



British Heart  
Foundation

# THE NATIONAL AUDIT OF CARDIAC REHABILITATION ANNUAL STATISTICAL REPORT 2015



**FIGHT  
FOR EVERY  
HEARTBEAT**

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**Cover image**

The cover shows the Cardiac Rehabilitation programmes of England, Northern Ireland, Scotland and Wales.

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## Acknowledgements

The National Audit of Cardiac Rehabilitation (NACR) is a British Heart Foundation (BHF) project which aims to support cardiovascular prevention and rehabilitation services to achieve the best possible outcomes for patients. The BHF strategy remains committed to reducing inequalities in service delivery so that patients can have the best possible care and achieve the desired outcomes irrespective of where they live. The National Audit team is grateful for the continued support from the BHF and their national and regional teams. The ability to communicate our findings effectively, through this annual report, is essential and we thank the BHF production team for making this possible.

Thanks to the British Association for Cardiovascular Prevention and Rehabilitation (BACPR) which, as the national body for Cardiac Rehabilitation (CR), shares our vision to ensure that all CR programmes in the UK perform to a basic minimum standard that is known to benefit patients. Our ability to change practice is influenced by ongoing education and training of clinicians which is something the BACPR continues to support through its range of courses.

Thanks also to the Health and Social Care Information Centre (HSCIC) team for their support and expertise in redesigning the audit and supporting the NACR to achieve high quality data governance. The HSCIC shares our desire to use audit data to reduce inequalities and improve services for the betterment of patients.

The National Audit team would like to thank patients for agreeing to take part in the audit and for completing the clinical assessments and questionnaires before and after their programme. Our gratitude extends to the CR teams who, in collaboration with patients and carers, have helped improve risk factor management, increase exercise frequency and improve psychosocial well-being for tens of thousands of patients in the last 12 months.

We would very much like to thank the NACR Steering Committee for their continued support and expertise in shaping recent developments. They are:

Alison Allen (Wales Representative), Professor Nick Black (NACR Audit Adviser), Mel Clark (Patient Representative), Frances Divers (Scotland Representative, NHS Lothian), Dr Jane Flint (Cardiologist), Professor Gill Furze (Former BACPR President), Dr Chris Gale (MINAP Audit Representative), Julie Henderson (Head of Analytical Services, HSCIC), Suzanne Indge (NACR Lead for the All Wales Cardiac Rehab Group), Catherine Kelly (BHF), Alana Lavery (Northern Ireland Representative), Dr Mike Knapton (BHF), Alan Keys (CCPUK President), Dr Gordon McGregor (Clinical Exercise Physiologist), Dr Joe Mills (BACPR President and Cardiologist), Elaine Tanner (BHF Regional Service Development Manager), Julie Thomas (Chair of the All Wales Cardiac Rehab Group), Irene Thomson (Scotland Representative, NHS Lothian), Iain Todd (Scotland Representative, NHS Lothian), Dr Sally Turner (NACR User Representative) and Alyson Whitmarsh (Programme Manager, Audit Support Unit, HSCIC).

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## Foreword by the British Heart Foundation (BHF)

The BHF welcomes the 2015 National Audit of Cardiac Rehabilitation (NACR) report which represents a turning point in its history as it will, in addition to reporting at national and Health Regions, now report at a local service level. The BHF has encouraged the NACR team to achieve this milestone so that it can produce data that is of direct importance to NHS services, commissioners and patients. As with any new level of health service reporting it will take time to establish a valid baseline which is why the BHF and the NACR Steering Committee decided to show performance trends locally without naming the specific services in this year's report.

At a national level, across the three countries, there has been an improvement in uptake of 2% which is no mean feat in the present health climate. The uptake figure for patients medically managed after a heart attack (post MI) has also improved but remains low at 38%. This same patient group has demonstrated a rather worrying trend in that the age of patients starting a rehabilitation programme is on average 8.5 years below the age of patients that enter cardiology services. Hospital Episodes Statistics (HES) data reveals that female patients remain significantly under-represented, across most regions in CR, compared to the number eligible. There are some positive exceptions with centres recruiting many more women but the picture, regionally and locally, is the opposite with too many centres recruiting less than 20% of females.

The ability to report outcomes across 24 Health Regions and now at a local level represents a particular strength of the NACR. What is clear from the new analysis is that regional reporting, albeit important, has masked huge local variability. There are some real successes locally in stopping smoking and improving BMI, physical activity status, fitness, psychosocial well-being, blood pressure, cholesterol control and health related quality of life. At the same time some programmes have had little or no effect on some of these outcomes. There is a clear opportunity for some programmes to learn from others in the same region and beyond, which is something we urge programmes to do through their clinical networks.

