# UNIVERSITY OF BIRMINGHAM AND UNIVERSITY OF YORK HEALTH ECONOMICS CONSORTIUM (NICE EXTERNAL CONTRACTOR)

# Health economic report on piloted indicator

QOF indicator area: Heart Failure Exercise Based Rehabilitation

Potential output: Recommendations for NICE Menu

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#### Introduction

This briefing paper provides a summary of the economic evidence generated on the proposed pilot four heart failure exercise rehabilitation indicator. The format of this paper is intended to provide the QOF Advisory Committee with sufficient information upon which to make a recommendation on whether the indicator is economically justifiable.

#### **Piloted indicator**

The percentage of patients with heart failure (diagnosed after 1/4/2011) with a record of referral for an exercise based rehabilitation programme.

#### Economic rationale for the indicator

Heart failure is a chronic condition that has a high mortality rate in the first year post diagnosis (30-40%). There is relatively low mortality subsequently (10%pa), but with significant healthcare costs. It is estimated that 2% of the NHS budget is spent annually providing treatment for patients with heart failure, 70% of which is due to costs of hospitalisation. [2]

There is clinical evidence that exercise based rehabilitation for some patients with heart failure can reduce hospitalisations because of heart failure. [1]

## **Objective**

To evaluate whether the proposed indicator represents a cost effective use of NHS resources.

# Type of health economic analysis

An indicative net benefit approach is applied with a one year time horizon at baseline.

# Delivery cost of indicator

No information could be found on the costs of an exercise based rehabilitation programme in the UK setting specifically for patients with heart failure. However, in the NICE guidance on myocardial infarction [5] the cost of delivering a cardiac rehabilitation programme with exercise was reported to vary between £59 and £846 (£65 and £925 adjusted for inflation). The reasons for these differences are due to the level of staffing, equipment and intensity of the programme. The value incorporated in the NICE model underpinning the guidance was not explicit, although sensitivity analysis was undertaken on the costs of rehabilitation between £140 and £800.

In our opinion it is not unreasonable to assume that such costs are broadly similar to the costs of exercise based rehabilitation for heart failure. As such in our modelling we have assumed at the base case that the cost is the midpoint of the inflation adjusted cardiac rehabilitation costs given above (£495) with sensitivity analysis used to explore the impact of varying the cost between the upper and lower inflation

adjusted values. We assume that no patients referred to rehabilitation die before receiving the full intervention and so incur the full cost.

In addition we added the cost of one GP consultation at 17.2 minutes (£53), extracted from the Unit Costs of Health and Social Care 2010 [3] to reflect the cost of the consultation leading to the referral.

A Cochrane review found that heart failure related hospitalisations were reduced with exercise based rehabilitation for heart failure [1]. This is supported by evidence presented as part of the NICE Guidance on heart failure [2] and has been incorporated into the only cost effectiveness analysis of exercise based rehabilitation for heart failure [6]. However, the Cochrane review found evidence that exercise based rehabilitation did not reduce all cause hospitalisations. As such our model does not assume a reduction in secondary healthcare resource use (hospital admissions) due to exercise based rehabilitation.

Similarly, the Cochrane review found evidence that exercise based intervention did not lower all cause mortality. As such life expectancy is assumed to be the same between both groups and overall demand for pharmaceutical, community and primary care health resources is assumed to be the same. As there is no difference in mortality or resource use between patients receiving and not receiving exercise based rehabilitation beyond the cost of the rehabilitation itself, a one year time horizon at baseline was deemed appropriate.

The incremental cost of providing exercise based rehabilitation to patients with heart failure in comparison to usual care was estimated to be £548.

#### Effectiveness of indicator

As stated above, no effectiveness is assumed for the indicator in either improved mortality or reduced resource use (notably in not reducing hospitalisations). However, the Cochrane review and the NICE guidance on heart failure both concluded that the evidence was supportive of improvements in quality of life (QoL) up to 5 years with NICE reporting that the evidence of improvement in QoL up to 12 months being of high quality (compared to moderate for 6 months and 5 years).

Various scales are used to measure QoL in the literature identified by NICE and the Cochrane review, although EQ5D scores were only reported in one study [8]. The improvements in QoL from 6 to 12 months were in the region of 10% to 30% on the various scales. In the one study with reported EQ5D scores the utility gain was reported to be 0.12 after 6 months and 0.06 after 5 years.

As our model is only run for one year for simplicity we have assumed that QoL increases linearly from a zero gain at month zero to 0.12 at 6 months and then decreases linearly to a 0.06 gain at 12 months. This results in an individual who lives a full year after diagnosis and receiving the intervention would see a QALY increase of 0.0775 compared to usual care.

As mortality is reported to be 30-40% in the first year after diagnosis we have assumed that 40% of the population have died by the end of the first year and that mortality occurs smoothly over the course of the year. This means that the expected QALY increase in the first year for someone receiving exercise based rehabilitation compared to someone with usual care only will be 0.058. This was varied by +/-50% in sensitivity analysis.

The incremental QALY gain of providing exercise based rehabilitation for patients with heart failure in comparison to usual care was estimated to be 0.058.

#### Incremental cost-effectiveness ratio

Both the NICE Guidance and the Cochrane review only found one cost effectiveness study. This was American based and was not deemed as being particularly relevant to the UK NHS. NICE modified the analysis slightly and reported an ICER of £1,157 per life year gained. The analysis was not cost utility (assuming no increase in quality of life with rehabilitation) and assumed changes in cost from reduced hospitalisation with rehabilitation and reduced mortality. This is in complete contrast to our model and what both NICE and the Cochrane review found that the weight of evidence concludes.

