PARCS PROJECT – THE ECONOMIC CASE FINAL REPORT

August 2014

CONTENTS

EXECUTIVE SUMMARY

This report examines the potential economic case for providing exercise maintenance services across Scotland. The comprehensiveness and conclusiveness of the calculations are limited by the lack of availability of data about exercise maintenance in Scotland, in particular:

- ★ participation levels
- ★ outcomes

To calculate approximate costs and benefits of exercise maintenance, we therefore made assumptions about possible uptake levels and drew inferences from a range of research evidence relating to both exercise maintenance and cardiac and pulmonary rehabilitation. There was insufficient evidence to calculate an economic case for exercise maintenance for people with stroke conditions.

Costs of delivery

The costs of delivering exercise maintenance to people with cardiac, pulmonary and stroke conditions across Scotland, based on a projected uptake of 12.45% of the eligible cohort, would be as shown in the table below:

Condition	Cost of classes with 20 participants	Cost of classes with 15 participants
Cardiac	£1,856,518	£4,367,677
Respiratory	£542,962	£1,277,382
Stroke	£545,401	£1,283,121

Potential savings for cardiac conditions

At 65% uptake, exercise maintenance could reduce avoidable readmissions by 30%. At the projected uptake levels, readmissions could be reduced by 5.75%.

The value of these readmissions would be in the range of £191,018 to £531,279, which alone is not sufficient to recover the costs of exercise maintenance.

However, there is an extensive evidence base describing the range positive outcomes of cardiac rehabilitation, together with research that shows these benefits mostly dissipate over a 6 to 12 month period without continued physical activity.

We would therefore argue that the reduced admissions, combined with the potential costs of not supporting cardiac rehabilitation completers to participate in exercise maintenance, together justify the expenditure.

Potential savings for pulmonary conditions

The evidence base is more comprehensive in relation to exercise maintenance for people with pulmonary conditions, and shows that it can lead to between 30 and 40% reduction in admissions.

Based on the projected 12.45% uptake levels, this would generate a net saving after the cost of delivery of between £369,354 and £1,652,686.

1 INTRODUCTION

Whilst there is considerable evidence of the physical and quality of life benefits of physical activity/exercise (more generally and for people with stroke, respiratory and cardiac conditions), the evidence base related directly to the economic benefits of exercise maintenance for people affected by stroke, respiratory and cardiac conditions is patchy. In order to fully quantify the benefits, further research is needed. In Scotland the lack of availability of data relating to exercise maintenance participants is a major limiting factor.

The PARCS project presented an opportunity to strengthen the evidence base, by assessing the economic impact of providing exercise maintenance services to people with cardiac, respiratory and stroke conditions across Scotland. The analysis described in this report was focused on the societal perspective in terms of NHS cost savings. Data to enable the analysis was drawn principally from secondary data sources, with bottom-up calculation of service costs. This has enabled an assessment of:

- ★ costs of service delivery – including an average unit cost at different scales of session delivery
- ★ cost-effectiveness based on savings from avoided admissions and readmissions[1]

[1] In relation to respiratory and cardiac conditions respectively; lack of data prevented a similar analysis for stroke.

2 METHODOLOGY FOR ASSESSING THE ECONOMIC CASE

Whilst the evidence base relating to the economic benefits of exercise maintenance is very limited, there is considerably more evidence about the economic benefits of rehabilitation, and the durability of these benefits; some of this can be used to make reasonable assumptions about the economic benefits of exercise maintenance. We also had access to a small amount of self-reported data from service users in CHSS-affiliated community based physical activity/exercise and support groups who responded to a PARCS survey (referred to as PARCS survey in the remainder of this chapter), which further assists in assessing whether there is an economic case for exercise maintenance.

2.1 Perspective of the economic assessment

We have assessed the potential economic case from the societal perspective, in terms of cost savings to the NHS as a result of exercise maintenance. In particular this is focused on admission and readmission rates.

