



Topic Exploration Report ¹

Selective internal radiation therapy (SIRT) for adults with unresectable metastatic colorectal cancer that cannot be treated successfully with chemotherapy or surgery alone.

What is a Topic Exploration Report?

Topic Exploration Reports are not health technology assessments. These reports provide a high-level briefing on new topics submitted to Health Technology Wales and are not based on exhaustive or systematic literature searches. Instead, they rely on a focussed scan of key resources.

What evidence is used in a Topic Exploration Report?

Priority is given to summarising the most relevant or useful evidence, rather than covering all possible evidence. Information reported is typically based on abstracts and study authors' own conclusions, rather than detailed scrutiny of full texts.

What are the aims of a Topic Exploration Report?

Topic Exploration Reports offer an overview of the available evidence on a topic and aim to highlight any uncertainties or gaps in the evidence. These reports outline the quantity and type of evidence found, but no critical appraisal or formal evidence synthesis is conducted.

How should a Topic Exploration Report be used?

Topic Exploration Reports can be used to indicate what evidence may be available for a topic, and do not provide definitive guidance on how a technology should be used. The evidence presented within the reports should be interpreted with caution.

¹ [Cyfieithu dogfennau HTW wedi'u cyhoeddi o'r Saesneg i'r Gymraeg](#)
Translation of published technical HTW documents from English into Welsh

Topic exploration report number	TER682
Topic	Selective internal radiation therapy (SIRT) for adults with unresectable metastatic colorectal cancer that cannot be treated successfully with chemotherapy or surgery alone
Summary of findings	<p>SIRT delivers radiotherapy treatment to internal tumours, usually in the liver, by injecting radioactive substances held in microspheres into arteries near the tumour. We searched for evidence on SIRT to treat adults with colorectal cancer that has metastasised to the liver and cannot be successfully treated with chemotherapy or surgery alone.</p> <p>A 2018 NHS England Clinical Commissioning Policy evaluated the clinical and cost effectiveness of SIRT using evidence from one randomised trial, two observational studies and UK registry data. The policy supports SIRT for selected adults with chemotherapy-refractory or chemotherapy-intolerant metastatic colorectal cancer whose disease is confined to the liver. We identified more recent systematic reviews, but these rely on the same evidence base. No new comparative studies were identified since HTW's previous review of this topic.</p> <p>Overall, the evidence suggests that SIRT may improve tumour control and overall survival compared with chemotherapy alone, best supportive care, or other non-SIRT treatment approaches. A recent network meta-analysis reported improved overall survival with SIRT compared with best supportive care. However, confidence in these findings is limited because the comparative evidence base is small, and much of it is observational.</p> <p>Economic evidence is mixed. Cost-effectiveness estimates suggest that SIRT may not be cost effective although results are highly sensitive to assumptions about survival and treatment costs. There is uncertainty about the clinical effectiveness and cost effectiveness of SIRT in this population</p>

Introduction and aims

Around 25% of people diagnosed with colorectal cancer will develop metastatic disease, and in most cases, this involves disease spread to the liver. Usual care can involve surgery and chemotherapy, and treatment plans largely depend on the extent of the metastases. SIRT (also known as transarterial radioembolisation) can be used to deliver radiotherapy treatment to tumours in the liver, by injecting radioactive substances held in microspheres into arteries near the tumour. These then lodge in small blood vessels and irradiate the tumour.

Examples of microspheres used for SIRT include yttrium-90 resin microspheres (SIR-Spheres, Sirtex Medical) and yttrium-90 glass microspheres (TheraSphere, Boston Scientific Corporation). Holmium-166 resin microspheres (QuiremSpheres, Terumo Europe) were previously available but were taken off the market in 2025.

SIRT has been investigated as both a first-line treatment with curative aims, or for later, palliative use in more advanced disease. Health Technology Wales researchers searched for evidence on SIRT for treatment of adults with colorectal cancer that has metastasised to the liver and cannot be successfully treated with chemotherapy or surgery alone.

Evidence overview

This topic was the subject of a previous HTW topic exploration report TER310 in 2021. This report included NHSE (2018), NICE (2020a) and NICE (2020b), described in more detail below. The topic did not proceed to the HTW work programme due to the existing NICE Interventional Procedures Guidance and NHS Commissioning policy.

Secondary Evidence

NHS England (NHSE, 2018) published a clinical commissioning policy on SIRT for chemotherapy refractory/intolerant metastatic colorectal cancer in 2018, which stated that there was enough evidence to make SIRT available to adults in cases where the metastatic disease is limited to the liver only. The policy was informed by two evidence reviews (that searched up to November 2017), and a UK-registry based Commissioning Through Evaluation study that reported results from a UK registry (White et al. 2019) with associated cost-effectiveness modelling.

