CANCER

DIAGNOSTICS

HEART

LUNG

STROKE

NHS

NHS Improvement

Heart

Making the case for cardiac rehabilitation:

modelling potential impact on readmissions

January 2013

Acknowledgements

Authors:

Michael Kaiser, Managing Director, MCK Healthcare Consultancy

Mel Varvel, National Improvement Lead, NHS Improvement - Heart

Patrick Doherty, Associate Clinical Lead for Cardiac Rehabilitation, NHS Improvement - Heart

Advice and Support:

Julie Harries, Director, NHS Improvement - Heart

Professor Sally Singh, Head of Cardiac and Pulmonary Rehabilitation, University Hospitals of Leicester

Tracey Ellison, Senior Data Analyst, National Cancer Services Analysis Team

Gary Shield, Senior Costing Analyst, National Institute for Health and Clinical Excellence

Michael Carpenter, Independent Consultant
National Audit of Cardiac Rehabilitation Team, University of York

Payments by Results Team, Department of Health

South East Public Health Observatory

Contents

> Achieving an uptake rate for cardiac rehabilitation of 65% in England among all eligible patients could release over £30 million per year in savings which could be reinvested in rehabilitation and re-ablement.

Executive summary

For more than a decade NHS Improvement and its predecessors (the Coronary Heart Disease (CHD) Collaborative and the Heart Improvement Programme) have been undertaking focused work with a wide range of partners aimed at increasing the access to cardiac rehabilitation (CR) and improving the equity of provision and uptake of CR services on the basis that it saves lives and improves quality of life.

This report summarises the findings of a short study, commissioned by NHS Improvement, which models the relationship between uptake of CR and unplanned cardiac readmission rates both nationally and at commissioner level.

The primary purpose of the study was to examine the Quality, Innovation, Productivity and Prevention (QIPP) potential of CR and to establish whether the benefits of CR outweigh the costs in terms of the potential impact on readmissions alone.

Over and above the well-documented, positive effects of rehabilitation on mortality, morbidity and quality of life, the results suggest that increasing the uptake of 'gold standard' CR has the potential to reduce cardiac-related readmissions and deliver significant financial savings.

The outputs of this analysis and the approach adopted by it should be used by commissioners and providers to make a cogent business case for CR in the new commissioning landscape and to assist with the achievement of the outcomes specified in the NHS Outcomes Framework.

Introduction

Coronary heart disease (CHD) is the most common cause of premature death in the UK. It is also a leading cause of disability. The British Heart Foundation's National Statistics indicate that CHD accounted for 88,000 deaths in the UK in 2008. That is one in five men and one in eight women.

Cardiac rehabilitation (CR) is a professionally supervised, menu-based programme incorporating a number of components which, taken together, ensure that people who have a cardiac condition, event or treatment are able to recover and get back to 'everyday life' as quickly and fully as possible.

The overall aim of CR is to provide all eligible patients with a person-centred service, which optimises their health and well-being, enhances their quality of life and minimises the risk of recurrent cardiac events.

Current national clinical guidelines and quality standards (NICE CG48, NICE CG94, NICE CG108 and NICE QS9) which recommend CR for specific cardiac conditions and treatments are based on a wealth of research evidence demonstrating the positive outcomes of CR, 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 (Taylor et al, 2004);
- A reduction in cardiac-related morbidity; and
- An improvement in functional capacity and quality of life.

Participation in CR has been shown to result in a reduction in anxiety and depression and an increase in physical activity and involvement in smoking cessation programmes. In addition, evidence suggests that CR provides support for patients to return to work and fosters the development of self-management skills as well as having a positive impact on overall health and well-being.

Recent research studies by Davies et al (2010), Heran et al (2011) and Lam et al (2011) also suggest that the delivery of a robust CR service has the potential to reduce unplanned cardiac readmissions by 28-56%. This is supported by a significant and robust but unpublished trial undertaken by a research group at the University Hospitals of Leicester which evidences a 30% reduction in readmissions with an uptake rate of 65%.

Despite the significant benefits associated with CR, the National Audit of Cardiac Rehabilitation (NACR) 2012 continues to highlight that uptake of CR is inequitable and poor – as low as 14% of eligible patients for some conditions in some regions. The average uptake among the main treatment groups in England remains below 50% (NACR, 2012) and falls far short of the National Service Framework for Coronary Heart Disease (2000) target that more than 85% of people discharged from hospital after acute myocardial infarction or after coronary revascularisation should be offered CR.

In addition, variation also exists in:

- Readmission rates;
- Costs of service;
- Quality of services provided;
- Quantity of services delivered;
- Outcomes; and
- Payment mechanisms.

There is no doubt that high quality CR saves lives and improves the quality of life. Evidence also suggests that CR is cost-effective. However, making the economic case for such a complex service is challenging.

There is increasing pressure on the NHS to continue to deliver quality whilst improving productivity and eliminating waste. In addition there is a new commissioning landscape for the NHS. Therefore, it is more important than ever to ensure that each pound spent on CR offers value for money and that the use of NHS resources is optimised.