2.2 Evidence available

The ideal basis for assessing the economic case for exercise maintenance would be high quality academic evidence (as described below) that examines the economic benefits of exercise maintenance on the three condition groups that are included in the PARCS project. Where this is not available, the next best option is evidence for the economic benefits and durability of benefits of rehabilitation for these condition groups (as exercise maintenance might be viewed as a long term extension of those benefits – see below). Each piece of evidence used in the economic assessment is referenced as a footnote (or, occasionally where more appropriate, in the main body of the text). After the reference, the level of evidence it represents is noted in brackets, using the following rating scale:

1++	High quality meta-analyses, systematic reviews of RCTs, or RCTs with a very low risk of bias
1+	Well conducted meta-analyses, systematic reviews, or RCTs with a low risk of bias
1-	Meta-analyses, systematic reviews, or RCTs with a high risk of bias
2++	High quality systematic reviews of case control or cohort studies High quality case control or cohort studies with a very low risk of confounding or bias and a high probability that the relationship is causal
2+	Well conducted case control or cohort studies with a low risk of confounding or bias and a moderate probability that the relationship is causal
2-	Case control or cohort studies with a high risk of confounding or bias and a significant risk that the relationship is not causal
3	Non-analytic studies eg case reports, case series
4	Expert opinion

We considered whether evidence related to the economic benefits of generic exercise referral schemes might be a third option in the absence of directly transferable evidence bases. However these are aimed at people at risk of developing a range of conditions, rather than those who have actually been diagnosed with cardiac, respiratory and stroke conditions, therefore we concluded

that we could not confidently draw inferences from this evidence about the economic benefits of exercise maintenance for people with diagnosed conditions. The benefits could be more or they could be less, therefore it would be risky to base any assessment on this data.

The types of evidence available for this assessment were as follows:

Table 1 – Evidence available for assessment of benefits of exercise maintenance and rehabilitation

Condition group	Academic evidence on economic benefits of exercise maintenance	Academic evidence on economic benefits of rehabilitation	Academic evidence on durability of benefits of rehabilitation[2]
Cardiac	No	Yes (1++)	Yes (1++)
Respiratory	Yes (2++)	Yes (1++)	Yes (1++)
Stroke	No	No	No

In addition, we had access to the PARCS survey data (n=221). This was used as supplementary data. We also had evidence of adherence and completion rates for exercise referral schemes and rehabilitation, which we used to inform assumptions about adherence rates for exercise maintenance. This was supplemented by data on cardiac rehabilitation numbers in Scotland supplied by the NHS Services Scotland Information Services Division.

Given the available evidence, we must make inferences from the pulmonary evidence-base to inform the assessment of the economic case for exercise maintenance for stroke and cardiac conditions (to a greater and lesser extent, respectively).

2.2.1 Why consider the benefits and durability of benefits of rehabilitation?

Rehabilitation (as defined in the glossary) is an intervention that combines a variety of inputs including advice on self-management, prevention and support with overcoming the psychological/emotional impacts of the condition. However, a major component of rehabilitation is supervised exercise to enable the person to regain functional capacity and develop habits that will enable them to maintain any gains achieved during the rehabilitation programme.

Rehabilitation is a fixed-term intervention, usually lasting between six and twelve weeks depending on the condition and provider. In many cases, patients are given advice on home-based exercise and/or the benefits of continuing physical activity at the end of rehabilitation. There is evidence that the quantifiable benefits (exercise capacity and amount of physical activity regularly undertaken) gained during cardiac[34] and pulmonary[56] rehabilitation diminish after the intensive programme ends.

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[2] The evidence in this category is not related to the economic benefits of rehabilitation, per se. However we are making an assumption that, if exercise maintenance extends the physical benefits of rehabilitation beyond the period they would typically endure without exercise maintenance, then economic benefits of rehabilitation will also be extended.