The two evidence reviews searched for comparative evidence of any design and identified three studies comparing SIRT to other forms of care. One was a randomised controlled trial (Hendlisz et al. 2010) comparing SIRT plus fluorouracil chemotherapy (n = 21) with fluorouracil chemotherapy alone (n = 23); two were observational studies that compared SIRT to current care (Bester et al. 2012 and Seidensticker et al. 2012). All used yttrium-90 based treatments. The randomised controlled trial reported a significant benefit for SIRT and chemotherapy in controlling liver tumour growth compared to chemotherapy alone. The two non-randomised studies indicated that SIRT may improve overall survival compared to standard care. The review authors highlighted some concerns with the reliability of the evidence, the lack of well-designed comparative studies comparing SIRT to current care and a lack of evidence on quality of life.

Outcomes from the Commissioning Through Evaluation study (White et al. 2019) were used to inform a cost effectiveness model comparing SIRT to best supportive care. The ICER for SIRT compared to best supportive care was £85,350 in the base case. Treatment with SIRT resulted in an increase in QALYs of 0.32 (0.58 vs 0.26). SIRT was £27,406 more expensive than BSC (£31,028 vs £3,623 discounted costs). The cost of the SIRT procedure and the length of overall survival were the main drivers in the model. A scenario analysis used a longer survival estimate and a lower procedure cost, along with a longer time horizon, based on a previously published model resulted in a lower ICER of £31,888.

Evidence overview

In 2020, NICE published Interventional Procedures Guidance on SIRT for unresectable colorectal metastases in the liver (NICE, 2020a). This considered use of SIRT for any line of treatment but included evidence on chemotherapy-refractory colorectal cancer liver metastases. The comparative evidence identified the sources included in NHSE (2018). The review also included the UK registry data used by NHSE (2018) and two other uncontrolled case series (1,137 patients included across the two studies). The NICE Guideline on colorectal cancer (NG151; NICE 2020b) was last updated in December 2021 and included a review of the evidence on treatments for patients presenting with metastatic colorectal cancer in the liver not amenable to treatment with curative intent. This did not identify any new comparative evidence in addition to that described above. The recommendations made in the guideline on the use of SIRT were in line with those of NICE (2020a), in that SIRT should not be offered as first-line treatment for people with colorectal liver metastasis that are unsuitable for local treatment without special arrangements for clinical governance, consent and audit and offered only in the context of research for those who can have chemotherapy. NICE (2020a) and NICE (2020b) were not limited to studies in patients refractory to chemotherapy.

A more recent systematic review and network meta-analysis (Azeredo-da-Silva et al. 2024) did not identify additional yttrium-90 SIRT comparative studies beyond the three included in NHSE (2018). As a network meta-analysis it also included 12 studies using regorafenib or trifluridine-tipiracil which did not use SIRT at all. Azeredo-da-Silva et al. (2024) concluded that all the active treatments improved overall survival compared to best supportive care, but SIRT had the most beneficial effect (HR 0.48, 95% credible interval 0.27 to 0.87) compared to best supportive care. Indirect comparisons between the active treatments did not demonstrate any statistically significant differences. Azeredo-da-Silva et al. (2024) reported grade 3 adverse events associated with SIRT: 4.8% experienced hand-foot skin reaction and 10.3% had radioembolization-induced liver disease.

A systematic review of economic evaluations of yttrium-90 SIRT for liver metastases of colorectal cancer (Alonso et al. 2023) identified seven economic evaluations: two cost analyses and five cost-utility analyses. Two included studies indicated that SIRT had a 56% to 57% probability of being cost effective compared to best supportive care at a £30,000 per QALY threshold.

Areas of uncertainty

No additional comparative SIRT studies were identified since HTW's last topic exploration report on this topic. This means the evidence base for SIRT in patients with unresectable colorectal liver metastases refractory to chemotherapy is still very limited and is based on a small randomised trial and two observational comparative studies. The only randomised trial (Hendlisz et al. 2010) compared SIRT plus 5-FU with 5-FU alone, so may not be fully applicable to current practice.