With this in mind, NHS Improvement set out to establish the costs and benefits of CR by modelling the potential impact of increasing uptake on unplanned cardiac readmissions. The primary aim was to enable commissioners to demonstrate the Quality, Innovation, Productivity and Prevention (QIPP) potential of good quality CR and to help make a compelling business case for local services.

Methodology

The modelling was based on the aforementioned research studies which indicate that achieving a 65% uptake of 'gold standard' CR- which meets British Association for Cardiovascular Prevention and Rehabilitation (BACPR) standards and includes BACPR core components - would result in a 30% reduction in unplanned cardiac readmissions.

The starting point of the analysis was therefore to establish the number and cost of cardiac admissions and emergency cardiac readmissions in a baseline year. A list of the specific 'in scope' cardiac diagnosis and treatment codes included in the analysis, denoting eligibility for CR, was derived from the DH Commissioning Pack for Cardiac Rehabilitation and the NICE Cardiac Rehabilitation Commissioning Guide (CMG40). This list can be found in Appendix 1.

Cardiac activity at commissioner[1] level was obtained via Hospital Episode Statistics (HES) data and used to calculate regional and national figures.

The HES data that formed the basis of the analysis included cardiac spells from 2009/10 and any cardiac spells for the same patients in the previous 12 months and the following 12 months.

Any spells with a cardiac admission in the 12 months prior to the 2009/10 admission were not regarded as a new spell and therefore not counted. This enabled calculation of the readmission rates within a 12 month period. Patients who died prior to discharge were also subtracted from the remaining new spells to result in the cohort of patients eligible for CR.

According to the NICE Cardiac Rehabilitation Commissioning Guide (CMG40), the indicative cost of delivering a good quality CR service is £477 per patient[2]. Multiplying this figure by 65% of the eligible cohort provided an understanding of the cost to deliver CR to 65% of eligible patients. The figure of 65% was chosen on the basis of uptake achieved in one of the key trials underpinning the modelling.

Effectively representing the midway point between the current national average and the target set out in the National Service Framework, this was also deemed to be a reasonable, realistic and achievable uptake rate given the current levels.

For the purpose of this analysis, a 'readmission' was defined as any emergency cardiac admission in the 12 months following the 2009/10 'new' spell. Readmissions were divided into those which occurred within 30 days of discharge, and readmissions which occurred outside 30 days but within 12 months of discharge. This was in view of the current interest in preventing readmissions within 30 days and the financial penalties for providers under Payment by Results. Readmission rates were then calculated at Primary Care Trust (PCT), regional and national levels.

Readmissions were counted as a total and at a patient level in order to understand the number of patients that had readmitted in addition to the number of readmissions that had occurred.

The Department of Health's Cardiac Rehabilitation Commissioning Pack gives the average weighted cost of a cardiac readmission as £3,637. Multiplying this cost by the number of readmissions gave an indication of the total cost of cardiac readmissions at a PCT, regional and national levels.

Based on the evidence showing a potential reduction in the cardiac readmission rate of 30% as a result of a robust CR service being completed by 65% of eligible patients, a new readmission rate was calculated. This modelled readmission rate was then multiplied by the number of new spells to give a potential new number of readmissions. This allowed us to model the number of cardiac readmissions saved and the associated financial savings at PCT, regional and national levels.

[1]The modelling is based on analysis of 2009/10 Hospital Episode Statistics (HES) data is therefore split by Primary Care Trust (PCT) rather than Clinical Commissioning Group (CCG).

[2]Please note that the tariff is based on pay costs (including staff on costs) only. Full details are given in Appendix 2.

The model assumed the same ratio of <30 day: 30-365 day cardiac readmissions as the HES baseline figures to highlight how the potential financial savings could be split between organisations within a health community. It was understood that this would not give a definitive result, but an indication of potential savings.

Due to the complexity of current commissioning arrangements, the difficulties associated with obtaining the true costs of CR at PCT level for the entire country and robust figures on current uptake, the model assumes a 0% uptake. However, it does not take into account the current cost or outcomes of any existing CR service delivery.

A full list of assumptions relating to this methodology is included in Appendix 2.

Further information on the methodology is included in the form of some Frequently Asked Questions and can be found in Appendix 3.

Results

Based on a 0% uptake increasing to a 65% uptake rate for CR, the cost-benefit analysis shows a potential reduction in emergency cardiac readmissions of 28,782 in the 12 months following the initial cardiac admission.

In terms of financial impact, this equates to a potential saving of £30,646,085 nationally, taking into consideration the costs to deliver a complete CR service to 65% of patients – a rate significantly higher than the current figure.

The tables below provide the key results of the analysis undertaken.

Table 1 highlights the number of cardiac readmissions occurring within 12 months of the 2009/10 admissions, the readmission rate that this equates to and the financial cost of these cardiac readmissions.