[3] Davies P, Taylor F, Beswick A, Wise F, Moxham T, Rees K, Ebrahim S. Promoting patient uptake and adherence in cardiac rehabilitation. Cochrane Database of Systematic Reviews 2010, Issue7. (1++)

[4] Pinto B, et al. Maintenance of Exercise After Phase II Cardiac Rehabilitation: A Randomized Controlled TrialAm J Prev Med . 2011 September ; 41(3): 274–283. (1+)

[5] Brooks D, Krip B, Mangovski-Alzamora S, Goldstein R. The effect of post-rehabilitation programs among individuals with COPD. *Eur Respir J*. 2002;20(1):20-29. (1++)

Based on this evidence we have concluded that exercise maintenance can extend the benefits of rehabilitation. The evidence only allows the assumption that benefits are extended by a year. Further research would be needed to demonstrate whether the benefits can be maintained beyond that period.

2.2.2 The cost benefits of exercise maintenance

The principal available evidence related to the economically quantifiable benefits of exercise maintenance is for patients with pulmonary conditions[7]. The evidence is based on a population-based sample (n=2386) tracked from 1981-3 to 2000 and 1991-4 and 2000. The study found that exercise equivalent to 2 hours cycling or walking per week or more was associated with a 30-40% reduction in COPD-related hospital admission and respiratory mortality.

2.2.3 The cost benefits of rehabilitation

A recent NHS Improvement document models potential economically quantifiable benefits of cardiac rehabilitation[8]. Based on data from across England, the modelling shows the potential for a 30% reduction in unplanned cardiac readmissions in a twelve month period, based on implementation of a 'gold standard' cardiac rehabilitation model with 65% patient uptake. It also cites other evidence, from a large scale systematic review, that a comprehensive cardiac rehabilitation service has the potential to reduce unplanned cardiac readmissions by 26% over a 5 year period[9]. The report also acknowledges a variety of other positive impacts associated with cardiac rehabilitation, cited by current English national clinical guidelines and quality standards[10] including, but not limited to:

- ★ a 26% relative reduction in cardiac mortality over five years according to an analysis of more than 48 randomised trials
- ★ a reduction in cardiac-related morbidity
- ★ an improvement in functional capacity and quality of life.

The economic assessment in this evaluation does not attempt to quantify these positive outcomes economically.

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[6] Beauchamp M, Evans R, Janaudis-Ferreira T, Goldstein R, Brooks D. Systematic Review of Supervised Exercise Programs After Pulmonary Rehabilitation in Individuals With COPD. Chest. 2013;144(4):1124-1133 (1++)

[7] Garcia-Aymerich J, Lange P, Benet M, Schnohr P, Anto JM. Regular physical activity reduces hospital admission and mortality in chronic obstructive pulmonary disease; a population based cohort study. *Thorax.* 2006; 61:772-778 (2++)

[8] NHS Improvement. Making the case for cardiac rehabilitation; modelling potential impact on readmissions. 2013

[9] Davies EJ, Moxham T, Rees K, Singh S, et al. Exercise based rehabilitation for heart failure. *Cochrane Database of Systematic Reviews.* 2010; Issue 4 (1++)

[10] National Institute for Health and Care Excellence (NICE). NICE CG48, NICE CG94, NICE CG108 and NICE QS9.

There is also evidence for reduced admissions as a result of pulmonary rehabilitation for patients with COPD. One randomised control study (n=191) found a 39.8% reduction in admissions over 12 months for patients completing pulmonary rehabilitation[11]. Another randomised control study (n=200) found no reduction in admissions, but a halving of the length of stay for patients who were admitted who had completed pulmonary rehabilitation[12].

2.2.4 Supplementary data on impact on admissions

We had access to the PARCS survey data on self-reported admissions (related to their condition) by exercise maintenance service users, and were able to compare this with national-level admissions data from ISD (2011)[13][14].