The BHF offers support to enable clinicians to share their expertise and showcase good service models and approaches for the benefit of NHS services and patients. The BHF will continue to work with the NACR to help support Health Regions, commissioners and local programmes to commission services that meet the evidence base and deliver optimal outcomes for patients.

I would like to acknowledge the dedication, expertise and skills of the multidisciplinary cardiac rehabilitation teams across England, Wales and Northern Ireland and their commitment to improving the outcomes and health of cardiac patients. I would also like to acknowledge and thank the team at University of York and the colleagues at the Health and Social Care Information Centre for their hard work in producing quality data for the NACR.

**Dr Mike Knapton**  
Associate Medical Director British Heart Foundation

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## Foreword by the British Association for Cardiovascular Prevention and Rehabilitation (BACPR)

The BACPR values this new approach by the NACR team and the BHF in reporting at local programme level. We believe this is an ideal way for cardiovascular rehabilitation (CR) and prevention teams to learn from each other.

It is encouraging to see that uptake to CR continues to rise which is something the UK clinical programmes should be proud of as it is one of the highest uptake figures across Europe.

CR programmes appear to have adapted alongside the newer cardiology approaches as the percentage of patients with MI+PCI attending CR has increased and now stands at 54%.

Overall uptake to CR in England has improved by 1% (now at 47% of eligible patients), across the four diagnosis/treatment groups, compared to last year. Uptake in post MI patients has improved by 5% and by 3% in MI+PCI but uptake in patients undergoing planned PCI has dropped slightly by 1%. The NACR has made a significant adjustment to older coding rules so that it can better assess uptake in patients following CABG surgery. This prevents direct comparison of CABG uptake figures, with previous years but will allow for a more accurate analysis in future years.

Northern Ireland uptake is 35% (up by 3%) across all groups with elective PCI showing a 4% increase and CABG uptake at 67%. The proportion of women across all groups and older post MI patients generally is lower than expected.

Uptake in Wales has increased to 42% (up by 4%) which is primarily a consequence of a 17% increase in uptake in CABG patients which meant that 180 extra patients attended CR. There was a 6% and 5% increase in MI+PCI and PCI patient groups respectively. Patients on a post MI pathway of care had a 4% drop in uptake. Too few women were recruited and the age gap between eligible post MI patients and those attending CR was evident.

Our success in recruiting more patients needs to be matched by the successful delivery of high quality CR. Regional and local level reporting suggests that some high performing programmes exist but there are some regions and many programmes performing well below the clinical minimum standards.

The BACPR promotes equality of opportunity in delivery of CR and the outcomes patients should expect yet the NACR report highlights considerable variation in both aspects. The relative inability of many programmes to recruit female patients is a concern as is the inability to recruit older patients particularly those on the post MI (medically managed) pathway of care.

The BACPR-NACR Certification programme was launched in June 2015 and has started to certify programmes with an aim to certify at least 25 programmes per year. The huge variation shown in this year's NACR report reiterates the need for national certification of local programmes. We aim to continue our collaboration with the NACR and the BHF in our shared endeavour, with all CR programmes, to deliver the best possible care to patients.

**Dr Joe Mills**  
President BACPR

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## NACR Executive Summary

Welcome to the 9th annual statistical report on cardiac rehabilitation (CR) which reports at national, regional and this year, for the first time, at local service level. The UK continues to lead the world in uptake to rehabilitation for patients following bypass surgery and in patients following heart attack who undergo coronary stenting (MI+PCI).

Female patients remain significantly under-represented in CR compared to the number eligible obtained through Hospital Episodes Statistics (HES) data this year. This situation is more worrying as patients attending CR that follow a post MI (medically managed) pathway are on average 8 years younger for males and 9 years younger for females than the eligible post MI group. There are a few exceptions with some centres recruiting many more women equivalent to the percentage accessing cardiology services however the overwhelming picture, regionally and locally, is the opposite with many centres recruiting less than 20% of females to their programme. The BHF continues to promote the need for a more proactive approach to increasing the proportion of females accessing cardiovascular services. This year's NACR annual report shows there is an urgent need for CR programmes to offer services that are more attractive to female patients generally and older post MI patients specifically.

As part of our new NACR approach to report at local service level we have discovered large variability in the quality of service delivery and patient outcomes from services. Some programmes are delivering above average timely services and achieving the desired outcomes, many others are meeting most of the national minimum standards but there are some programmes that are below average in delivery and outcomes. We aim to use this year's report to gain a better understanding of the metrics associated with local reporting with an aim to report outcomes at a named service level in 2016.