Table 1: Cardiac readmissions occurring within 12 months of the 2009/10 admissions, readmission rate and financial cost of these cardiac readmissions by Strategic Health Authority region

Region	Cohort of patients eligible for CR	No. of cardiac readmissions from 2009/10 admissions	Readmission rate in 2009/10	Cost of readmissions 2009/10
East Midlands	21,710	8,752	35%	£31,831,024
East of England	26,604	10,309	34%	£37,493,833
London	28,412	12,562	39%	£45,687,994
North East	14,304	6,211	38%	£22,589,407
North West	35,546	15,316	37%	£55,704,292
South Central	16,256	5,297	28%	£19,265,189
South East	19,455	7,008	31%	£25,488,096
South West	26,451	9,790	32%	£35,606,230
West Midlands	25,324	10,847	37%	£39,450,539
Yorkshire and the Humber	24,719	9,848	35%	£35,817,176
England	**238,781**	**95,940**	**35%**	**£348,933,780**

Source: Hospital Episode Statistics, the NHS Information Centre for Health and Social Care. Analysis provided by the National Cancer Services Analysis Team (NatCanSAT) www.natcansat.nhs.uk

Table 2 shows the first results of the analysis. This includes the number of cardiac readmissions that potentially would have occurred within 12 months of the 2009/10 admissions had a 'gold standard' CR programme been in place.

The table also shows the resulting, reduced readmission rate together with the cost associated with the reduced number of readmissions, the cost of delivering the CR service and the total cost of the service and the readmissions.

Table 2: Modelled cardiac readmissions within 12 months of the 2009/10 admissions, 'new' readmission rate and associated costs assuming a 'gold standard' CR programme with 65% uptake had been in place

Region	Cohort of patients eligible for CR	No. of cardiac readmissions using new model	Readmission rate using new model	Cost of readmissions using new model	Cost of service based on new model (for 65% uptake)	Total cost of new service (readmissions + service cost)
East Midlands	21,710	6,126	24%	£22,281,717	£6,731,186	£29,012,903
East of England	26,604	7,216	24%	£26,245,683	£8,248,570	£34,494,253
London	28,412	8,793	27%	£31,981,596	£8,809,141	£40,790,737
North East	14,304	4,348	27%	£15,812,585	£4,434,955	£20,247,540
North West	35,546	10,721	26%	£38,993,004	£11,021,037	£50,014,041
South Central	16,256	3,708	20%	£13,485,632	£5,040,173	£18,525,805
South East	19,455	4,906	22%	£17,841,667	£6,032,023	£23,873,690
South West	26,451	6,853	23%	£24,924,361	£8,201,133	£33,125,494
West Midlands	25,324	7,593	26%	£27,615,377	£7,851,706	£35,467,083
Yorkshire and the Humber	24,719	6,894	24%	£25,072,023	£7,664,126	£32,736,149
England	**238,781**	**67,158**	**24%**	**£244,253,645**	**£74,034,049**	**£318,287,694**

Source: Hospital Episode Statistics, the NHS Information Centre for Health and Social Care. Analysis provided by the National Cancer Services Analysis Team (NatCanSAT) www.natcansat.nhs.uk

Finally, Table 3 calculates the difference between tables 1 and 2 – effectively representing the resulting savings. It highlights a potential reduction of 28,782 readmissions and despite a cost of £74,034,049 to deliver a robust CR service in England; a saving of £30,646,086 could be achieved nationally.

Table 3: Modelled reduction in cardiac readmissions and associated financial savings as a result of delivering a 'gold standard' CR service to 65% of eligible patients

Region	Cohort of patients eligible for CR	Total numeric reduction in readmissions	Readmission rate with new model	Financial savings from readmissions	Total financial savings from new service including readmission savings
East Midlands	21,710	2,626	24%	£9,549,307	£2,818,121
East of England	26,604	3,093	24%	£11,248,150	£2,999,580
London	28,412	3,769	27%	£13,706,398	£4,897,257
North East	14,304	1,863	27%	£6,776,822	£2,341,867
North West	35,546	4,595	26%	£16,711,288	£5,690,251
South Central	16,256	1,589	20%	£5,779,557	£739,384
South East	19,455	2,102	22%	£7,646,429	£1,614,406
South West	26,451	2,937	23%	£10,681,869	£2,480,736
West Midlands	25,324	3,254	26%	£11,835,162	£3,983,456
Yorkshire and the Humber	24,719	2,954	24%	£10,745,153	£3,081,027
England	**238,781**	**28,782**	**24%**	**£104,680,135**	**£30,646,086**

Source: Hospital Episode Statistics, the NHS Information Centre for Health and Social Care. Analysis provided by the National Cancer Services Analysis Team (NatCanSAT) www.natcansat.nhs.uk

Conclusion and recommendations

Overall the results of the modelling demonstrate that the benefits of providing good quality CR outweigh the costs as stated in the NICE Commissioning Guide for CR (CMG40). The analysis adds to existing evidence that CR saves lives and reduces readmissions by indicating that it also has the potential to save money. This should help to ensure that CR is a priority in the new commissioning landscape.

Aside from the results, this analysis sets a precedent for establishing the costs and benefits of CR by modelling the potential impact of improving quality and increasing uptake on unplanned cardiac readmissions. In doing so it supports the increasing focus on outcomes-based commissioning.