Table 2 – National data on admissions, bed days and patients derived from ISD data tables (referenced above) for calendar year 2012

Condition group	Admissions	Patients	Admitted patients as % of total prevalence	Total bed days	Mean bed days per admission	Mean admissions per patient
CHD	24897	19911	5.021%	113493	4.6	1.250
COPD	18904	12163	10.488%	144389	7.6	1.554
Stroke	7899	7607	6.530%	202767	25.7	1.038

Self-reported data on admissions from the 221 PARCS survey respondents showed average numbers of admissions per respondent as follows:

- Cardiac conditions: 0.38
- COPD: 0.42
- Stroke: 0.76

In addition, the majority of respondents had not had an admission in the previous year (78% of respondents with cardiac conditions, 67% of respondents with respiratory conditions and 60% of respondents with stroke conditions).

This suggests a substantial reduction in admissions compared to the national data. However it is important to note that the national admissions data also includes initial acute events, whereas many of the survey respondents had been living with their condition for a number of years. Nevertheless this small scale dataset does offer positive indications of the role of exercise maintenance in reducing admissions.

[11] Bourbeau J, et al. Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention. *Arch Intern Med.* 2003;163:585-591 (1++)

[12] Griffiths TL, et al. Results at 1 year of outpatient multidisciplinary pulmonary rehabilitation: a randomised controlled trial. *Lancet*. 2000 Jan 29;355(9201):362-8. (1++)

[13] Cardiac and Stroke data taken from ISD Table: Number of bed days, admissions and patients for selected conditions, NHS Scotland, Calendar Year 2011.

[14] COPD data taken from ISD Table: Total and average number of admissions and bed days for COPD, NHS Scotland, Calendar Year 2011.

2.3 Assumptions in our calculations

There is very limited data available in Scotland about exercise maintenance uptake and adherence levels, therefore a number of assumptions were essential to the economic calculations. These are as follows:

2.3.1 Eligible cohort

We have assumed that all patients with a cardiac condition[15] or COPD[16][17] or stroke (including TIA) condition[18] should be eligible for physical activity, therapeutic exercise and physical fitness training unless there are any absolute contra-indications to these interventions. ISD prevalence data allows us to calculate the eligible cohort, however we must note that no account has been made of possible double counting for people with more than one of the cardiac conditions for which data is available:

Table 3 – Prevalence of condition and numbers eligible for rehabilitation

Condition group	Total prevalence (and eligible cohort)
Cardiac[19]	396543
Respiratory[20]	115974
Stroke[21]	116495

[15] Based on SIGN Guideline 57: Cardiac rehabilitation (2002)

[16] Whilst the Scottish Clinical Standards for COPD indicate that rehabilitation should only be offered to people with a MRC dyspnoea rating of 3 or above, it is not possible to disaggregate the number of people with COPD that would fall into this category from the data available. However, there is an argument for offering rehabilitation to all people diagnosed with COPD, to maintain fitness and delay/prevent deterioration.

[17] Some patients with other pulmonary conditions (not COPD) would also be eligible for rehabilitation and exercise maintenance. However data on the potential numbers are not available. COPD would account for the majority of eligible patients, therefore has been used as a proxy.

[18] Based on expert guidance provided by Prof. Frederike van Wijck PhD MCSP FHEA, Professor in Neurological Rehabilitation, Glasgow Caledonian University, Prof. Gillian Meade, MB B Chir, MA, MD, FRCP, Professor of Stroke and Elderly Care Medicine, Honorary Consultant Geriatrician, The University of Edinburgh and Mr Mark Smith Consultant Physiotherapist, Strategic AHP Lead Stroke Rehabilitation - NHS Lothian, based on the following rationale:
Eligibility for physical activity, (therapeutic) exercise and physical fitness training depends largely on the presence of contra-indications. To our knowledge, there are no reliable data on the number of stroke survivors with absolute or relative contra-indications to these interventions. Often, interventions can be tailored to people with relative contra-indications. Additionally, in some cases absolute or relative contra-indications can be treated successfully, after which people may be eligible for one or more of these interventions. (4)

[19] ISD Quality and Outcomes Framework data for Coronary Heart Disease, Left Ventricular Dysfunction, Heart Failure, Atrial Fibrillation 2012/13