Figure 1: Incremental cost-effectiveness ratio

$$ICER = \frac{Cost_{Treatment} - Cost_{Alternativ e}}{Effect_{Treatment} - Effect_{Alternativ e}}$$

# Eligible population

The eligible population are essentially those patients with newly diagnosed heart failure. The British Heart Foundation estimated an annual incidence of heart failure in the UK of 0.039% [3] which contrasts with that reported by NICE of 0.07%. The reported prevalence rate of heart failure given by the BHF is approximately 0.8% which given the high mortality rate in the first year following diagnosis suggests that the incidence rate of 0.07% will be closer to reality and this is used as the baseline figure. The impact of reducing this to 0.039% is explore in sensitivity analysis.

#### Baseline level of achievement

Data from the pilot sites suggested that this was new work so we have assumed that baseline achievement is 25%.

## **Population**

In the base case, the threshold analysis of the proposed indicator was conducted based on the total practice population registered with practices in England, that is, 8,228 practices with a mean practice size of 6,297 [4].

**Table 1: Practice information for all UK members** 

Country	Number of practices	Number of patients
England	8,228	6,297
Scotland	1,014	5,122
Wales	488	6,146

Northern Ireland 357 5,011
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# **QOF Payments**

Each QOF point is assumed to result in a payment of £133.76. This is the forecast value per point in England during 2011/12 (source; Information Centre).

Table 2: Value per point for all UK members (most recently available)

Country	Value per point
England	£133.76
Scotland	£130.46
Wales	£133.72
Northern Ireland	£125.04

#### Societal value of a QALY

The expected increase in quality adjusted life year (QALY) will be costed at both £20,000 and £25,000 per QALY. This is based on the bottom and the middle of the range £20,000 - £30,000, below which NICE generally considers something to be cost effective.

## **QOF Points**

The economic analysis considers the cost-effectiveness of incentivising the proposed activity over a range of QOF points. The range of QOF points evaluated was agreed by NICE, YHEC and the economic sub-group to justify the practice successfully completing the activity.

In the base case analysis, 5 points were allocated to the proposed indicator. Sensitivity analysis will be followed out between the agreed lower and upper bounds of 2 and 10 points (i.e. the range evaluated).

#### **Thresholds**

The minimum threshold is set to 40% and the incentivised payments increase linearly up to the maximum threshold of 90%.

# Results (assuming a value per QALY of £25,000)

The indicative net benefit analysis suggests that the indicator is highly cost effective, with QOF payments up to the upper bound of 10 points warranted on economic grounds (Appendix A). The increase in quality of life offered by cardiac rehabilitation outweighs the additional healthcare costs in a net benefit analysis, if the value per QALY is assumed to be £25,000.

Sensitivity analysis shows the findings are highly insensitive to changes in costs and to the lower estimate of the eligible population (Appendix B and D). Findings are sensitive to reductions in utility (Appendix C). However, our baseline estimate of

utility was conservative as improvements in utility were only assumed to be seen over the first year whereas the evidence is that there are utility gains up to five years post intervention.

Due to the potential size of the eligible population and the relatively low cost of the intervention compared to potential quality of life gains, there is a strong economic case for the indicator at a baseline of 5 points. Provided conservative assumptions on quality of life hold, there are also economic grounds to award QOF points at the top end of the range analysed, i.e. 10 points.

## Results (assuming a value per QALY of £20,000)

The indicative net benefit analysis suggests that the indicator is highly cost effective, with QOF payments up to the upper bound of 10 points warranted on economic grounds (Appendix E). The increase in quality of life offered by cardiac rehabilitation outweighs the additional healthcare costs in a net benefit analysis, if the value per QALY is assumed to be £20,000.

Sensitivity analysis shows the findings are largely insensitive to changes in costs, although at the upper bound considered, the indicator was marginally no longer cost effective at 5 points (Appendix F). Costs have to almost double from baseline to £927 before the indicator is not cost effective at 5 points and 90% achievement.

Findings were insensitive to changes in the eligible population, with the indicator still cost effective at 5 points even when only half the population is assumed eligible compared to baseline (Appendix G). However, findings are sensitive to reductions in utility (Appendix H) and the indicator ceases to become cost effective if the QALY gain per patient falls 33% from baseline to 0.039.

Due to the potential size of the eligible population and the relatively low cost of the intervention compared to potential quality of life gains, there is a strong economic case for the indicator at a baseline of 5 points. Provided conservative assumptions on quality of life hold, there are also economic grounds to award up to the maximum QOF points appropriate for this indicator, i.e. 10 points.

#### Discussion

There are several caveats that must be considered around our conclusions. Evidence on the cost of exercise rehabilitation could not be found and it may be that the costs are higher than the proxy (cardiac rehabilitation) that we used. However, the findings were invariant to an almost 100% increase in costs and at baseline, assuming 5 points, the cost of rehabilitation per patient would have to rise to £1,217 (QALY value £25,000) or £932 (QALY value £20,000) before the indicator could no longer be justified on economic grounds.