Taking into account the various caveats and assumptions, it should assist commissioners to demonstrate the Quality, Innovation, Productivity and Prevention (QIPP) potential of good quality CR and make a compelling business case for local services. It will also help to demonstrate the contribution that good quality CR has to the achievement of the outcomes specified in the NHS Outcomes Framework.

The results of the analysis effectively represent a significant new evidence base and provide greater impetus to the need to increase the quality of CR services and to further improve uptake across all eligible cardiac patients.

In addition, the analysis points to further savings that could be made by considering the current costs to deliver a CR service at a local level. Further quality improvements and financial gains might achieved by redesigning existing services and/or exploring innovative ways of delivering rehabilitation, for example web-based CR, or 'generic' rehabilitation in which service provision is targeted at common disability rather than the primary organ disease and combines both generalist and specialist input as appropriate. CR could also be used as a primary prevention intervention for those at high risk of cardiovascular disease (CVD).

Providers in particular may also be interested in exploring the potential impact of early rehabilitation on readmissions within 30 days of discharge in order to avoid financial penalties under Payment by Results (PbR). The advent of a post-discharge tariff for CR in PbR in 2012-13 reflects emerging evidence which points to the role that CR may have in avoiding readmissions in the first few weeks following discharge. The results of this analysis suggest that 25% of cardiac readmissions currently occur within the first 30 days following discharge nationally, although this varies considerably across PCTs. It may therefore pay dividends for providers and commissioners to work together to explore early rehabilitation interventions which may impact favourably on patient outcomes and use of resources in the first 30 days after discharge from hospital.

As evidence suggests that CR may impact on all cause mortality and morbidity, work could also be undertaken to understand the impact that the improved delivery of CR has on non-cardiac pathways such-as stroke and chronic obstructive pulmonary disorder (COPD). In addition, further analysis could be carried out to understand the potential effect of improved CR on demand in Accident and Emergency departments across the country given the reduced number of emergency readmissions implied by the modelling.

Appendix 1: List of 'in scope' (eligible) patients

In order to determine what comprised a 'cardiac admission' or 'cardiac readmission', the following codes were used. These are codes referred to in the Department of Health's Cardiac Rehabilitation Commissioning Pack.

Diagnosis Codes:

ICD10 Code	Group	Description
I 110	Chronic HF	Hypertensive heart disease with (congestive) heart failure
I 130	Chronic HF	Hypertens heart and renal dis with (conges) heart failure
I 132	Chronic HF	Hyper heart and renal dis both (cong) heart and renal failure
I 255	Chronic HF	Ischaemic cardiomyopathy
I 420	Chronic HF	Dilated cardiomyopathy
I 429	Chronic HF	Cardiomyopathy, unspecified
I 500	Chronic HF	Congestive heart failure
I 501	Chronic HF	Left ventricular failure
I 509	Chronic HF	Heart failure, unspecified
I 515	Chronic HF	Myocardial degeneration
I 21	MI	Acute myocardial infarction, unspecified
I 210	MI	Acute transmural myocardial infarction of anterior wall
I 211	MI	Acute transmural myocardial infarction of inferior wall
I 212	MI	Acute transmural myocardial infarction of other sites
I 213	MI	Acute transmural myocardial infarction of unspecified site
I 214	MI	Acute subendocardial myocardial infarction
I 219	MI	Acute myocardial infarction, unspecified
I 22	MI	Subsequent myocardial infarction of unspecified site
I 220	MI	Subsequent myocardial infarction of anterior wall
I 221	MI	Subsequent myocardial infarction of inferior wall
I 228	MI	Subsequent myocardial infarction of other sites
I 229	MI	Subsequent myocardial infarction of unspecified site

Procedure Codes:

OPCS Code	Group	Description - Level 1	Description - Level 2
K401	CABG	Saphenous Vein Graft Replacement of Coronary Artery	Saphenous Vein Graft Replacement of One Coronary Artery
K402	CABG	Saphenous Vein Graft Replacement of Coronary Artery	Saphenous Vein Graft Replacement of Two Coronary Arteries
K403	CABG	Saphenous Vein Graft Replacement of Coronary Artery	Saphenous Vein Graft Replacement of Three Coronary Arteries
K404	CABG	Saphenous Vein Graft Replacement of Coronary Artery	Saphenous Vein Graft Replacement of Four or More Coronary Arteries
K408	CABG	Saphenous Vein Graft Replacement of Coronary Artery	Other Specified
K409	CABG	Saphenous Vein Graft Replacement of Coronary Artery	Unspecified
K411	CABG	Other Autograft Replacement of Coronary Artery	Autograft Replacement of One Coronary Artery NEC
K412	CABG	Other Autograft Replacement of Coronary Artery	Autograft Replacement of Two Coronary Arteries NEC
K413	CABG	Other Autograft Replacement of Coronary Artery	Autograft Replacement of Three Coronary Arteries NEC
K414	CABG	Other Autograft Replacement of Coronary Artery	Autograft Replacement of Four or More Coronary Arteries NEC
K418	CABG	Other Autograft Replacement of Coronary Artery	Other Specified
K419	CABG	Other Autograft Replacement of Coronary Artery	Unspecified
K421	CABG	Allograft Replacement of Coronary Artery	Allograft Replacement of One Coronary Artery
K422	CABG	Allograft Replacement of Coronary Artery	Allograft Replacement of Two Coronary Arteries
K423	CABG	Allograft Replacement of Coronary Artery	Allograft Replacement of Three Coronary Arteries