Literature search results

Health technology assessments and guidance	
<p>NHSE. (2018). Selective internal radiation therapy for chemotherapy refractory intolerant metastatic colorectal cancer. Available at: https://www.england.nhs.uk/publication/selective-internal-radiation-therapy-for-chemotherapy-refractory-intolerant-metastatic-colorectal-cancer/ [Accessed 22/07/2026].</p> <p>NICE. (2020a). HTG542: Selective internal radiation therapy for unresectable colorectal metastases in the liver. Available at: https://www.nice.org.uk/guidance/htg542 [Accessed 15/07/2026].</p> <p>HTW. (2021). TER310: Selective internal radiation therapy for metastatic colorectal cancer. Available at: https://healthtechnology.wales/reports-guidance/selective-internal-radiation-therapy/ [Accessed 15/07/2026].</p> <p>NICE. (2020b). NG151: Colorectal cancer. Available at: https://www.nice.org.uk/guidance/ng151 [Accessed 15/07/2026].</p>	
Evidence reviews and economic evaluations	
<p>Azeredo-da-Silva ALF, de Jesus VHF, Agirrezabal I, et al. (2024). Selective Internal Radiation Therapy Using Y-90 Resin Microspheres for Metastatic Colorectal Cancer: An Updated Systematic Review and Network Meta-Analysis. <i>Adv Ther.</i> 41(4): 1606-20. doi: 10.1007/s12325-024-02800-5</p> <p>Townsend A, Price T, Karapetis C. (2009). Selective internal radiation therapy for liver metastases from colorectal cancer. <i>Cochrane Database Syst Rev.</i> 2009(4): CD007045. doi: 10.1002/14651858.CD007045.pub2</p> <p>Ramdhani K, Smits MLJ, Lam M, et al. (2023). Combining Selective Internal Radiation Therapy with Immunotherapy in Treating Hepatocellular Carcinoma and Hepatic Colorectal Metastases: A Systematic Review. <i>Cancer Biother Radiopharm.</i> 38(4): 216-24. doi: 10.1089/cbr.2022.0071</p> <p>Alonso JC, Casans I, Gonzalez FM, et al. (2023). Economic evaluations of radioembolization with yttrium-90 microspheres in liver metastases of colorectal cancer: a systematic review. <i>BMC Gastroenterol.</i> 23(1): 181. doi: 10.1186/s12876-023-02793-5</p>	
Individual studies	
We searched for, but did not identify, any additional individual studies that compared SIRT to other care options to treat liver metastases of colorectal cancer in patients refractory to chemotherapy.	
Ongoing research	
We searched for, but did not identify, any ongoing studies that compared SIRT to other care options to treat liver metastases of colorectal cancer in patients refractory to chemotherapy.	
Studies included in NHSE (2018)	
<p>Bester L, Meteling B, Pocock N, et al. (2012). Radioembolization versus standard care of hepatic metastases: comparative retrospective cohort study of survival outcomes and adverse events in salvage patients. <i>J Vasc Interv Radiol.</i> 23(1): 96-105. doi: 10.1016/j.jvir.2011.09.028</p> <p>Hendlisz A, Van den Eynde M, Peeters M, et al. (2010). Phase III trial comparing protracted intravenous fluorouracil infusion alone or with yttrium-90 resin microspheres radioembolization for liver-limited metastatic colorectal cancer refractory to standard chemotherapy. <i>J Clin Oncol.</i> 28(23): 3687-94. doi: 10.1200/JCO.2010.28.5643</p> <p>Seidensticker R, Denecke T, Kraus P, et al. (2012). Matched-pair comparison of radioembolization plus best supportive care versus best supportive care alone for chemotherapy refractory liver-dominant colorectal metastases. <i>Cardiovasc Intervent Radiol.</i> 35(5): 1066-73. doi: 10.1007/s00270-011-0234-7</p> <p>White J, Carolan-Rees G, Dale M, et al. (2019). Analysis of a National Programme for Selective Internal Radiation Therapy for Colorectal Cancer Liver Metastases. <i>Clin Oncol (R Coll Radiol).</i> 31(1): 58-66. doi: 10.1016/j.clon.2018.09.002</p>	

Date of search	15/07/2026
Concepts used	Selective internal radiotherapy, radioembolisation, colorectal

Proposed research question and evidence selection criteria (if selected)

Proposed Research question	What is the clinical and cost effectiveness of SIRT for the treatment of adults with colorectal cancer and unresectable liver metastases who are refractory to or cannot tolerate chemotherapy?	
	Inclusion criteria	Exclusion criteria
Population	Adults with colorectal cancer and unresectable liver metastases who are refractory to or cannot tolerate chemotherapy	
Intervention	SIRT	First line treatment
Comparison/ Comparators	<ul style="list-style-type: none"> • Best supportive care • Systemic treatment options for refractory metastatic colorectal cancer (e.g. regorafenib) 	
Outcome measures	Overall survival Progression free survival Treatment related adverse events Health related QoL Resource use Economic outcomes	
Proposed speciality	Cancer, digestive system	