Whilst we believe we have taken a conservative approach to utility estimation, only one study provided EQ5D measures that can be readily translated into QALYs. Again at baseline, assuming 5 points, the QALY gain would have to fall to 0.031 (QALY value £25,000) or 0.039 (QALY value £20,000) before the indicator cannot be justified economically.

Our baseline estimate of utility was conservative as improvements in utility were only assumed to be seen over the first year whereas the evidence is that there are utility

gains up to five years post intervention. As such it is likely our baseline estimate is very conservative and so the sensitivity of our findings around even lower utility gains than assumed at baseline may be interpreted as a very pessimistic scenario given the available evidence.

The analysis we have undertaken ignored any potential reductions in hospitalisation or improvements in mortality from exercise based rehabilitation. It is also invariant to substantial increases in the cost of rehabilitation from baseline. In addition, we have taken what we believe to be a conservative assumption on the improvement in quality of life from rehabilitation. Taking this approach we found the indicator to be justified on economic grounds with a QALY value of £25,000. Where the QALY value was taken to be £20,000, we found the indicator to be justified on economic grounds at 5 points and very likely up to 10 points.

#### References

- [1] Exercise training for systolic heart failure: Cochrane systematic review and metaanalysis. Edward J. Davies, Tiffany Moxham, Karen Rees, Sally Singh et al; Eur J Heart Fail (2010) 12(7): 706-715
- [2] National Clinical Guideline Centre. (2010) Chronic heart failure: the management of chronic heart failure in adults in primary and secondary care. London: National Clinical Guideline Centre.
- [3] Coronary Heart Disease 2010, British Heart Foundation
- [4] General Practice Trends in the UK. NHS Information Centre. Published 22 March 2011.
- [5] Clinical Guidelines and Evidence Review for Post Myocardial Infarction: Secondary prevention in primary and secondary care for patients following a myocardial infarction London: National Collaborating Centre for Primary Care and Royal College of General Practitioners. (2007) Cooper A, Skinner J, Nherera L, Feder G, Ritchie G, Kathoria M, Turnbull N, Shaw G, MacDermott K, Minhas R, Packham C, Squires H, Thomson D, Timmis A, Walsh J, Williams H, White A
- [6] Cost-effectiveness analysis of long-term moderate exercise training in chronic heart failure. Georgiou D, Chen Y, Appadoo S, Belardinelli R, Greene R, Parides MK, Glied S; Am J Cardiol 2001;87:984-988
- [7] Unit Costs of Health & Social Care 2010. Personal Social Services Research Unit (PSSRU). Complied by Lesley Curtis. University of Kent.
- [8] Five-year follow-up findings from a randomized controlled trial of cardiac rehabilitation for heart failure. Austin J,Williams WR, Ross L,Hutchison S. Eur J Cardiovasc Prev Rehabil 2008;15:162-167.

# **Appendix A: Net Benefit Base Case Analysis**

Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis

PIIOL 4 - E	xercise be	seu ne	паршіа	ition ioi	пеан	anure.	ivet be	Hent Ai	iaiysis		
	Value per po Number of per Mean praction		8,228		Societal valu	ie of a QALY			£25,000	1	
Points	Minimum thre Maximum thr		40% 90%	5		lation (mean		e population) ible patients)	0.070% 25.0%	Cost per patient QALY gain per patient	£548 0.058
					N	National to	tals				
Expected Achievement				QOF pa	yments (£00	)0s)				Change in treatment cost (£)	Change in QALYs
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£993,749	105
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,987,497	210
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£2,981,246	316
45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£3,974,995	421
50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£4,968,744	526

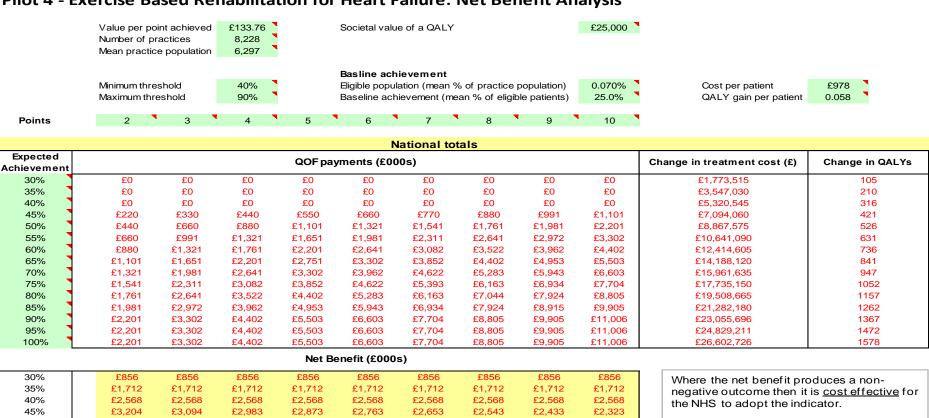
•	acine ve in ent											
	30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£993,749	105
	35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,987,497	210
	40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£2,981,246	316
	45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£3,974,995	421
	50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£4,968,744	526
	55%	£660	£991	£1,321	£1,651	£1,981	£2,311	£2,641	£2,972	£3,302	£5,962,492	631
	60%	£880	£1,321	£1,761	£2,201	£2,641	£3,082	£3,522	£3,962	£4,402	£6,956,241	736
	65%	£1,101	£1,651	£2,201	£2,751	£3,302	£3,852	£4,402	£4,953	£5,503	£7,949,990	841
	70%	£1,321	£1,981	£2,641	£3,302	£3,962	£4,622	£5,283	£5,943	£6,603	£8,943,738	947
	75%	£1,541	£2,311	£3,082	£3,852	£4,622	£5,393	£6,163	£6,934	£7,704	£9,937,487	1052
	80%	£1,761	£2,641	£3,522	£4,402	£5,283	£6,163	£7,044	£7,924	£8,805	£10,931,236	1157
	85%	£1,981	£2,972	£3,962	£4,953	£5,943	£6,934	£7,924	£8,915	£9,905	£11,924,985	1262
	90%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£12,918,733	1367
	95%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£13,912,482	1472
	100%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£14,906,231	1578
					Net Be	enefit (£000	s)			•		