Procedure Codes:

OPCS Code	Group	Description - Level 1	Description - Level 2
K424	CABG	Allograft Replacement of Coronary Artery	Allograft Replacement of Four or More Coronary Arteries
K428	CABG	Allograft Replacement of Coronary Artery	Other Specified
K429	CABG	Allograft Replacement of Coronary Artery	Unspecified
K431	CABG	Prosthetic Replacement of Coronary Artery	Prosthetic Replacement of One Coronary Artery
K432	CABG	Prosthetic Replacement of Coronary Artery	Prosthetic Replacement of Two Coronary Arteries
K433	CABG	Prosthetic Replacement of Coronary Artery	Prosthetic Replacement of Three Coronary Arteries
K434	CABG	Prosthetic Replacement of Coronary Artery	Prosthetic Replacement of Four or More Coronary Arteries
K438	CABG	Prosthetic Replacement of Coronary Artery	Other Specified
K439	CABG	Prosthetic Replacement of Coronary Artery	Unspecified
K441	CABG	Other Replacement of Coronary Artery	Replacement of Coronary Arteries Using Multiple Methods
K442	CABG	Other Replacement of Coronary Artery	Revision of Replacement of Coronary Artery
K448	CABG	Other Replacement of Coronary Artery	Other Specified
K449	CABG	Other Replacement of Coronary Artery	Unspecified
K451	CABG	Connection of Thoracic Artery To Coronary Artery	Double Anastomosis of Mammary Arteries To Coronary Arteries
K452	CABG	Connection of Thoracic Artery To Coronary Artery	Double Anastomosis of Thoracic Arteries To Coronary Arteries

Procedure Codes:

OPCS Code	Group	Description - Level 1	Description - Level 2
K453	CABG	Connection of Thoracic Artery To Coronary Artery	Anastomosis of Mammary Artery To Left Anterior Descending Coronary Artery
K454	CABG	Connection of Thoracic Artery To Coronary Artery	Anastomosis of Mammary Artery To Coronary Artery NEC
K455	CABG	Connection of Thoracic Artery To Coronary Artery	Anastomosis of Thoracic Artery To Coronary Artery NEC
K456	CABG	Connection of Thoracic Artery To Coronary Artery	Revision of Connection of Thoracic Artery To Coronary Artery
K458	CABG	Connection of Thoracic Artery To Coronary Artery	Other Specified
K459	CABG	Connection of Thoracic Artery To Coronary Artery	Unspecified
K461	CABG	Other Bypass of Coronary Artery	Double Implantation of Mammary Arteries Into Heart
K462	CABG	Other Bypass of Coronary Artery	Double Implantation of Thoracic Arteries Into Heart NEC
K463	CABG	Other Bypass of Coronary Artery	Implantation of Mammary Artery Into Heart NEC
K464	CABG	Other Bypass of Coronary Artery	Implantation of Thoracic Artery Into Heart NEC
K465	CABG	Other Bypass of Coronary Artery	Revision of Implantation of Thoracic Artery Into Heart
K468	CABG	Other Bypass of Coronary Artery	Other Specified
K469	CABG	Other Bypass of Coronary Artery	Unspecified
K491	PCI	Transluminal Balloon Angioplasty of Coronary Artery	Percutaneous Transluminal Balloon Angioplasty of One Coronary
K492	PCI	Transluminal Balloon Angioplasty of Coronary Artery	Percutaneous Transluminal Balloon Angioplasty of Multiple Co

Procedure Codes:

OPCS Code	Group	Description - Level 1	Description - Level 2
K493	PCI	Transluminal Balloon Angioplasty of Coronary Artery	Percutaneous Transluminal Balloon Angioplasty of Bypass Graf
K494	PCI	Transluminal Balloon Angioplasty of Coronary Artery	Percutaneous Translum Cutting Balloon Angioplasty of Coronar
K498	PCI	Transluminal Balloon Angioplasty of Coronary Artery	Other Specified
K499	PCI	Transluminal Balloon Angioplasty of Coronary Artery	Unspecified
K501	PCI	Other Therapeutic Transluminal Operations/Coronary Arte	Percutaneous Transluminal Laser Coronary Angioplasty
K502	PCI	Other Therapeutic Transluminal Operations/Coronary Arte	Percutaneous Transluminal Coronary Thrombolysis Using Strept
K503	PCI	Other Therapeutic Transluminal Operations/Coronary Arte	Percutaneous Transluminal Injection of Therapeutic Substance
K504	PCI	Other Therapeutic Transluminal Operations on Coronary	Percutaneous Transluminal Atherectomy of Coronary Artery
K508	PCI	Other Therapeutic Transluminal Operations/Coronary Arte	Other Specified
K509	PCI	Other Therapeutic Transluminal Operations/Coronary Arte	Unspecified
K751	PCI	Percutaneous Translum Balloon Angioplasty And Stenting	Percutaneous Translum Balloon Angioplasty Ins 1-2 Drug
K752	PCI	Percutaneous Translum Balloon Angioplasty And Stenting	Percutaneous Translum Balloon Angioplasty Ins 3 Or More Drug
K753	PCI	Percutaneous Translum Balloon Angioplasty And Stenting	Percutaneous Translum Balloon Angioplasty Ins 1-2 Stents
K754	PCI	Percutaneous Translum Balloon Angioplasty And Stenting	Percutaneous Translum Balloon Angioplasty Ins 3 Or More Stents
K758	PCI	Stenting	Other Specified

