Technoleg Iechyd Cymru
Health Technology Wales

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.

Topic:	Passive respiratory gating with Stereotactic Ablative Radiotherapy (SABR) for people with liver cancer
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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 a real-time passive respiratory motion management system during SABR for people with liver cancer. 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

Stereotactic Ablative Radiotherapy (SABR) is a type of radiotherapy that differs from conventional radiotherapy as it is typically used to treat smaller tumours that have been detected early and is guided by computed tomography (CT) which enables SABR to be given in higher doses directly to the tumour without damaging nearby critical normal structures. Higher treatment doses are given in a much shorter period of time typically three to five treatments over a period of 5 days whereas typical conventional radiation therapy is given 30 minutes a day for 6 weeks or more.

Passive respiratory gating using real-time position monitors (RPM), is used to reduce the effects of respiratory movement by co-ordinating the delivery of the radiotherapy with the patient's respiratory cycle using reflective markers mounted on the abdomen and an infrared camera. The phase of respiration around the end of expiration is often chosen as this is the phase when the tumour is, on average, expected to spend most time. Generally patients tolerate this treatment much better as it can reduce the amount of scarring and damage to tissue surrounding

the target site. However, passive respiratory gating will only work if the patient's respiratory cycle is consistent with tumour motion.

This treatment combination is currently being used for other abdominal cancers.

Proposed PICO	
Population	Patients requiring liver stereotactic ablative radiotherapy (SABR)
Intervention	Passive respiratory gating during SABR
Comparator	SABR
Outcome measures	Level of tissue toxicity/damage Survival

Summary of findings

The evidence for SABR and passive respiratory gating in patients with liver metastases is very limited as only one case study was identified. This case study suggests that the use of SABR and respiratory gating as a bridge to transplant in a patient with hepatocellular carcinoma resulted in damage only to the target site and not surrounding tissue. It also highlighted that in appropriate transplant patients, this could be a safe and viable treatment option. However, this is in one patient and there is no comparative data available.

As the proposal only references passive respiratory gating and SABR, the references included were not picked up within the search.

Economic impact

No economic studies of SABR and passive respiratory gating for this indication were identified.

It was proposed that there would be minimal additional equipment costs as all necessary equipment/hardware/software is already in use. The additional costs will be staff related via training, extra set-up and planning time per patient, for both radiologists and physicists, and the extra time needed to complete SABR due to the interruption in beam time to accommodate the motion management strategy.

Assuming the costs included are doubled to reflect 2 radiologists or a band 6 hourly rate of £47 for a radiologist, the costs included in the submission look accurate. Please see below for cost breakdown.

Time required in planning				
CT Simulation	30 min	60 min	30x20 = 600 **+10 hrs**	10 x £23.41 x 2 = **£468.20**
Physicists	Most patients are already planned and then withdrawn from treatment. Assume only 2 patients extra per annum		2 x 15 hours	£702.30
Consultant Time				
Time required to deliver				
Treatment delivery	20 min	20 min		
IGRT	10 CBCT	10 min CBCT 15 min RPM	15minx5#x20pts = 1500 **+25 hrs**	25 x £23.41 x 2 = **£1,170.50**
Total per annum				**£2,341.00**
Time to Develop				
Clinicians				
Physics	0		0	0
Radiotherapy	RPM for gating in CT and on LA2/4/5 - 5 hrs System set up - 5 hrs System training to inc competency packages - 10 hrs		**+20 hrs**	**20 x £23.41 = £468.20**
Total year 1 (inc training and development)				**£2,809.20**
Total				**£5150.20**

Prioritisation criteria

Clinical impact (Potential for the technology to have an impact on patient-related health outcomes):
Cannot say based on available evidence.

Budget impact (Impact of the technology on health care spending):
Based on 20 patients indicated in the proposal, the intervention would be cost incurring of approximately £5150.20 over one year. Majority of this would be training and planning costs so would likely reduce in subsequent years.

Population impact (The size of the population that would be affected by the technology):
Based on the 20 patients per year indicated in the proposal: Affects 5% or more of those diagnosed with liver metastases in 2015 (WCISU)

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? Yes

The very limited evidence would suggest the implementation of the procedure would be beneficial and safe for appropriate patients with liver metastases as a bridge to transplant only. However, this is based on one person.

Questions for topic proposer

- Why are the costs of CT planning time and IGRT doubled?
- Is the 15 hours extra physicists time per patient accurate?
- What is the procedure for identifying patients who are suitable for respiratory gating?
- There was no comparative data available but would/are other motion management strategies be more appropriate for this indication? Abdominal compression or active breath control?
- Would this be considered as a curative treatment on its own or in addition to chemotherapy for example, as a bridge to transplant or a bridge to surgery?
- Has extra linac time/cost an issue and has it been accounted for?

Topic proposer response

Further work is needed before these questions can be answered.

Sources of evidence

- Stereotactic radiotherapy of the liver: a bridge to transplantation
  Al Hamad AA; Hassanain M; Michel RP; Metrakos P; Roberge D.

Appendix – Brief literature search results

Resource	Results
UK guidelines and guidance	
e.g. NICE; Healthcare Improvement Scotland; Guidelines International Network; SIGN	None
Secondary literature and economic evaluations	
e.g.Cochrane library; Medline *systematic reviews, meta-analyses, economic evaluations*	None
Primary studies	
Medline *RCTs; observational studies*	None
Cochrane *trials database*	None
Ongoing secondary research	
Clinicaltrials.gov	None
Other sources	
Case study	One case study identified via Ovid Medline using SABR and respiratory gating for hepatocellular carcinoma (HCC)

Date of search:	5th December 2018
Concepts searched:	stereotactic radiotherapy, SABR, liver, respiratory gating