At a local programme level there has been some real successes with improvements in all clinical outcomes and risk factors including the numbers stopping smoking, physical activity status, psychosocial health and health related quality of life. Based on local level reporting there is normal distribution of effectiveness meaning that some programmes have produced large positive outcomes, others have had limited success and in some programmes select clinical outcomes have got worse following CR.



The BACPR-NACR Certification programme, led by former BACPR President Prof Gill Furze and Prof Patrick Doherty, has officially started after a successful pilot period. We look forward to working with the BACPR and its new President, Dr Joe Mills, to continue this important work and achieve a basic minimum standard across all CR programmes by 2020.

We wish to thank CR teams for their efforts in the delivery of services to patients and for supplying data to the NACR which is essential to achieving our shared aim of high-quality CR.

**Report main author: Professor Patrick Doherty (Director of the NACR)**

Co-authors include:

- Corinna Petre, NACR Project Manager
- Nerina Onion, NACR Training and Information Officer
- Alex Harrison, Health Services Researcher (analyst)
- Veronica Dale, Senior Statistician
- Jenny Fell, Health Services Researcher
- Karen Cardy, Audit and Research Secretary
- Lars Tang, International NACR representative

The BHF National Audit is hosted at the Department of Health Sciences, University of York, UK.

For further information and contact details please visit our webpage:

**British Heart Foundation Cardiac Care and Education Research Group**  
**[www.cardiacrehabilitation.org.uk](http://www.cardiacrehabilitation.org.uk)**

## Part one

# INTRODUCTION AND METHODS

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## Introduction and methods

Cardiovascular disease (CVD) continues to be a significant challenge in terms of premature death and a health service burden as seen through increased hospital admissions and readmissions (JBS3 2014). Over 50 clinical trials, numerous systematic reviews and clinical commentaries have established the effectiveness of cardiac rehabilitation (CR) over the last 20 years (Heran et al 2011, Dalal, Doherty & Taylor 2015). However, given the rapidly changing nature of cardiology and associated innovation in service delivery, some CR is arguably less effective in the modern era (West et al 2011, Wood 2012, Doherty & Lewin 2012, Dalal et al 2015). British and European clinical guidelines continue to stress the need for a comprehensive and tailored approach to CR based on the assessment of patient need (BACPR 2012, Piepoli et al 2012).

The National Audit of Cardiac Rehabilitation (NACR) is an essential part of local and national quality assurance which monitors the extent to which CR programmes perform against key service indicators and achieve expected patient outcomes. A recent clinical review of CR published in the British Medical Journal (Dalal et al 2015) highlights that CR is highly effective but warns that not all programmes are working to the minimum standards. The BHF NACR now has the data and statistical power to report national, regional and local performance against agreed minimum clinical standards (BACPR 2012). The NACR also generates routine reports used by clinicians, providers and commissioners to evaluate service provision. Local programmes can also generate the similar reports for their own service.

In 2015 the NACR is finally in a position to audit against agreed minimum standards locally and to test the extent by which CR services deliver quality and outcomes. Continued debate in the research literature suggests that routine clinical practice might be sub-optimal and may not be deriving the expected outcomes (West et al 2011, Doherty & Lewin 2012). There is also huge variability in what constitutes CR in routine practice prompting the BACPR to set basic minimum standards. Data from routine clinical practice shows that CR (1) is being delivered later than recommended (2) is not underpinned by pre and post assessment and (3) is shorter in duration than the evidence would suggest (Heran et al 2011, NICE 2013, Piepoli et al 2012, Vanhees et al 2012).

It has become apparent in previous reports that national and regional reporting, albeit useful in driving strategy, falls short of being able to judge the quality and outcomes of CR. Last year the NACR Steering Committee agreed to report at local clinical level which we are happy to say we have achieved. This is the first CR audit world-wide to do this and CR programmes in the UK should be congratulated for their willingness to input their data and support the NHS transparency and quality focused agenda.

The national audit continues to work with the Health and Social Care Information Centre (HSCIC) to keep pace with data quality and governance requirements which are essential when collecting data from NHS clinical practice.

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## Methods for collecting data for NACR Annual Statistical Report

The NACR approach to monitoring CR and supporting service improvement is dependent on using the highest quality data from CR programmes. The NACR uses a quality approach with extensive data checking and validating which has reduced the burden of harmonising and cleaning audit data. Through our work with the HSCIC and representatives from Wales, Northern Ireland and England we have aligned data collection with key indicators across regional health boundaries. We continue to work with clinical leaders in Scotland to complete a feasibility study that will hopefully result in their inclusion in the national audit in the near future. The NACR 2015 report uses data from 2013-2014.