[20] ISD Quality and Outcomes data for COPD 2012/13

[21] ISD Quality and Outcomes Framework data for Stroke and TIA 2012/13

2.3.2 Likely uptake

Given the lack of available data on likely uptake of exercise maintenance, we have used figures from the available evidence about:

- likely or target uptake of rehabilitation
- adherence/completion rates for rehabilitation
- likely uptake of exercise maintenance amongst those completing rehabilitation

The expected uptake for cardiac rehabilitation, cited in the Scottish Intercollegiate Guidelines Network (SIGN) guideline for cardiac rehabilitation[22], is 80%. Current uptake in Scotland is 58% - an increase on the 45% uptake achieved in 2008[23]. Assuming continued increases in uptake, we have used 65% as our estimate for rehabilitation uptake.

Evidence from an evaluation of generic exercise referral[24] showed likely adherence and completion at 37 – 48%, although the programmes under review were time-limited and of varying length. We have used the upper end of this range (taking a cautious view of potential costs) in the absence of figures about adherence rates for rehabilitation. Given that the initial uptake figures for exercise referral schemes look broadly similar to the rehabilitation target figures, we have assumed that the adherence to rehabilitation will also be broadly similar. However, it is important to note that exercise referral schemes are focused on primary prevention and therefore tend not to accept referrals for people with the pre-existing conditions that are the subject of this study.

Evidence on uptake of exercise maintenance is taken from the audit of referrals made by pulmonary rehabilitation services in NHS Greater Glasgow and Clyde to Live Active and Vitality services - conducted as part of this BLF evaluation (see chapter 4). This shows a referral rate of 57%. In terms of adherence to exercise maintenance, no Scottish data is available. However, the review of services outside of Scotland, led by BHF as part of the PARCS project, generated anecdotal evidence that adherence at 50-70% could be reasonably expected[25][26]. Again to err on the side of caution, we have assumed 70% of those who are referred will adhere as they have already demonstrated commitment through their completion of rehabilitation.

Therefore, the cohort for assessing costs and benefits has been calculated using the following process of discounting:

- number eligible for rehabilitation
- discounted by 35% to arrive at 65% uptake
- discounted by 52% to arrive at 48% rehabilitation completion
- discounted by 43% to arrive at 57% referral to exercise maintenance
- discounted by 30% to arrive at 70% adherence to exercise maintenance

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[22] SIGN Guideline 57: Cardiac Rehabilitation (2002)

[23] ISD Cardiac Rehabilitation Tables 2011/12

[24] Pavey TG, Anokye N, Taylor AH, Trueman P, Moxham T, Fox KR, et al. The clinical effectiveness and cost-effectiveness of exercise referral schemes: a systematic review and economic evaluation. *Health Technol Assess* 2011;15(44). (1++)

[25] Service Provision Scoping Report - Wales, BHF Scotland, 2014. (Part of the PARCS project)

[26] Service Provision Scoping Report – England & Northern Ireland, BHF Scotland, 2014. (Part of the PARCS project)

The table below shows the discounting and end figures for each condition group:

Table 4 – Discounting and end figures by condition

Condition group	Eligible for rehab	Rehab uptake 65%	Rehab adherence 48%	EM referral 57%	EM adherence 70%
Cardiac	396543	257753	123721	70521	49365
Respiratory	115974	75383	36184	20625	14437
Stroke	116495	75722	36346	20717	14502

Whilst this only represents 12.45% of people eligible for exercise maintenance potentially taking it up and adhering, the figure may be lower than this in reality; anecdotal evidence from the PARCS partners indicates that slippage between referral to and initial attendance at exercise maintenance is a significant issue.

These figures were used to calculate costs of service provision and quantifiable benefits. It is important to note that anecdotal evidence[27] suggests that there would be variations in uptake and adherence between conditions, but the lack of data on actual uptake and adherence means that we do not have reliable figures on these variations. Therefore we must use the same assumptions across all condition groups.

[27] Findings of PARCS scoping research undertaken by CHSS, based on meetings with HCPs and service providers across Scotland and surveys of HCP, GPs, service providers and Managed Clinical Networks to compile regional overview profiles.