					3110111 (2000	٠,			
30%	£1,636	£1,636	£1,636	£1,636	£1,636	£1,636	£1,636	£1,636	£1,636
35%	£3,271	£3,271	£3,271	£3,271	£3,271	£3,271	£3,271	£3,271	£3,271
40%	£4,907	£4,907	£4,907	£4,907	£4,907	£4,907	£4,907	£4,907	£4,907
45%	£6,323	£6,213	£6,103	£5,992	£5,882	£5,772	£5,662	£5,552	£5,442
50%	£7,738	£7,518	£7,298	£7,078	£6,858	£6,638	£6,418	£6,197	£5,977
55%	£9,154	£8,824	£8,493	£8,163	£7,833	£7,503	£7,173	£6,843	£6,512
60%	£10,569	£10,129	£9,689	£9,249	£8,808	£8,368	£7,928	£7,488	£7,048
65%	£11,985	£11,435	£10,884	£10,334	£9,784	£9,234	£8,683	£8,133	£7,583
70%	£13,401	£12,740	£12,080	£11,420	£10,759	£10,099	£9,438	£8,778	£8,118
75%	£14,816	£14,046	£13,275	£12,505	£11,735	£10,964	£10,194	£9,423	£8,653
80%	£16,232	£15,351	£14,471	£13,590	£12,710	£11,829	£10,949	£10,068	£9,188
85%	£17,647	£16,657	£15,666	£14,676	£13,685	£12,695	£11,704	£10,714	£9,723
90%	£19,063	£17,962	£16,862	£15,761	£14,661	£13,560	£12,459	£11,359	£10,258
95%	£20,699	£19,598	£18,497	£17,397	£16,296	£15,196	£14,095	£12,995	£11,894
100%	£22,334	£21,234	£20.133	£19.033	£17.932	£16.831	£15.731	£14.630	£13.530

Where the net benefit produces a nonnegative outcome then it is <u>cost effective</u> for the NHS to adopt the indicator.

# Appendix B: Net Benefit Analysis Assuming Upper Bound for Costs of Rehabilitation

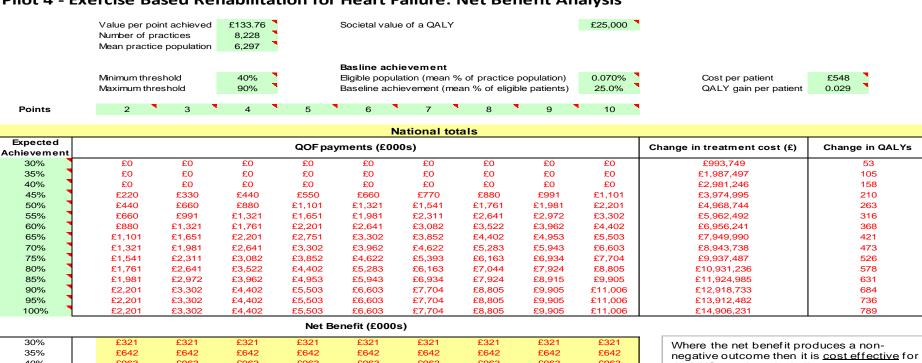
### Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis



				Not Be		3)			
30%	£856	£856	£856	£856	£856	£856	£856	£856	£856
35%	£1,712	£1,712	£1,712	£1,712	£1,712	£1,712	£1,712	£1,712	£1,712
40%	£2,568	£2,568	£2,568	£2,568	£2,568	£2,568	£2,568	£2,568	£2,568
45%	£3,204	£3,094	£2,983	£2,873	£2,763	£2,653	£2,543	£2,433	£2,323
50%	£3,839	£3,619	£3,399	£3,179	£2,959	£2,739	£2,519	£2,299	£2,078
55%	£4,475	£4,145	£3,815	£3,485	£3,155	£2,824	£2,494	£2,164	£1,834
60%	£5,111	£4,671	£4,231	£3,790	£3,350	£2,910	£2,470	£2,029	£1,589
65%	£5,747	£5,197	£4,646	£4,096	£3,546	£2,995	£2,445	£1,895	£1,345
70%	£6,383	£5,722	£5,062	£4,402	£3,741	£3,081	£2,421	£1,760	£1,100
75%	£7,018	£6,248	£5,478	£4,707	£3,937	£3,166	£2,396	£1,626	£855
80%	£7,654	£6,774	£5,893	£5,013	£4,132	£3,252	£2,372	£1,491	£611
85%	£8,290	£7,300	£6,309	£5,319	£4,328	£3,338	£2,347	£1,356	£366
90%	£8,926	£7,825	£6,725	£5,624	£4,524	£3,423	£2,322	£1,222	£121
95%	£9,782	£8,681	£7,581	£6,480	£5,380	£4,279	£3,178	£2,078	£977
100%	£10,638	£9,537	£8,437	£7,336	£6,235	£5,135	£4,034	£2,934	£1,833