The NACR has made a significant adjustment to older coding rules so that it can better assess uptake in patients following CABG surgery. This has led to a relative reduction in uptake as MI+CABG, which was previously reported as MI, is now combined with CABG as a single category. This prevents direct comparison with previous years but will allow for a more accurate analysis in future years.

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### Number receiving CR

Detail about the number of patients receiving CR was achieved by collating data from the NACR electronic database and via the NACR postal survey. Where programmes did not provide data the numbers were estimated using either the previous year's figures for that site if they confirmed that the service had not changed, or using the median number calculated from those sites that had returned data.

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### Number eligible for CR

Uptake was calculated for the three diagnosis groups; myocardial infarction (MI), percutaneous coronary intervention (PCI) and coronary artery bypass surgery (CABG). In order to avoid double counting, patients with an MI and CABG in the same year were counted in the CABG group. Due to national coding variations in reporting heart failure patient numbers we are unable to derive valid numerator and denominator values across the nations of the UK.

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### England

Individual anonymised patient level Hospital Episode Statistics (HES) data was provided by the HSCIC on the number of people with MI, PCI or CABG. Those with death on discharge recorded were excluded.

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## Northern Ireland

The Department of Health, Social Services and Public Safety Northern Ireland Statistics provided aggregated data on people discharged alive after having an MI, PCI or CABG.

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## Wales

NHS Wales Informatics Service provided aggregated data on people discharged alive after an MI, PCI or CABG. The NACR now reports across Health Boards in Wales which are the organisations tasked with ensuring the quality of care that patients receive.

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## Other

This includes the Isle of Man and the Channel Islands, which are reported in terms of key service indicators and outcomes where applicable.

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# Approval process for accessing NHS data for the NACR

The NHS is committed to ensuring that all patients receive the highest quality care and achieve similar benefits no matter where they live, and the NACR is tasked with ensuring this is accomplished. This is achieved by comparing data collected by the NACR, ideally from all programmes in the UK, with agreed national 'minimum standards' on how best to deliver CR. The NACR is the only national audit collecting data on the quality of care and clinical outcomes for patients taking part in CR following a heart attack, after bypass surgery or after having a stent inserted into diseased arteries in the heart. To fulfil this role the NACR needs to collect data from routine clinical practice about the type of service offered and the typical benefits patients achieve. To gain the best possible picture we ideally need data from all eligible patients who are offered CR. The data the NACR collects serves two purposes. Firstly, to support local hospital or community based CR teams to generate their own local reports about patient progress and secondly, to enable the national audit to monitor and help improve the quality of CR services across the UK. The data seen by the national audit team does not contain personal details of patients.

The NACR, through the HSCIC, has approval (under Section 251 of the NHS Act 2006) from the Health Research Authority's Confidentiality Advisory Group (CAG) to collect patient identifiable data without explicit consent from individual patients. The challenge of gaining patient consent, to use their data for national audit purposes, is extremely difficult and would create a huge burden on services and staff during the management of a heart attack or immediately following surgery. For this reason the NHS has in place an 'exemption from consent' process where clinical and personal data is entered into NHS systems without explicit consent. Patients are informed about the purposes of the audit and how the information will be used through face to face communication and through the assessment questionnaires that are used to collect data for the audit. There is information on the front of these questionnaires to provide patients with details of why the data is being collected, how it is used, who can see it, and their right to opt out without any effect on their treatment. The Section 251 approval covers the roles of the BHF, HSCIC and the NACR team and ensures the highest quality procedures for collecting, sharing and using only the agreed data about a patient's rehab experience. The approval and the role of the national audit are reviewed each year by CAG.

For more information about the national audit please visit our web page.

**British Heart Foundation Cardiac Care and Education Research Group**

**[www.cardiacrehabilitation.org.uk](http://www.cardiacrehabilitation.org.uk)**

**[www.york.ac.uk/healthsciences/research/cardiac](http://www.york.ac.uk/healthsciences/research/cardiac)**

## Part two

# PROGRAMME LEVEL DATA AND UPTAKE TO CR BY COUNTRY

## Number of CR programmes reporting in the NACR

The number of CR programmes delivering core CR in 2013-2014 is 308 (Table 1). The total number of programmes identified through NACR survey ID numbers and NACR electronic data entry, is slightly more at 318 programmes across England, Wales and Northern Ireland. The response rate for this year is 90% of all programmes in the three nations making it highly representative of CR provision in the UK.

The NACR and BHF continue with the Scotland feasibility study, initially with the Lothian Health Board, to investigate the inclusion of Scotland's CR programmes into the NACR in 2016.