Procedure Codes:

OPCS Code	Group	Description - Level 1	Description - Level 2
K759	PCI	Percutaneous Translum Balloon Angioplasty And Stenting	Unspecified
K591	ICD	Cardioverter Defibrillator Introduced Through the Vein	Implantation of Cardioverter Defibrillator Using One Electro
K592	ICD	Cardioverter Defibrillator Introduced Through the Vein	Implantation of Cardioverter Defibrillator Using Two Electro
K596	ICD	Cardioverter Defibrillator Introduced Through the Vein	Implantation of cardioverter defibrillator using three electrode leads
K598	ICD	Cardioverter Defibrillator Introduced Through the Vein	Other Specified
K599	ICD	Cardioverter Defibrillator Introduced Through the Vein	Unspecified

Appendix 2 - Assumptions

Data Sources:

- All HES data has been provided by the National Cancer Services Analysis Team (NatCanSAT) courtesy of the NHS Information Centre for Health and Social Care.
- The model uses the CR cost from the NICE Cardiac Rehabilitation Commissioning Guide (CMG 40) at £477 per patient. This cost includes pay and staff-related on-costs. However, it does not include any capital-related costs. Please refer to the NICE Commissioning Guide for specific assumptions associated with this cost calculation.
- The cost of the CR service (as per the NICE Commissioning Guide) does not take into account London weighting.
- The model uses the average cardiac readmission cost from the Department of Health's Commissioning Pack for Cardiac Rehabilitation (£3,637 per patient). Please refer to the DH Commissioning Pack for specific assumptions associated with this cost calculation.
- All reference data was extracted from Hospital Episode Statistics admitted patient care records - inpatient or day case episodes between 1st April 2008 and 31st December 2011 (inclusive).

Additional Savings:

- The current service cost for CR has not been calculated for each PCT or region. Instead, the model refers to a 0% uptake rate and is modelled on a CR service based on the NICE CMG40 cost per patient. The current cost of CR represents an additional saving.
- The model looks at the impact of commissioning a new CR service for 65% of the eligible patients in place of any existing service.
- Non-cardiac readmissions as a result of cardiac primary admission have not been included in any of the modelling and could be regarded as potential additional savings.

Data Information:

- Spells have been classified by year and by the year of the last episode in the spell. Only 2009/2010 spells have been analysed.
- Only patients resident in England are included in the analysis. Patients living outside England, attending an English trust were therefore excluded.
- Spells were included if any episode in that spell contained a relevant cardiac diagnosis/procedure in any diagnosis/procedure position; spells were counted once only.
- All admission methods are included in the original cardiac admission data (i.e. elective, emergency and transfers).
- The Elective Admission Method Group for the original cardiac admissions includes both elective admissions and transfers.
- Spells include all patient classifications. Examples include, but are not limited to day case episodes, ordinary admission, inpatients and regular day attendees.
- Patients who had a previous admission (for a relevant procedure/diagnosis) within the previous year were identified as subsequent spells.
- 'New Spells' were those spells who did not have a previous admission within the last year (of any admission method).
- Spells were identified as being "Discharged Alive" if the discharge method for that spell was not 'Died' or 'Baby Still Born'.
- The 'Cohort' patients were those 'new spells' (i.e. that did not have a previous relevant admission within one year) and where the spell was discharged alive.
- The 'Cohort' patients were checked to see if they had a subsequent emergency readmission (for a relevant procedure/diagnosis) within one year following discharge
- The type of spell - i.e. 'New', 'Subsequent', and 'Cohort' was determined by analysing all relevant codes together (not by individual groupings).

Additional Information:

- CR was not coded as a separate service in 2009/10, nor did it have its own tariff.
- A split in health outcomes and associated finances between provider and commissioner has been made assuming even impacts on readmission rates. This does not affect the total figures stated for health outcomes or associated finances.

A second model was undertaken looking at the impact of commissioning a new CR service for additional eligible patients to result in a 65% uptake rate.

