

# Comparing the Budget Impact of Selective Internal Radiation Therapy using Y-90 Resin Microspheres versus Drug Eluting Bead Transarterial Chemoembolization in Hepatocellular Carcinoma in England

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## Introduction

### Background

Selective internal radiation therapy (SIRT) is a well-tolerated treatment for hepatocellular carcinoma (HCC) that has been investigated extensively in patients with Barcelona Clinic Liver Cancer (BCLC) stage B HCC. The recent 2022 update to the BCLC strategy for prognosis prediction and treatment recommendation in HCC proposed the use of SIRT at various points in the treatment algorithm for patients with BCLC stage 0-B HCC.<sup>1</sup> Furthermore, the National Institute for Health and Care Excellence (NICE) recently recommended SIRT using Y-90 resin microspheres as an option for treating unresectable advanced HCC in adults with Child–Pugh grade A liver impairment when conventional transarterial therapies are inappropriate.<sup>2</sup>

Drug-eluting bead transarterial chemoembolization (DEB-TACE) is an alternative form of conventional lipiodol-based TACE that involves the intra-arterial injection of large embolic microspheres containing sequestered doxorubicin, which then release the chemotherapeutic agent directly into the tumor in a controlled and sustained manner. DEB-TACE has been shown to substantially diminish the amount of chemotherapy that reaches the systemic circulation versus conventional TACE.<sup>3</sup> While DEB-TACE has been widely adopted in clinical practice, its therapeutic efficacy for HCC is still a matter of debate, with the Cochrane Group reporting an “absence of evidence of TACE having a beneficial effect on survival in participants with unresectable HCC”.<sup>4</sup>

### Objective

The aim of the present study was to quantify the budget impact of treating patients with BCLC stage B HCC either via SIRT with Y-90 resin microspheres (SIR-Spheres) or DEB-TACE, from the perspective of the English Department of Health and Social Care (DHSC).

## Methods

### Economic Model

The costs of SIRT and DEB-TACE work-ups, procedures, adverse events (AEs), and subsequent lines of treatment were modeled in a budget impact model developed in Microsoft Excel. The model was structured as a Markov model with states corresponding to those in a traditional partitioned survival model (progression-free survival [PFS], post-progression survival, and death). Published arm-level data on the duration of PFS and overall survival (OS) were used to model progressions through subsequent treatments and to death.

### Clinical Data

All patients started in the progression-free state on the initial treatment (either SIRT or DEB-TACE) and progressed to subsequent treatment lines based on derived transition probabilities. For the first-line treatments, OS and PFS were based on the SARAH randomized controlled trial (RCT) and PFS and OS were assumed to be the same after initial treatment with SIRT and DEB-TACE.<sup>5</sup> The model captured incidence of grade 3/4 AEs with SIRT based on the SARAH RCT. The corresponding rates with TACE were then based on an overall odds ratio from a 2016 systematic review and meta-analysis comparing SIRT with TACE.<sup>6</sup>

Table 1: DEB-TACE costing

Cost element	Cost basis	Cost basis detail	Cost (GBP)
DEB-TACE work-up			
MRI	HRG	RD01A	114
CT	HRG	RD20A	69
DEB-TACE procedure			
TACE procedure	HRG	YR57Z	3,777
Chemotherapy	HRG	SB10Z	360
Beads	Literature	Manos <i>et al.</i> and Fateen <i>et al.</i>	550

CT, computed tomography; DEB-TACE, drug-eluting bead transarterial chemoembolization; GBP, 2022 pounds sterling; HRG, healthcare resource group; MRI, magnetic resonance imaging.

### Costs and Resource Use

Costs of SIRT using Y-90 resin microspheres and DEB-TACE (Table 1) were calculated from the DHSC perspective using healthcare resource group (HRG) tariff costs from the National Tariff 2022/23. In the case of SIRT, the list price of SIR-Spheres Y-90 resin microspheres was obtained from the manufacturer (Sirtex Medical United Kingdom Ltd) and added to the HRG tariff costs.<sup>7</sup> Costs of Grade 3/4 AEs were based on HRGs, National Tariff guide prices for outpatient consultations, and dietician or GP visits.

Subsequent systemic and curative treatments (atezolizumab-bevacizumab, sorafenib, regorafenib, ablation, resection, and liver transplant) were captured based on expert opinion and costed based on the British National Formulary and HRG codes. The mean number of SIRT and DEB-TACE procedure per patient was based on a 2015 RCT comparing the two interventions, specifically one SIRT procedure versus 3.8 DEB-TACE procedures.<sup>8</sup>

Analyses were run both for SIRT with separate hospital spells for the SIRT work-up and the SIRT procedure, and for “same stay” SIRT using the Order-Map-Treat (OMT) Program, which requires only a single hospital admission.<sup>9</sup>

All analyses were conducted over a three-year time horizon and future costs were not discounted in line with budget impact modeling good practice guidance from the International Society of Pharmacoeconomic and Outcomes Research.<sup>10</sup>