**Table 1**  
Number and type of patients starting CR

	Number of patients			
	England	Northern Ireland	Wales	Other
MI	14,941	484	650	45
MI+PCI	20,929	762	1,282	91
PCI	10,695	400	413	38
CABG	10,987	413	671	44
Heart Failure	3,364	22	200	8
Angina	2,445	112	367	8
Valve Surgery	4,438	96	329	6
Other Surgery	299	2	25	2
Cardiac Arrest	120	3	14	1
Pacemaker	240	1	16	3
ICD	457	4	26	1
Other	5,022	119	452	28
Unknown	998	7	47	0
<b>Total</b>	<b>74,935</b>	<b>2,425</b>	<b>4,492</b>	<b>275</b>
Number of core CR delivery programmes	266	15	24	3
Number with NACR data	164	15	24	1
Number estimated	50	0	3	0
% Estimated	19	0	13	0



The exclusion of certain patient groups from CR is partly based on historical practice and funding arrangements for cardiology services which can vary in terms of patient group priority based on diagnoses, treatments and procedures. The good news is that since the release of NICE guidance on Heart Failure (HF) CG108 (NICE 2010), 91% of CR programmes in the UK now offer CR to patients with HF. The NACR and BACPR continue to encourage CR programmes to use the BHF 'Innovative Service Redesign' scheme and the 'Business Tool Kit' which has helped programmes to develop a strong clinical business case. The BHF supports clinicians to share their expertise and showcase good service models and approaches for the benefit of NHS services and patients.

[www.bhf.org.uk/healthcare-professionals/best-practice](http://www.bhf.org.uk/healthcare-professionals/best-practice)

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## Uptake to Cardiac Rehabilitation (CR) services

The ability of CR programmes in the UK to recruit even more patients from the eligible population, is evidenced through the continued improvement in uptake from 45% to 47%. This is not a chance phenomenon but is instead the result of hard work by CR teams and national associations in each of the nations. Albeit uptake to CR services in the UK far exceeds that seen in other European countries (mean of 30%) it remains short of national recommendations for England (Cardiovascular Disease Outcomes Strategy CVD\_OS 2013), Scotland (SIGN 2002), Northern Ireland (CREST 2006) and Wales (All Wales Cardiac Rehabilitation review 2013) where for example 65% uptake is recommended across all treatment conditions.

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### UK

Overall uptake to CR in the UK has improved by 2% which means that approximately 2,500 additional patients had CR compared to last year. This improvement, based on national averages, should not be taken as the sole marker of success, as significant in some cases, unacceptable variation remains in uptake to CR services. The NACR 2015 report shows that the number of eligible patients following an MI (medically managed) is the largest of all clinical groups yet the percentage starting CR is the lowest. In the post MI population alone over 27,000 patients did not receive CR as recommended by NICE (NICE 2013). In contrast the percentage of patients with MI+PCI attending CR has increased once again and stands at 54%.

CR programmes appear to have adapted alongside the newer cardiology approaches, such as primary PCI, but may have done so at the cost of patients following the more traditional post MI patient pathway. In order to investigate this emerging situation the NACR Team has decided to revisit its treatment coding and hierarchy where previously MI with CABG at the same time point was recorded as MI. Where national coding allows we now report MI (medically managed) as MI and report MI+CABG as CABG (Table 2). This means that the number of eligible CABG patients has increased which has led to a larger denominator and a concomitant reduction in uptake to CR for CABG patients. Albeit this new coding approach hinders comparison with previous NACR reports it does allow for a more realistic assessment of key CR indicators and outcomes in CABG and post MI (medically managed) patients.

In previous annual reports we have shown that older patients are not recruited to the same extent as younger patients however this year's report shows that in three of the four diagnosis/treatment groups the gap between the age of eligible patients and those starting CR is relatively small (1 year). The one exception is the age gap between post MI eligible patients and those that started CR which differs by 8 and 9 years for male and females. It would appear that the CR pathway for post MI is failing to recruit older patients. The expected percentage of eligible female post MI patients, based on HES data, is 47% yet the average proportion in the referred and started CR groups is 39% and 35% respectively. The post MI pathway is the most traditional (oldest) and may not, in recent years, have seen equivalent investment or focus when compared to the newer cardiology approaches such as primary PCI.

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## England

Overall uptake to CR in England has improved and now stands at 47% of eligible patients, across the four diagnosis/treatment groups receiving CR with over 2,000 more patients treated compared to last year (Table 2). Uptake in post MI patients has improved by 5% and by 3% in MI+PCI. The percentage of uptake in patients undergoing planned PCI has dropped slightly by 1%. Uptake to CR in patients following CABG surgery is now lower due to the new coding approach where MI+CABG is now combined with CABG as a single category.