Further information can be obtained by contacting NHS Improvement - email: lesley.manning@improvement.nhs.uk

Appendix 3 - Frequently Asked Questions

1. What is the definition of 'uptake' used in the modelling?
'Uptake' in the modelling is synonymous with 'completion' of cardiac rehabilitation (CR) as this is the definition used by existing national guidance and the trigger for payment under the Payment by Results (PbR) post-discharge tariff for CR. The readmissions study conducted at the University Hospitals Leicester (unpublished) compared eligible patients who did not take up the offer of CR, those who had an initial assessment but did not attend CR, and those who accepted the offer and completed the course. The study concluded that if 65% of eligible patients completed a CR programme (i.e. 65% uptake), a reduction of 30% in cardiac emergency re-admissions could be achieved. NB. The National Audit of Cardiac Rehabilitation (NACR) defines uptake by the presence of a Phase 3 start date on the audit database.

2. Why have you chosen to model 65% uptake?
The figure of 65% was chosen as a conservative but realistic uptake 'target'. It is above the current national average (from NACR) but below the estimates on the take-up and referral of CR provided by the National Institute for Health and Clinical Excellence (NICE) commissioning guide for CR (CMG40) topic advisory group (which were based on best practice and assumed to be the proportions that could be achieved given optimal service design). The unpublished readmissions study from University Hospitals Leicester on which the modelling is (in part) based demonstrated that a 65% uptake among eligible patients (c. 3000) is achievable.

3. What evidence is there to suggest that CR can lead to a 30% reduction in cardiac readmissions?
The figure of 30% is the estimated reduction in the risk of being admitted to hospital per heart failure patient as a result of rehabilitation used in the NICE commissioning and benchmarking tool for CR services (CMG40, 2011). This reduction is supported by recent Meta-analyses- see Heran et al (2011) in The Cochrane Database of Systematic Reviews 2011, Issue 7 and Davies et al (2010) in The Cochrane Database of Systematic Reviews 2010, Issue 4. Lam et al (2011) also found a significant reduction in 60-day hospital readmissions after an acute myocardial infarction. A 'real life' readmissions reduction of equivalent magnitude was achieved in an unpublished study conducted at the University Hospitals Leicester (based on 2008/09 data). Earlier research studies demonstrating the positive impact of cardiac rehabilitation on readmissions are cited in The Case for Change, part of the DH Commissioning Pack for CR and Chapter 1 of the NICE commissioning guide for CR services (CMG40, 2011). Taken together, existing evidence points to a potential reduction in emergency cardiac readmission rates of up to 30% following participation in comprehensive, high quality CR programmes, compared with patients who decline the offer.

4. Where does the figure on the average cost of a cardiac readmission come from and how has it been calculated?
The cost of a readmission (total weighted average cost £3,637) was taken from the cost benefit analysis in the Department of Health (DH) Commissioning Pack for Cardiac Rehabilitation (2011). Costs per patient in the DH model were calculated using Reference costs 07/08 activity and 2010/11 Mandatory Tariff costs. Full details of the calculation can be found in the DH Commissioning Pack cost-benefit tool.

5. Where does the figure on the per-patient cost of CR come from and how has it been calculated? Does it include non-pay costs?
The per patient cost of £477 used in the modelling was taken from the Department of Health Commissioning Pack for Cardiac Rehabilitation (2011) and the NICE CMG40 commissioning and benchmarking tool. According to both sources, this evidence-based cost is intended to cover the whole pathway of care for CR (stages 1-6) detailed in the Commissioning Pack. The costing was used as the basis for post-discharge tariff for CR under PbR. Details of how the per-patient cost was calculated is included in both DH and NICE publications. It is important to note that this per-patient cost relates to staff costs only and was based on specific staff bands (to meet British Association of Cardiac Rehabilitation (BACR 2007) standards). Both the Department of Health (DH) Commissioning Pack and NICE CMG40 emphasise that providers and commissioners should agree any additional non-recurrent costs to reflect local circumstances. The DH and NICE costing models represent the activities required to run a generic rehabilitation programme supporting low to medium risk patients. They stress that any variation in patient requirements, for example an increased staff to patient ratio to cater for 'high risk' patients, must be reflected appropriately in local costings.

6. Does the per-patient cost of CR used in the modelling take London weighting into account?
As indicated in the DH Commissioning Pack cost-benefit tool, the calculated costs are England-wide based on mean basic NHS salary costs and exclude any regional variations. Modelled savings also exclude any regional variation. Any locally specific costs would need to be agreed and included in the pathway costing to ensure the full cost reflects local needs and requirements.

7. Which patients are deemed by the modelling to be 'eligible' for CR and included in calculations?
The eligibility criteria employed in the modelling was based on the data specification in the NICE CMG40 commissioning and benchmarking tool and reflects the 'in scope' patients listed in the DH Commissioning Pack, i.e. patients with acute coronary syndromes, patients having undergone revascularisation and patients with heart failure. See Appendix 1 of the modelling report for further details including the relevant treatment/ diagnosis codes.

8. Why does the modelling not factor in current uptake (from NACR) and the current cost of CR for each PCT/ region?
At present, the National Audit of Cardiac Rehabilitation (NACR) reports uptake at national and regional (Strategic Health Authority) level. Evidence suggests that the cost of CR services varies enormously across the country but there is currently no central mechanism to ascertain costs at PCT level. Availability of data on cost may improve in future with the advent of a post-discharge tariff for CR under PbR alongside other tariff developments. Commissioners and providers may wish to explore specific local costs and uptake in more detail and factor these into future modelling.