3 FINDINGS – COST AND BENEFIT CALCULATIONS

3.1 Calculation of costs

We have estimated the cost of providing exercise maintenance services, based on the likely uptake in a year as calculated in chapter 2. The table below shows how we arrived at our gross class costs using a 'bottom up' calculation methodology.

Table 5 – Cost per class calculations

Salary from current online vacancy for physical activity referral trainer (Bo'Ness)		£ 23,000.00
Salary plus 'on costs' at 30%		£ 29,900.00
Hourly rate based on 37 hour week (46 working weeks after leave)		£ 17.57
Instructor for 1.5 hours (including set up and break down of 1 hour class)		£ 26.35
Venue hire (average of current costs cited by a number of leisure and community venues across Scotland - sourced directly by the Brightpurpose research team)		£ 40.00
Cost per class		£ 66.35

The delivery model we have costed is based on:

1 hour of exercise instruction per week per person for 46 weeks per year, delivered by a qualified instructor, either in a leisure services venue (such as a leisure centre) or a community-based support group (eg in a community venue such as a church hall or community centre).

However, it is important to note that we are aware of other models of delivery that may have higher costs, such as:

- services employing self-employed instructors to run sessions (usually paid in the region of £25 per hour for a phase IV qualified instructor); this provides flexibility to respond to variable demand
- services with a dedicated coordinator acting as a single point of contact for assessing and directing service users into the most appropriate provision (although in some cases the coordinator undertakes this role as part of a wider existing role, such as leisure services manager; in this case there may be limited additional costs, depending on demand)
- services where an instructor conducts an assessment with a service user before inviting them to join the most appropriate provision (again this is sometimes undertaken by a staff instructor as part of their existing role, therefore may have limited impact on cost)

We are also aware that, in some cases, support groups have been able to secure community venues at substantially reduced prices. Where this is possible, the costs of delivery would be lower than the costs set out below. However, it would be unrealistic to assume that these arrangements could be secured at scale across Scotland, therefore they have not been factored into the calculations.

3.1.1 Class/group sizes and unit costs

We have observed classes run by a single instructor, with up to 25 participants. However, we recognise that not all service providers would want to work with those ratios, and indeed in some locations and for some client groups (eg rural and stroke) this would not necessarily be feasible. We have therefore calculated costs per session per person based on class sizes from 5 through to 25. We have also provided a cost for one to one instruction, per person per session[28]. In all cases, we have assumed that sessions are 1 hour in length. We have also assumed a £2.50 contribution per session per participant, as this was the typical price paid by service users involved in our evaluation (Table 6).

Table 6 – Cost per person by class size

Class size	Gross cost pp	Cost pp (after £2.50 contribution)
5	£ 13.27	£ 10.77
6	£ 11.06	£ 8.56
7	£ 9.48	£ 6.98
8	£ 8.29	£ 5.79
9	£ 7.37	£ 4.87
10	£ 6.64	£ 4.14
11	£ 6.03	£ 3.53
12	£ 5.53	£ 3.03
13	£ 5.10	£ 2.60
14	£ 4.74	£ 2.24
15	£ 4.42	£ 1.92
16	£ 4.15	£ 1.65
17	£ 3.90	£ 1.40
18	£ 3.69	£ 1.19
19	£ 3.49	£ 0.99
20	£ 3.32	£ 0.82
21	£ 3.16	£ 0.66
22	£ 3.02	£ 0.52
23	£ 2.88	£ 0.38
24	£ 2.76	£ 0.26
25	£ 2.65	£ 0.15

The cost of one to one instruction, again for 1 hour assuming a £2.50 contribution by the participant, would be £15.07.

[28] Using data from one study, inflation-adjusted to 2014 prices: North Lanarkshire Leisure Services. Social Impact Evaluation. 2010.