As with the UK the number of women accessing services in England is reduced across the diagnosis/treatment groups (estimated at 5,500 fewer females) with a particular challenge in post MI patients. The proportion of older post MI patients is well below that expected.

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## Northern Ireland

Uptake to CR in Northern Ireland is 35% (up by 3%) across all groups with elective PCI showing a 4% increase and CABG uptake at 67% (up by 9%). The coding differences in Northern Ireland prevent us from teasing out post MI from MI+PCI which is an area that shows a 6% drop in uptake compared to last year. The proportion of women across all groups and older post MI patients generally is lower than expected.

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## Wales

CR uptake in Wales has increased to 42% (up by 4%) which is primarily a consequence of a 17% increase in uptake in CABG patients which meant that 180 extra patients attended CR. There was a 6% and 5% increase in MI+PCI and PCI patient groups respectively. The one group that bucked the trend was the post MI patients with a 4% drop in uptake. Albeit to a lesser extent than the other nations too few women were recruited and the age gap between eligible post MI patients and those attending CR was evident.

**Table 2**

CR uptake split by country and diagnosis/treatment group

	N	Receiving CR	%
UK: combined data for all three nations			
MI	43,724	16,463	38
MI+PCI	41,622	22,585	54
PCI	28,872	11,508	40
CABG	20,408	12,071	59
Total	134,625	62,627	47
England			
MI	37,782	14,941	40
MI+PCI	39,121	20,929	53
PCI	25,723	10,695	42
CABG	19,000	10,987	58
Total	121,626	57,552	47
Northern Ireland			
MI and MI+PCI	3,315	1,246	38
PCI	1,963	400	20
CABG	620	413	67
Total	5,898	2,059	35
Wales			
MI	3,621	650	18
MI+PCI	1,506	1,282	85
PCI	1,186	413	35
CABG	788	671	85
Total	7,101	3,016	42

## Part three

# NACR STATISTICS BY COUNTRY, REGION AND LOCAL PROGRAMME LEVEL

## NACR statistics by country, region and local programme level

In meeting our aim to align the NACR with NHS policy on emerging health services accountability the national audit reports key service indicators and patient outcomes at a regional and, for the first time, local level. Table 3 shows the 24 regions, across the three nations represented in the NACR used in reporting this year's audit figures. In the following sections each of the key audit variables is reported regionally followed by local reporting of the same variable.

**Table 3**  
Country and Health Region areas reported in the NACR

Country	Health Regions	NACR regional abbreviations
England*	Cheshire and Merseyside	C & M
	East Midlands	EM
	East of England	E o E
	Greater Manchester, Lancashire and South Cumbria	G M, L & S C
	London	L
	Northern England	NE
	South East Coast	SEC
	South West	SW
	Thames Valley	TV
	Wessex	W
	West Midlands	WM
	Yorkshire and The Humber	Y & TH
Northern Ireland	Belfast Health and Social Care Trust	BHSCT
	Northern Health and Social Care Trust	NHSCT
	South Eastern Health and Social Care Trust	SEHSCT
	Southern Health and Social Care Trust	SHSCT
	Western Health and Social Care Trust	WHSCT
Wales	Abertawe Bro Morgannwg	ABM
	Aneurin Bevan	AB
	Betsi Cadwaladr	BC
	Cardiff and Vale	C & V
	Cwm Taf	CT
	Hywel Dda	HD
	Powys Teaching	PT
Other		

CR programme data by country and region.

\*Health regions in England are defined as Strategic Clinical Networks (SCN).

## CR programme data by country and region

Service and patient demographics for the three nations and 24 Health Regions (Table 4) shows that the majority of regions and health boards are inputting data into the NACR. The percentage of programmes submitting data electronically to the national audit is 63%.

**Table 4**  
CR programme data by country and Health Region

Country	Health Regions	Total programmes	Electronic NACR data	% Entering data
England	C & M	14	10	71
	EM	25	13	52
	E o E	29	18	62
	G M, L & S C	25	19	76
	L	35	21	60
	NE	20	4	20
	SEC	23	17	74
	SW	29	17	59
	TV	6	4	67
	W	8	7	88
	WM	28	17	61
	Y & TH	34	17	50
Northern Ireland	BHSCT	3	3	100
	NHSCT	4	4	100
	SEHSCT	3	3	100
	SHSCT	3	3	100
	WHST	2	1	50
Wales	ABM	4	4	100
	AB	4	4	100
	BC	4	4	100
	C & V	2	2	100
	CT	2	2	100
	HD	4	4	100
	PT	5	4	80
Other		2	1	50
Total		318	204	63

NB: PT has been removed from future tables as insufficient NACR data.  
See table 3 for abbreviations.