9. The model assumes a '0% baseline', i.e. no service in place currently, therefore no cost and no impact on cardiac readmissions. However, we do have a service in place locally which may be affecting the 'current' cardiac admissions/ readmissions rate. This means that the savings in terms of readmissions may not be as great as the modelling implies.
The National Audit of CR suggests that many existing services have low uptake, particularly among the cohort of patients in which readmissions are the highest, e.g. heart failure, and the quality of services in terms of clinical outcomes is variable. Moreover, evidence suggests that few services are routinely measuring the potential impact of CR on readmissions. From a national perspective, the impact of current services on readmissions is therefore difficult to quantify with any degree of accuracy. Any potential diminution in modelled savings due to the absence of a true '0%' baseline for readmissions at PCT level may be offset by the cost of any existing CR service, and may therefore be viewed as an 'additional' saving.

10. Does the analysis include the cost/ savings associated with non-cardiac readmissions?
Evidence suggests that a proportion of readmissions are for a different health issue than that responsible for the primary admission. However, non-cardiac readmissions following a primary cardiac admission have not been included in the modelling as it is difficult to identify with any degree of accuracy if the primary admission and readmission are causally linked. It is reasonable to assume that a proportion of non-cardiac readmissions are related to the original cardiac admission and that these related non-cardiac readmissions might be avoided with the intervention of CR. Avoiding these non-cardiac readmissions would effectively represent additional savings.

11. Can I look at the data in more detail?
NHS Improvement is happy to discuss the results in greater detail on request but access to the Hospital Episode Statistics (HES) data underpinning the modelling is restricted to those who have been given prior access and who have signed a non-disclosure agreement. Please address any queries/ requests to lesley.manning@improvement.nhs.uk in the first instance.

References

BACPR Standards and Core Components for Cardiovascular Prevention and Rehabilitation 2012 (2nd Edition)

British Heart Foundation National Statistics 2010

Davies EJ, Moxham T, Rees K, Singh S, Coats AJ, Ebrahim S, Lough F, Taylor RS. Exercise based rehabilitation for heart failure. Cochrane Database of Systematic Reviews 2010, Issue 4. Art. No. CD003331. DOI: 10.1002/14651858.CD003331.pub3

Department of Health (2010) Commissioning Pack for Cardiac Rehabilitation

Heran BS, Chen JM, Ebrahim S, Moxham T, Oldridge N, Rees K, Thompson DR, Taylor RS. Exercise-based cardiac rehabilitation for coronary heart disease. Cochrane Database of Systematic Reviews 2011, Issue 7. Art. No. CD001800. DOI: 10.1002/14651858.CD001800.pub2

Lam G, Snow R, Shaffer L, La Londe M, Spencer K, Caulin-Glaser T. The effect of a comprehensive cardiac rehabilitation program on 60-day hospital readmissions after an acute myocardial infarction free. J Am Coll Cardiol. 2011;57(14s1):E597-E597. DOI: 10.1016/S0735-1097(11)60597-4

National Audit of Cardiac Rehabilitation Annual Statistical Report 2010

National Audit of Cardiac Rehabilitation Annual Statistical Report 2012

NICE 2007 (CG48) MI: Secondary prevention in primary and secondary care for patients following a myocardial infarction

NICE 2010 (CG94) Unstable angina and NSTEMI: The early management of unstable angina and non-ST-segment-elevation MI

NICE 2011 (CMG40) Commissioning Guide for Cardiac Rehabilitation

NICE 2011 (QS9) Chronic Heart Failure

Singh et al, (2010) The effect of a comprehensive cardiac rehabilitation program on 12 month hospital readmissions, (unpublished)

Taylor RS, Brown A, Ebrahim S, et al. Exercise-based rehabilitation for patients with coronary heart disease: systematic review and meta-analysis of randomized controlled trials. Am J Med 2004;116:682-92

THE SUNDAY TIMES 100 BEST NOT-FOR-PROFIT ORGANISATIONS TO WORK FOR 2012

NHS

NHS Improvement

CANCER

DIAGNOSTICS

HEART

LUNG

STROKE

NHS Improvement

NHS Improvement's strength and expertise lies in practical service improvement. It has over a decade of experience in clinical patient pathway redesign in cancer, diagnostics, heart, lung and stroke and demonstrates some of the most leading edge improvement work in England which supports improved patient experience and outcomes.

Working closely with the Department of Health, trusts, clinical networks, other health sector partners, professional bodies and charities, over the past year it has tested, implemented, sustained and spread quantifiable improvements with over 250 sites across the country as well as providing an improvement tool to over 2,000 GP practices.

NHS Improvement
3rd Floor | St John's House | East Street | Leicester | LE1 6NB
Telephone: 0116 222 5184 | Fax: 0116 222 5101

www.improvement.nhs.uk

Follow us on:

twitter LinkedIn

Delivering tomorrow's improvement agenda for the NHS

Publication Ref: IMP/heart002 - January 2013