## Results

### English Analysis of SIRT versus DEB-TACE

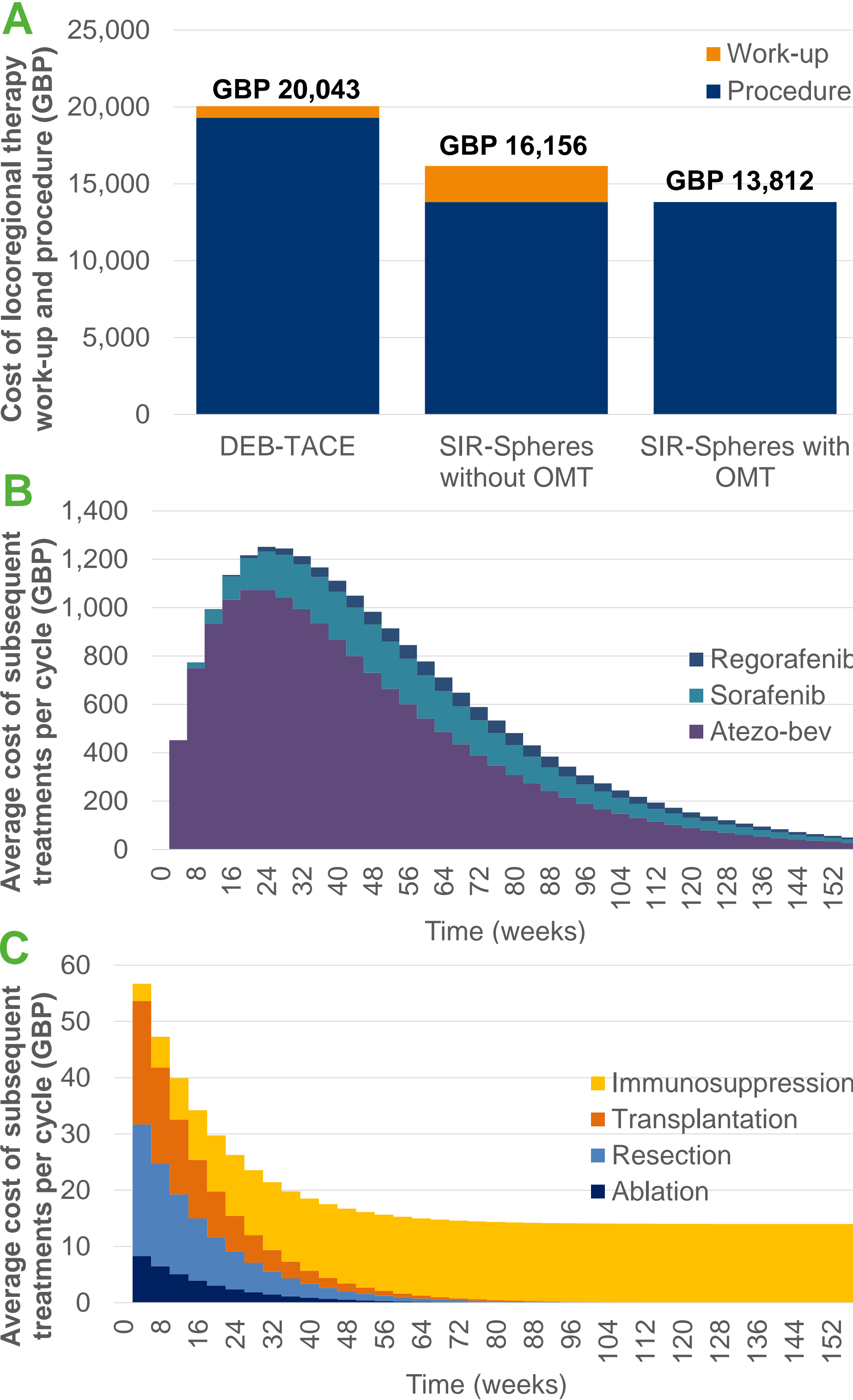
Relative to DEB-TACE, SIRT with “same-stay” OMT resulted in cost savings of GBP 6,536 per patient over 3 years (GBP 34,892 versus GBP 41,428; Table 2 and Figure 1), while performing SIRT work-up during a separate hospital spell resulted in per-patient savings of GBP 4,192 with SIRT versus DEB-TACE (GBP 37,236 versus GBP 41,428; Table 2).

Table 2: Base case results in 2022 pounds sterling (GBP) broken down by cost category

	DEB-TACE	SIRT without OMT	Δ vs DEB-TACE	SIRT with OMT	Δ vs DEB-TACE
Work-up	753	2,344	+1,591	0	-753
Procedure	19,290	13,812	-5,478	13,812	-5,478
Grade 3/4 AEs	1,017	712	-305	712	-305
Atezo-Bev	15,535	15,535	0	15,535	0
Sorafenib	3,357	3,357	0	3,357	0
Regorafenib	933	933	0	933	0
Ablation	38	38	0	38	0
Resection	106	106	0	106	0
Transplant and immunosuppression	399	399	0	399	0
Total	41,428	37,236	-4,192	34,892	-6,536

AEs, adverse events; DEB-TACE, drug-eluting bead transarterial chemoembolization; OMT, Order-Map-Treat; SIRT, selective internal radiation therapy.

Figure 1: Costs of A) initial DEB-TACE work-up and procedure, and SIRT work-up and procedure with and without OMT, B) second- and third-line systemic therapy, and C) second-line treatments with curative intent



The analysis was most sensitive to the number of SIRT and DEB-TACE procedures performed per-patient. Holding the mean number of DEB-TACE procedures per patient constant at 3.8, the cost breakeven point in terms of the number of (same-stay, OMT) SIRT procedures was 1.5 per patient. Conversely, holding the mean number of same-stay, OMT SIRT procedures constant at 1, the cost breakeven point in terms of the number of DEB-TACE procedures was 2.6 procedures per patient.

## Conclusions

Both same-stay and separate-stay SIRT using SIR-Spheres Y-90 resin microspheres was found to be cost saving versus DEB-TACE from the perspective of the DHSC in patients with BCLC stage B HCC.

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