# Appendix C: Net Benefit Analysis Assuming 50% Reduction in Utility

#### Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis



						- /			
30%	£321	£321	£321	£321	£321	£321	£321	£321	£321
35%	£642	£642	£642	£642	£642	£642	£642	£642	£642
40%	£963	£963	£963	£963	£963	£963	£963	£963	£963
45%	£1,064	£954	£844	£734	£624	£513	£403	£293	£183
50%	£1,165	£945	£724	£504	£284	£64	-£156	-£376	-£596
55%	£1,265	£935	£605	£275	-£55	-£385	-£716	-£1,046	-£1,376
60%	£1,366	£926	£486	£46	-£395	-£835	-£1,275	-£1,715	-£2,155
65%	£1,467	£917	£367	-£184	-£734	-£1,284	-£1,835	-£2,385	-£2,935
70%	£1,568	£908	£247	-£413	-£1,073	-£1,734	-£2,394	-£3,054	-£3,715
75%	£1,669	£899	£128	-£642	-£1,413	-£2,183	-£2,953	-£3,724	-£4,494
80%	£1,770	£889	£9	-£872	-£1,752	-£2,633	-£3,513	-£4,393	-£5,274
85%	£1,871	£880	-£110	-£1,101	-£2,091	-£3,082	-£4,072	-£5,063	-£6,054
90%	£1,972	£871	-£230	-£1,330	-£2,431	-£3,531	-£4,632	-£5,733	-£6,833
95%	£2,292	£1,192	£91	-£1,009	-£2,110	-£3,210	-£4,311	-£5,412	-£6,512
100%	£2,613	£1,513	£412	-£688	-£1,789	-£2,889	-£3,990	-£5,091	-£6,191

the NHS to adopt the indicator.

# Appendix D: Net Benefit Analysis Assuming Lower Estimate for Eligible Population

Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis

FIIOL 4 - LA	CEICISE D	aseu ne	iiabiiita		Heart	andle.	IVEL DEI	ient Ai	iaiysis		
	Number of p	oint achieved ractices ce population	£133.76 8,228 6,297		Societal valu	ue of a QALY			£25,000	1	
	Minimum thre Maximum thr		40% 90%			nievement lation (mean % nievement (me			0.039% 25.0%	Cost per patient QALY gain per patient	£548 0.058
Points	2	3	4	5	6	7	8	9	10		
					N	National to	tals				
Expected Achievement				QOF pa	yments (£00	00s)				Change in treatment cost (£)	Change in QALYs
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£553,660	59
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,107,320	117
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,660,980	176
45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£2,214,640	234
50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£2,768,300	293
55%	£660	£991	£1,321	£1,651	£1,981	£2,311	£2,641	£2,972	£3,302	£3,321,960	352
60%	£880	£1,321	£1,761	£2,201	£2,641	£3,082	£3,522	£3,962	£4,402	£3,875,620	410
65%	£1,101	£1,651	£2,201	£2,751	£3,302	£3,852	£4,402	£4,953	£5,503	£4,429,280	469
70%	£1,321	£1,981	£2,641	£3,302	£3,962	£4,622	£5,283	£5,943	£6,603	£4,982,940	527
75%	£1,541	£2,311	£3,082	£3,852	£4,622	£5,393	£6,163	£6,934	£7,704	£5,536,600	586
80%	£1,761	£2,641	£3,522	£4,402	£5,283	£6,163	£7,044	£7,924	£8,805	£6,090,260	645
85%	£1,981	£2,972	£3,962	£4,953	£5,943	£6,934	£7,924	£8,915	£9,905	£6,643,920	703
90%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£7,197,580	762
95%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£7,751,240	820
100%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£8,304,900	879
				Net B	enefit (£000	s)					
30%	£911	£911	£911	£911	£911	£911	£911	£911	£911	Where the net benefit pro	oduces a non-
35%	£1,823	£1,823	£1,823	£1,823	£1,823	£1,823	£1,823	£1,823	£1,823	negative outcome then it	
40%	£2,734	£2,734	£2,734	£2,734	£2,734	£2,734	£2,734	£2,734	£2,734	the NHS to adopt the ind	
45%	£3,425	£3,315	£3,205	£3,095	£2,985	£2,875	£2,765	£2,655	£2,545		
50%	£4,116	£3,896	£3,676	£3,456	£3,236	£3,016	£2,796	£2,576	£2,355	When this is the case, th	e cells are
55%	£4,808	£4,477	£4,147	£3,817	£3,487	£3,157	£2,827	£2,496	£2,166	highlighted with a yellow	
60%	£5,499	£5,059	£4,618	£4,178	£3,738	£3,298	£2,857	£2,417	£1,977		g
65%	£6,190	£5,640	£5,089	£4,539	£3,989	£3,439	£2,888	£2,338	£1,788		
70%	£6,881	£6,221	£5,560	£4,900	£4,240	£3,579	£2,919	£2,259	£1,598		
75%	£7,572	£6,802	£6,032	£5,261	£4,491	£3,720	£2,950	£2,180	£1,409		
80%	£8,264	£7,383	£6,503	£5,622	£4,742	£3,861	£2,981	£2,100	£1,220		
85%	£8,955	£7,964	£6,974	£5,983	£4,993	£4,002	£3,012	£2,021	£1,031		
90%	£9,646	£8,545	£7,445	£6,344	£5,244	£4,143	£3,042	£1,942	£841		
95%	£10,557	£9,457	£8,356	£7,256	£6,155	£5,054	£3,954	£2,853	£1,753		