## Age and gender profile at country, Health Region and programme level

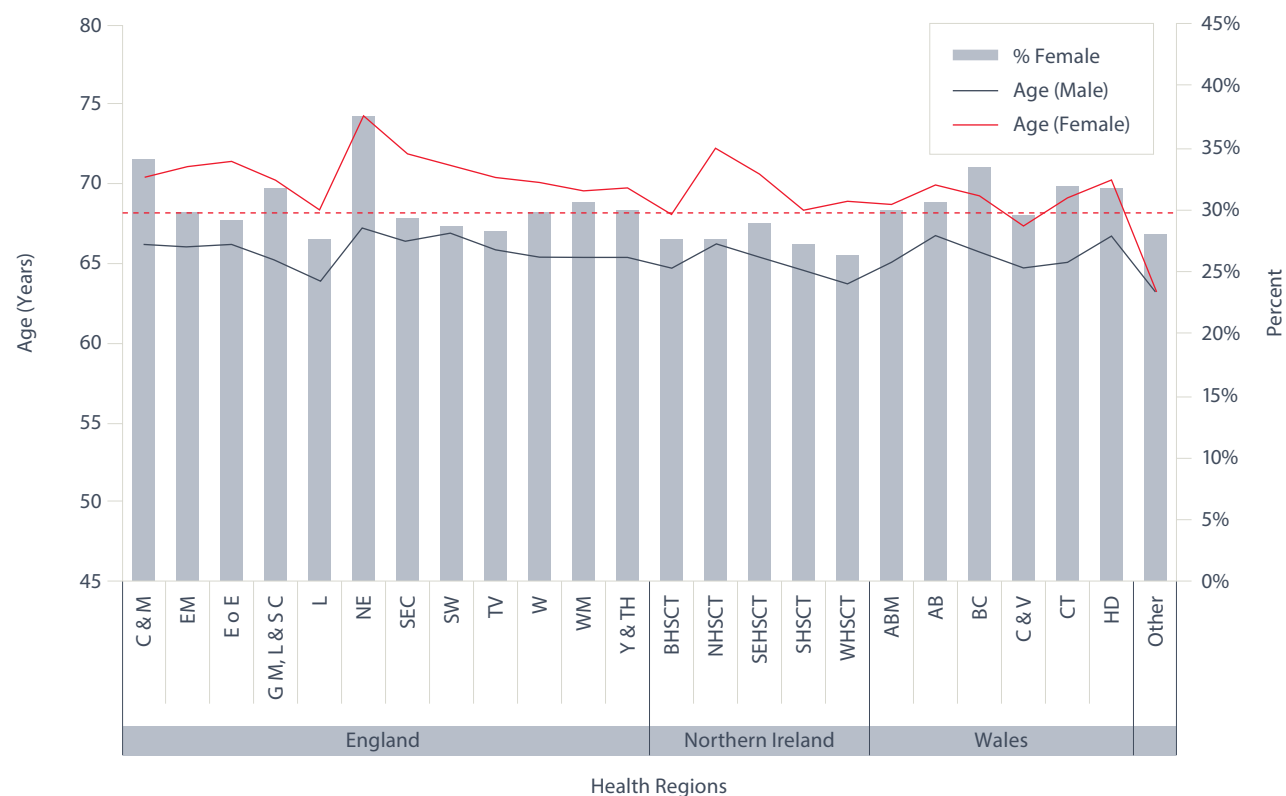
At the national level the overwhelming sense is that many Health Regions are recruiting close to the national expectation of 30% of females across all condition groups (Table 5, Figure 1). The picture is very different when reported at local level as the majority of local programmes are failing to recruit sufficient numbers of eligible females (Figure 2). Such huge variation in recruitment of females represents a significant deficiency in service provision and requires urgent action. There are a few positive exceptions with some centres recruiting higher proportions of females, equivalent to that seen in general cardiology, who are also older. In previous reports we were unable to draw such conclusions because regional reporting masked the effect.