3.1.2 Delivery costs (after service user contributions)

With a class size of 20, the cost per year across Scotland (after service user contributions) would be as follows:

Table 7 – Annual cost of 20 person class across Scotland by condition

Condition group	Uptake numbers	Annual cost
Cardiac	49365	£ 1,856,518.43
Respiratory	14437	£ 542,962.22
Stroke	14502	£ 545,401.42

At a class size of 15 the delivery costs (after service user contributions) would rise to:

Table 8 – Annual cost of 15 person class across Scotland by condition

Condition group	Uptake numbers	Annual cost
Cardiac	49365	£ 4,367,676.96
Respiratory	14437	£ 1,277,382.20
Stroke	14502	£ 1,283,120.69

3.2 Calculation of benefits

Based on the available data, we are able to estimate the value of benefits for exercise maintenance for different condition groups as follows:

- cardiac conditions – maintenance of reductions in readmissions achieved by cardiac rehabilitation
- respiratory conditions – reduced admissions achieved by exercise maintenance
- stroke – no calculation of benefits possible due to a lack of data

3.2.1 Benefits of exercise maintenance for people with cardiac conditions

The principal quantifiable benefit of exercise maintenance for cardiac patients is the preservation of the benefits of cardiac rehabilitation in the longer term. The evidence indicates a potential 30% annual reduction in readmissions arising from cardiac rehabilitation, but evidence relating to the durability of benefits of cardiac and pulmonary rehabilitation shows that benefits can be lost within a 6 month to 1 year period, due to lapse in healthy habits acquired during rehabilitation and forgetting important information learned during rehabilitation. We have therefore assumed that a year of exercise maintenance could preserve the benefits of cardiac rehabilitation for a further year.

As the modelling that provided evidence of a 30% reduction in cardiac readmissions was based on 65% uptake of cardiac rehabilitation, and we are basing our calculations on 12.44% adherence to exercise maintenance, we discounted the potential readmissions from exercise maintenance to reflect these differing levels of uptake.

Table 9 below shows the potential reduction in readmissions based on this proportionate discounting to be 5.75%

Table 9: potential readmission avoidance rate for cardiac patients

	Uptake	Readmission avoidance rate
CR uptake in modelling	65%	30%
Projected uptake of EM	12.45%	5.75%

The most recently available cardiac readmissions data for Scotland, supplied by ISD indicates that there were 1819 cardiac readmissions in the calendar year 2012. A 5.75% rate of avoided readmissions equates to 104 saved readmissions, and approximately 476 bed days saved.

The most up to date figures available for costs of admissions in Scotland are in the Scottish Tariff, published by ISD. There is no single figure for the cost of an average bed day, but the tariff provides costs for non-elective admissions across a range of conditions. We have used these figures to calculate the value of avoided cardiac admissions as follows:

Table 10 - Cost per individual admission for CHD

Condition group	Lower end of range	Upper end of range	Midpoint
CHD	£ 1,829.00	£ 5,087.00	£ 3,458.00

CHD admission costs were calculated using the following tariff codes:

- ★ lower end – cardiac condition without critical care
- ★ upper end – cardiac condition with critical care

Table 11 provides a calculation of the potential financial value of the saved readmissions.

Table 11 – Cost value of readmissions avoided (cardiac conditions)

Rate of readmissions avoided	Value based on lower end	Value based on upper end	Value based on midpoint
5.75%	£ 191,018.17	£ 531,279.08	£ 361,148.63

As the annual cost of providing exercise maintenance for people with cardiac conditions would be between £1.86m and £4.37m, the saved readmissions alone would not recover the costs of the exercise maintenance provision. However, there is an extensive evidence base describing the range positive outcomes of cardiac rehabilitation, together with research that shows these benefits mostly dissipate over a 6 to 12 month period without continued physical activity. We would therefore argue that the reduced admissions, combined with the potential costs of not supporting cardiac rehabilitation completers to participate in exercise maintenance, together justify the expenditure.