# **Appendix E: Net Benefit Base Case Analysis**

**Points** 

## Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis

Value per point achieved	£133.76	Societal value of a QALY	£20,000		
Number of practices	8,228				
Mean practice population	6,297				
		Bas line achievement			
Minimum threshold	40%	Basline achievement  Eligible population (mean % of practice population)	0.070%	Cost per patient	£5-

					N	lational to	tals				
Expected Achievement				QOF pay	yments (£00	)0s)				Change in treatment cost (£)	Change in QALYs
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£993,749	105
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,987,497	210
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£2,981,246	316
45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£3,974,995	421
50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£4,968,744	526
55%	£660	£991	£1,321	£1,651	£1,981	£2,311	£2,641	£2,972	£3,302	£5,962,492	631
60%	£880	£1,321	£1,761	£2,201	£2,641	£3,082	£3,522	£3,962	£4,402	£6,956,241	736
65%	£1,101	£1,651	£2,201	£2,751	£3,302	£3,852	£4,402	£4,953	£5,503	£7,949,990	841
70%	£1,321	£1,981	£2,641	£3,302	£3,962	£4,622	£5,283	£5,943	£6,603	£8,943,738	947
75%	£1,541	£2,311	£3,082	£3,852	£4,622	£5,393	£6,163	£6,934	£7,704	£9,937,487	1052
80%	£1,761	£2,641	£3,522	£4,402	£5,283	£6,163	£7,044	£7,924	£8,805	£10,931,236	1157
85%	£1,981	£2,972	£3,962	£4,953	£5,943	£6,934	£7,924	£8,915	£9,905	£11,924,985	1262
90%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£12,918,733	1367
95%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£13,912,482	1472
100%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£14,906,231	1578

	Net Benefit (£000s)												
30%		£1,110	£1,110	£1,110	£1,110	£1,110	£1,110	£1,110	£1,110	£1,110			
35%		£2,220	£2,220	£2,220	£2,220	£2,220	£2,220	£2,220	£2,220	£2,220			
40%		£3,329	£3,329	£3,329	£3,329	£3,329	£3,329	£3,329	£3,329	£3,329			
45%		£4,219	£4,109	£3,999	£3,889	£3,779	£3,669	£3,559	£3,449	£3,339			
50%		£5,109	£4,889	£4,669	£4,448	£4,228	£4,008	£3,788	£3,568	£3,348			
55%		£5,998	£5,668	£5,338	£5,008	£4,678	£4,348	£4,017	£3,687	£3,357			
60%		£6,888	£6,448	£6,008	£5,567	£5,127	£4,687	£4,247	£3,807	£3,366			
65%		£7,778	£7,228	£6,677	£6,127	£5,577	£5,026	£4,476	£3,926	£3,376			
70%		£8,668	£8,007	£7,347	£6,687	£6,026	£5,366	£4,705	£4,045	£3,385			
75%		£9,557	£8,787	£8,016	£7,246	£6,476	£5,705	£4,935	£4,164	£3,394			
80%		£10,447	£9,566	£8,686	£7,806	£6,925	£6,045	£5,164	£4,284	£3,403			
85%		£11,337	£10,346	£9,356	£8,365	£7,375	£6,384	£5,394	£4,403	£3,412			
90%		£12,226	£11,126	£10,025	£8,925	£7,824	£6,723	£5,623	£4,522	£3,422			
95%		£13,336	£12,236	£11,135	£10,034	£8,934	£7,833	£6,733	£5,632	£4,532			
100%		£14,446	£13,345	£12,245	£11,144	£10,044	£8,943	£7,842	£6,742	£5,641			

Where the net benefit produces a nonnegative outcome then it is <u>cost effective</u> for the NHS to adopt the indicator.

# Appendix F: Net Benefit Analysis Assuming Upper Bound for Costs of Rehabilitation

## Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis

	Value per po Number of pr Mean practic	ractices	8,228	3	Societal v	alue of a QAL	_Y		£20,000		
	Minimum thre Maximum thre		40% 90%	-	Eligible po		t n % of practio mean % of eli		·	Cost per patient QALY gain per patient	£978 0.058
Points	2	3	4	5	6	7	8	9	10		
						National	totals				
Expected Achievement				QOI	payments (£	2000s)				Change in treatment cost (£)	Change in Q
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,773,515	105
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£3,547,030	210
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£5,320,545	316

