. This can allow the most effective does to be delivered to the target site while minimising the risk of side effects of the treatment.
**Proposed PICO**

<table>
<thead>
<tr>
<th>Population</th>
<th>Patients with bladder cancer who require radical radiotherapy</th>
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<tr>
<td>Intervention</td>
<td>Daily online image-guided radiotherapy (IGRT)</td>
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<tr>
<td>Comparator</td>
<td>Weekly IGRT, primarily offline</td>
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<td>Outcome measures</td>
<td>Reduction in Planning Target Volume (PTV)</td>
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<td></td>
<td>Proportion of patients who require revision of their treatment plan</td>
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<td></td>
<td>Costs of:</td>
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<td></td>
<td>• Initial implementation (including capital costs and training where relevant)</td>
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<td></td>
<td>• Ongoing service provision (e.g. staff time for treatment planning and delivery; consumables; maintenance of equipment)</td>
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<td></td>
<td>Normal tissue sparing</td>
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<td>Adverse events</td>
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<td>Patient QoL</td>
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**Summary of findings**

The evidence identified was limited, with no RCTs identified.

The 2016 Vestergaard et al study concluded that online imaging has a great potential for ensuring target coverage, while maintaining normal tissue sparing in treatment sites. Similar findings were identified in the Vestergaard 2014 and 2013 studies.

Similarly Faroudi et al (2011) found that the use of online adaptive radiotherapy was feasible and reduced the area of normal tissue irradiated without reducing CVT coverage. Tuomikoski et al (2011) concluded that adaptive radiotherapy considerably reduced the radiotherapy dose to the small bowel, while maintaining the dose coverage of CTV at similar level when compared to the conventional treatment.

Faroudi et al (2014) noted that a CTV to PVT margin of 7mm was inadequate in some cases due to fluid load or medication use which resulted in rapid bladder filling.

**Economic impact**

No economic studies were identified.

Based on the information provided by the topic referrer, VCC already has skills and equipment required to implement these changes. There is no requirement for the purchase of any additional equipment or additional staff training. The technique will not save time in other stages of a patient’s treatment pathway.

For the cohort of patients suggested by the proposer, there would be an additional 66.6 hours per annum for treatment delivery equating to an additional 15 minutes per day (based on 40 patients). The costs of this are estimated by the proposer as: additional time per fraction X no
of patients X no of fractions per patient (5 X 40 X 20 = 4000). This result of 4000 minutes is equal to 66.6666 hours per annum. The proposer has estimated the cost of this as 66.6 X £23.41 X 2 giving an overall cost of £3,121.33. It is unclear what the source of this cost is or why it is doubled. The 66.6 used has been rounded down by the proposer from 66.6666 which will have a minor impact on the cost calculation. NB: in the proposal, current treatment options include one fraction of IGRT online and 4 fractions of IGRT offline per patient: it is unclear if these would still be required if the proposed option is implemented. The current calculation assumes that the 20 online fractions are additional to current care.

Additionally, it is estimated that the proposed change in treatment would lead to an increase in the proportion of patients requiring replans. This is estimated at an additional 10 patients at 7.5 hours per replan equating to an additional 75 hours. The proposer has calculated the cost of this as £1,755.80 although it is unclear where this cost originated.

A cost for physics input of £936.41 has been included for validation if the PTV margins change, the source of this is unclear.

Overall the suggested additional total per annum cost for the proposed treatment option is:

£3,121.33 + £1,755.80 + £936.41 = £5,831.54

Prioritisation criteria

**Clinical impact** (Potential for the technology to have an impact on patient-related health outcomes):
Weak evidence available, more evidence and comparative data required. Increased accuracy is likely to result in better outcomes and reduced adverse events however there is a lack of evidence regarding if/how much this technique will change outcomes. No data on long term outcomes is available.

**Budget impact** (Impact of the technology on health care spending):
Based on the costs and savings provided by the topic referrer, the change in treatment will incur a cost of £5,831.54 per annum for based on 40 patients per year.

**Population impact** (The size of the population that would be affected by the technology):
Topic proposer estimates approx. 40 patients per year. This equates to 0.001% of the population of Wales (3.099 Million people) or 7.89% of the population diagnosed with bladder cancer each year (Welsh Cancer Intelligence and Surveillance Unit 2015 data)

**Equity** (The technology has the potential to introduce, increase, or decrease equity in health status):
No equity issues identified.

Questions for researcher

Based on the sources you have identified, is your impression that the evidence is likely to:

- favour implementation of the procedure?
- favour standard care?
- be inconclusive?

The evidence identified is inconclusive. There is limited evidence on the superiority of this technique. The study data that is available is limited to small studies. There is a lack of comparative data. No RCTs are available and there is a lack of economic evidence.
Questions for topic proposer

- Please provide the sources of the costs of the staff and other assumptions made in the cost table.
- The additional cost of IGRT is calculated at 66.6 X £23.41 X 2. Please clarify where the X 2 originates.
- Please clarify if the one fraction of IGRT online and 4 fractions of IGRT offline per patient used in current standard care would still be required.
- How accurate is the patient estimate and what is this based on? What are predicted future patient numbers?
- Would the additional IGRT have an impact on capacity and a detrimental effect on other patients?

Sources of evidence

## Brief literature search results

### Resource | Results
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**UK guidelines and guidance**
- e.g. NICE; Healthcare Improvement Scotland; Guidelines International Network; SIGN
  - NICE: [NICE guideline (NG2) Bladder Cancer Diagnosis and Management](https://www.nice.org.uk/guidance/ng2). February 2015
  - HIS: No relevant evidence identified
  - GIN:
    - [EAU Guidelines on Non-muscle-invasive Bladder Cancer (TaT1 and CIS)](https://www.eurourology.com). European Association of Urology 2017
  - SIGN: No relevant evidence found

### Secondary literature and economic evaluations
- e.g. Cochrane library; Medline
  - systematic reviews, meta-analyses, economic evaluations

### Primary studies
- Medline
  - RCTs; observational studies

### Cochrane trials database
- No relevant trials identified

### Ongoing secondary research
- [Clinicaltrials.gov](https://clinicaltrials.gov)
  1. NCT011043501: Image-Guided Radiation Therapy for Bladder-Cancer Patients Undergoing Radiotherapy and Concurrent Gemcitabine Chemotherapy , Active not recruiting.
  2. NCT00609843: Pilot Study of Lipiodol Demarcation of the Tumour in Bladder Cancer , Completed
  4. NCT00913536: Cone Beam Computed Tomography (CT) Bladder. Active, not recruiting.
  5. NCT02447549: Study of Tumour Focused Radiotherapy for Bladder Cancer (RAIDER). Recruiting
  6. NCT00963404: Image-Guided Tumourboost of Bladder Cancer, Completed

**Other sources**

**Citation tracking**


**Date of search:** 3rd December 2018

**Concepts searched:**

- **Cochrane Library:**
  MeSH: ‘radiotherapy’, ‘urinary bladder neoplasm’, ‘radiotherapy, image-guided’

- **Medline:**
  1 Bladder Neoplasms/ (68604)
  2 Radiotherapy, Image-Guided/ (5251)
  3 Daily,ti,ab (467383)
  4 1 and 2 and 3 (122)