3.2.2 Benefits of exercise maintenance for people with respiratory conditions

The principal quantifiable benefit of exercise maintenance for respiratory patients is a reduction in admissions of between 30 and 40%. Based on the uptake and adherence figures shown in Table 4, and the admissions data shown in Table 2, the number of admissions and bed days that could be saved in a year as a result of exercise maintenance would be, as shown in the table below:

Table 12 – Admissions avoided and bed days saved (respiratory conditions)

Rate of admissions avoided	Admissions avoided	Bed days saved
30%	706	5392
40%	941	7190

As described in section 3.2.1, the most up to date figures available for costs of admissions in Scotland are in the Scottish Tariff, published by ISD. We have used these figures to calculate the value of avoided respiratory admissions as follows:

Table 13 – Cost per individual admission for COPD

Condition group	Lower end of range	Upper end of range	Midpoint
COPD	£ 1,482.50	£ 3,182.50	£ 2,332.50

COPD admission costs were calculated using the following tariff codes:

- lower end - average of 'upper respiratory tract condition without critical care' and 'lower respiratory tract condition without critical care'
- upper end - average of 'upper respiratory tract condition with critical care' and 'lower respiratory tract condition with critical care'

Applying these values to the potential admissions avoided figures above, we reached the following potential value of avoided admissions:

Table 14 – Cost value of admissions avoided (respiratory conditions)

Rate of admissions avoided	Value based on lower end	Value based on upper end	Value based on midpoint
30%	£ 1,046,639.58	£ 2,246,833.37	£ 1,646,736.48
40%	£ 1,395,519.44	£ 2,995,777.83	£ 2,195,648.63

Finally, we calculated the potential net savings, assuming the midpoint value of avoided admissions is a reasonable expectation. The table below sets out these savings, based on class/group sizes or 15 and 20.

Table 15 – Net savings (respiratory conditions)

Rate of admissions avoided	Value of avoided admissions (midpoint)	Cost of service delivery (class size 15)	Savings (class size 15)	Cost of service delivery (class size 20)	Savings (class size 20)
30%	£ 1,646,736.48	£ 1,277,382.20	£ 369,354.28	£ 542,962.22	£ 1,103,774.26
40%	£ 2,195,648.63	£ 1,277,382.20	£ 918,266.44	£ 542,962.22	£ 1,652,686.41

4 CONCLUSIONS AND AREAS FOR CONSIDERATION

4.1 Economic evaluation

The data available to date indicates that there is an economic case for investing in exercise maintenance for people with respiratory conditions, in terms of avoidable admissions. The value of those saved admissions would cover the costs of exercise maintenance provision.

The data available in relation to potential savings in cardiac readmissions shows that these alone would not cover the costs of exercise maintenance provision for people with cardiac conditions. However, there is a wealth of evidence relating to other health and quality of life outcomes for cardiac patients participating in cardiac rehabilitation, and other evidence which shows these are largely lost within 6 to 12 months of the rehabilitation programme completing. These have not been economically quantified in this evaluation, but include relative reductions in mortality. We conclude that investment in exercise maintenance for people with cardiac conditions could sustain these benefits for longer periods and therefore generate additional savings for health and social care. However, the data available for this economic assessment did not allow quantification of these.

There is insufficient data to calculate the economic benefit of exercise maintenance for stroke.

4.2 Limitations in data availability

The biggest limitation in conducting the economic analysis was the lack of data on exercise maintenance participation and outcomes in Scotland. To conclusively prove the impact of exercise maintenance, a research and economic modelling project is needed based on real people's participation and outcomes. This would require service providers to collect data in a consistent manner and share it with a central research team. Whilst we understand from the three charities leading the PARCS project that one of the barriers to collecting consistent data is the short term nature of the funding for exercise maintenance programmes (and therefore the relatively low priority of collecting data in such a context), the lack of data is one of the factors contributing to the short term funding: a conclusive economic case (underpinned by local data) would strengthen the ability to secure longer term funding.

Areas for consideration:

- ★ agree (across all service providers) a consistent data set and protocols for collection, storage and sharing
- ★ once the data set is in place, consider commissioning a health economics team to conclusively assess the economic case for exercise maintenance across all three condition groups