Expected Achievement				QOF pay		Change in treatment cost (£)	Change in QALYs				
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,773,515	105
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£3,547,030	210
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£5,320,545	316
45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£7,094,060	421
50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£8,867,575	526
55%	£660	£991	£1,321	£1,651	£1,981	£2,311	£2,641	£2,972	£3,302	£10,641,090	631
60%	£880	£1,321	£1,761	£2,201	£2,641	£3,082	£3,522	£3,962	£4,402	£12,414,605	736
65%	£1,101	£1,651	£2,201	£2,751	£3,302	£3,852	£4,402	£4,953	£5,503	£14,188,120	841
70%	£1,321	£1,981	£2,641	£3,302	£3,962	£4,622	£5,283	£5,943	£6,603	£15,961,635	947
75%	£1,541	£2,311	£3,082	£3,852	£4,622	£5,393	£6,163	£6,934	£7,704	£17,735,150	1052
80%	£1,761	£2,641	£3,522	£4,402	£5,283	£6,163	£7,044	£7,924	£8,805	£19,508,665	1157
85%	£1,981	£2,972	£3,962	£4,953	£5,943	£6,934	£7,924	£8,915	£9,905	£21,282,180	1262
90%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£23,055,696	1367
95%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£24,829,211	1472
100%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£26,602,726	1578

	Net Benefit (£000s)												
30%		£330	£330	£330	£330	£330	£330	£330	£330	£330			
35%		£660	£660	£660	£660	£660	£660	£660	£660	£660			
40%		£990	£990	£990	£990	£990	£990	£990	£990	£990			
45%		£1,100	£990	£880	£770	£660	£550	£440	£330	£220			
50%		£1,210	£990	£770	£550	£330	£109	-£111	-£331	-£551			
55%		£1,320	£990	£660	£329	-£1	-£331	-£661	-£991	-£1,321			
60%		£1,430	£990	£549	£109	-£331	-£771	-£1,212	-£1,652	-£2,092			
65%		£1,540	£989	£439	-£111	-£661	-£1,212	-£1,762	-£2,312	-£2,863			
70%		£1,650	£989	£329	-£331	-£992	-£1,652	-£2,312	-£2,973	-£3,633			
75%		£1,760	£989	£219	-£552	-£1,322	-£2,092	-£2,863	-£3,633	-£4,404			
80%		£1,870	£989	£109	-£772	-£1,652	-£2,533	-£3,413	-£4,294	-£5,174			
85%		£1,979	£989	-£2	-£992	-£1,983	-£2,973	-£3,964	-£4,954	-£5,945			
90%		£2,089	£989	-£112	-£1,212	-£2,313	-£3,414	-£4,514	-£5,615	-£6,715			
95%		£2,419	£1,319	£218	-£882	-£1,983	-£3,083	-£4,184	-£5,285	-£6,385			
100%		£2,749	£1,649	£548	-£552	-£1,653	-£2,753	-£3,854	-£4,955	-£6,055			

Where the net benefit produces a nonnegative outcome then it is <u>cost effective</u> for the NHS to adopt the indicator.

# Appendix G: Net Benefit Analysis Assuming 50% Reduction in Utility

## Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis

	Value per po Number of p Mean practio		£133.76 8,228 6,297		Societal val	ue of a QALY	•		£20,000		
	Minimum thre Maximum thr		40% 90%		Eligible popu	•	•	e population) gible patients)	0.070% 25.0%	Cost per patient QALY gain per patient	£548 0.029
Points	2	3	4	5	6	7	8	9	10		
						National to	otals				
Expected Achievement				QOF pa	yments (£0	00s)				Change in treatment cost (£)	Change in QALYs
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£993,749	53
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,987,497	105
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£2,981,246	158
45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£3,974,995	210
50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£4,968,744	263
55%	£660	£991	£1,321	£1,651	£1,981	£2,311	£2,641	£2,972	£3,302	£5,962,492	316
60%	£880	£1,321	£1,761	£2,201	£2,641	£3,082	£3,522	£3,962	£4,402	£6,956,241	368
65%	£1,101	£1,651	£2,201	£2,751	£3,302	£3,852	£4,402	£4,953	£5,503	£7,949,990	421
70%	£1,321	£1,981	£2,641	£3,302	£3,962	£4,622	£5,283	£5,943	£6,603	£8,943,738	473
75%	£1,541	£2,311	£3,082	£3,852	£4,622	£5,393	£6,163	£6,934	£7,704	£9,937,487	526
80%	£1,761	£2,641	£3,522	£4,402	£5,283	£6,163	£7,044	£7,924	£8,805	£10,931,236	578
85%	£1,981	£2,972	£3,962	£4,953	£5,943	£6,934	£7,924	£8,915	£9,905	£11,924,985	631
90%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£12,918,733	684
95%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£13,912,482	736
100%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£14,906,231	789
				Net B	Benefit (£00	0s)					
30%	£58	£58	£58	£58	£58	£58	£58	£58	£58	Where the net benefit pro	oduces a non-
35%	£116	£116	£116	£116	£116	£116	£116	£116	£116	negative outcome then it	
40%	£174	£174	£174	£174	£174	£174	£174	£174	£174	the NHS to adopt the ind	
45%	£12	-£98	-£208	-£318	-£428	-£538	-£648	-£758	-£868	and the to adopt the maleator.	

					•	•			
30%	£58	£58	£58	£58	£58	£58	£58	£58	£58
35%	£116	£116	£116	£116	£116	£116	£116	£116	£116
40%	£174	£174	£174	£174	£174	£174	£174	£174	£174
45%	£12	-£98	-£208	-£318	-£428	-£538	-£648	-£758	-£868
50%	-£150	-£370	-£590	-£810	-£1,031	-£1,251	-£1,471	-£1,691	-£1,911
55%	-£312	-£642	-£973	-£1,303	-£1,633	-£1,963	-£2,293	-£2,623	-£2,954
60%	-£474	-£914	-£1,355	-£1,795	-£2,235	-£2,675	-£3,116	-£3,556	-£3,996
65%	-£636	-£1,187	-£1,737	-£2,287	-£2,837	-£3,388	-£3,938	-£4,488	-£5,039
70%	-£798	-£1,459	-£2,119	-£2,779	-£3,440	-£4,100	-£4,761	-£5,421	-£6,081
75%	-£961	-£1,731	-£2,501	-£3,272	-£4,042	-£4,813	-£5,583	-£6,353	-£7,124
80%	-£1,123	-£2,003	-£2,884	-£3,764	-£4,644	-£5,525	-£6,405	-£7,286	-£8,166
85%	-£1,285	-£2,275	-£3,266	-£4,256	-£5,247	-£6,237	-£7,228	-£8,218	-£9,209
90%	-£1,447	-£2,547	-£3,648	-£4,749	-£5,849	-£6,950	-£8,050	-£9,151	-£10,251
95%	-£1,389	-£2,489	-£3,590	-£4,690	-£5,791	-£6,892	-£7,992	-£9,093	-£10,193
100%	-£1,331	-£2,431	-£3,532	-£4,632	-£5,733	-£6,834	-£7,934	-£9,035	-£10,135

# Appendix H: Net Benefit Analysis Assuming Lower Estimate for Eligible Population

# Pilot 4 - Exercise Based Rehabilitation for Heart Failure: Net Benefit Analysis

85%

90%

95%

100%

£5,439

£5,837

£6,455

£7,074

£4,448

£4,736

£5,355

£5,973

£3,458

£3,636

£4,254

£4,873

£2,467

£2,535

£3,154

£3,772

£1,477

£1,435

£2,053

£2,671

£486

£334

£1,571

-£504

-£766

-£148

£470

-£1,495

-£1,867

-£1,249

-£630

-£2,485

-£2,968

-£2,349

-£1,731

	Value per po Number of p Mean practio		£133.76 8,228 6,297		Societal valu	ie of a QALY			£20,000	1	
	Minimum thre Maximum thr		40% 90%			<b>nievement</b> lation (mean % nievement (me			0.039% 25.0%	Cost per patient QALY gain per patient	£548 0.058
Points	2	3	4	5	6	7	8	9	10		
					N	National to	tals				
Expected Achievement				QOF pa	yments (£00	00s)				Change in treatment cost (£)	Change in QALYs
30%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£553,660	59
35%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,107,320	117
40%	£0	£0	£0	£0	£0	£0	£0	£0	£0	£1,660,980	176
45%	£220	£330	£440	£550	£660	£770	£880	£991	£1,101	£2,214,640	234
50%	£440	£660	£880	£1,101	£1,321	£1,541	£1,761	£1,981	£2,201	£2,768,300	293
55%	£660	£991	£1,321	£1,651	£1,981	£2,311	£2,641	£2,972	£3,302	£3,321,960	352
60%	£880	£1,321	£1,761	£2,201	£2,641	£3,082	£3,522	£3,962	£4,402	£3,875,620	410
65%	£1,101	£1,651	£2,201	£2,751	£3,302	£3,852	£4,402	£4,953	£5,503	£4,429,280	469
70%	£1,321	£1,981	£2,641	£3,302	£3,962	£4,622	£5,283	£5,943	£6,603	£4,982,940	527
75%	£1,541	£2,311	£3,082	£3,852	£4,622	£5,393	£6,163	£6,934	£7,704	£5,536,600	586
80%	£1,761	£2,641	£3,522	£4,402	£5,283	£6,163	£7,044	£7,924	£8,805	£6,090,260	645
85%	£1,981	£2,972	£3,962	£4,953	£5,943	£6,934	£7,924	£8,915	£9,905	£6,643,920	703
90%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£7,197,580	762
95%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£7,751,240	820
100%	£2,201	£3,302	£4,402	£5,503	£6,603	£7,704	£8,805	£9,905	£11,006	£8,304,900	879
				Net E	Benefit (£000	s)					
30%	£618	£618	£618	£618	£618	£618	£618	£618	£618	Where the net benefit pro	oduces a non-
35%	£1,237	£1,237	£1,237	£1,237	£1,237	£1,237	£1,237	£1,237	£1,237	negative outcome then it	
40%	£1,855	£1,855	£1,855	£1,855	£1,855	£1,855	£1,855	£1,855	£1,855	the NHS to adopt the ind	
45%	£2,253	£2,143	£2,033	£1,923	£1,813	£1,703	£1,593	£1,483	£1,373		
50%	£2,651	£2,431	£2,211	£1,991	£1,771	£1,551	£1,331	£1,111	£890	When this is the case. th	e cells are
55%	£3,050	£2,719	£2,389	£2,059	£1,729	£1,399	£1,069	£738	£408	highlighted with a yellow	
60%	£3,448	£3,008	£2,567	£2,127	£1,687	£1,247	£806	£366	-£74	Ingringrica with a yellow	Dading Tourid.
65%	£3,846	£3,296	£2,745	£2,195	£1,645	£1,095	£544	-£6	-£556		
70%	£4,244	£3,584	£2,924	£2,263	£1,603	£942	£282	-£378	-£1,039		
75%	£4,642	£3,872	£3,102	£2,331	£1,561	£790	£20	-£750	-£1,521		
	£5,041	£4,160	£3,280	£2,399	£1,519	£638	-£242	-£1,123	-£2,003	1	