**Table 5**  
NACR demographics for age and gender by country and Health Region

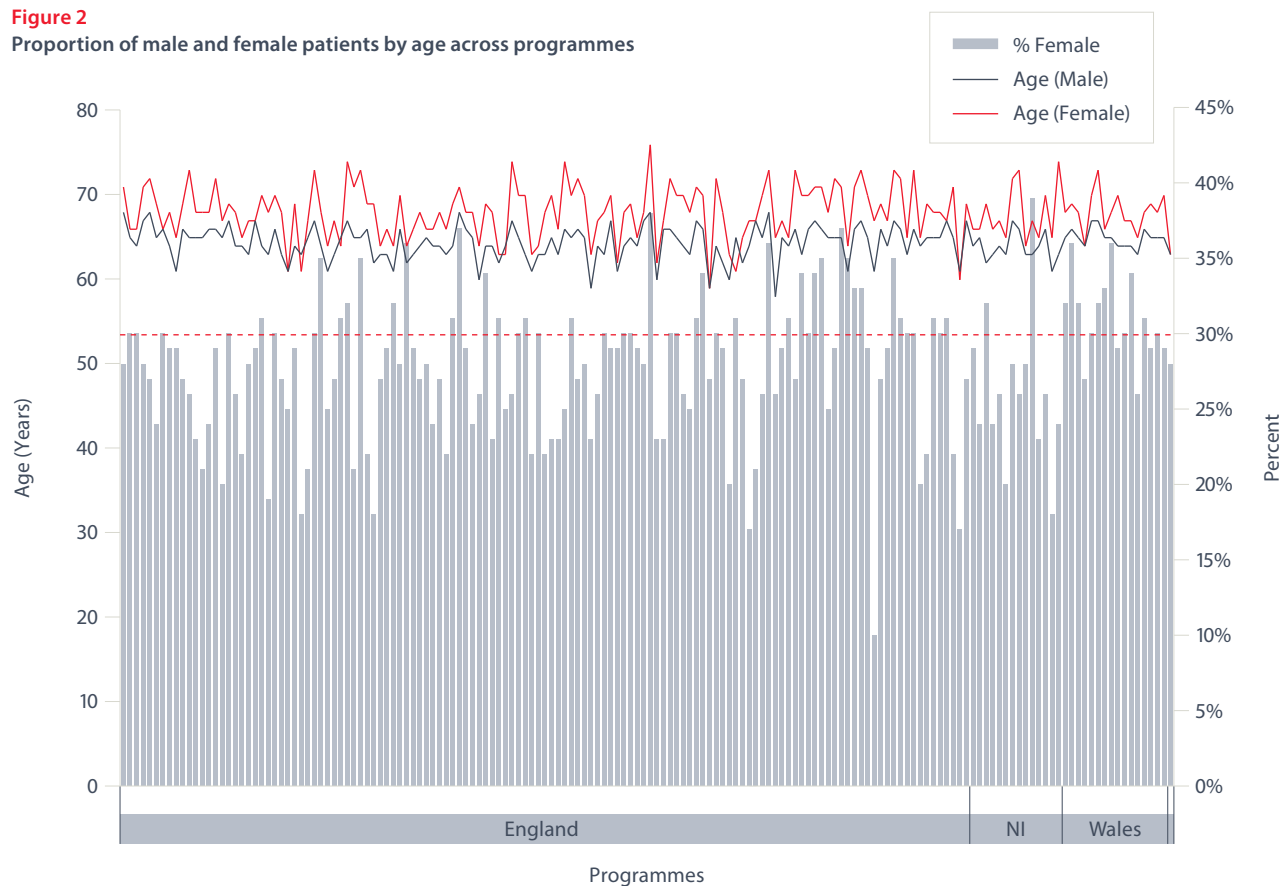
Country	Health Regions	N	Male		Female		Age	
			Age	%	Age	%	Minimum	Maximum
England	C & M	5,590	66	66	70	34	13	103
	EM	6,075	66	70	71	30	15	102
	E o E	7,735	66	71	71	29	15	104
	G M, L & S C	12,101	65	68	70	32	13	103
	L	10,613	64	73	68	28	16	109
	NE	596	67	62	74	38	29	107
	SEC	5,943	66	71	72	29	17	101
	SW	7,916	67	71	71	29	18	105
	TV	1,736	66	72	70	28	20	101
	W	4,410	65	70	70	30	16	97
	WM	7,067	65	70	70	31	18	101
	Y & TH	4,036	65	70	70	30	19	102
Northern Ireland	BHSCT	1,874	65	73	68	28	17	96
	NHSCT	854	66	72	72	28	24	97
	SEHSCT	1,004	65	71	70	29	29	98
	SHSCT	803	65	73	68	27	21	93
	WHSCT	697	64	74	69	26	26	97
Wales	ABM	735	65	70	69	30	22	99
	AB	1,327	67	70	70	31	22	100
	BC	1,991	66	67	69	34	18	101
	C & V	1,370	65	70	67	30	20	95
	CT	667	65	68	69	32	22	94
	HD	930	67	68	70	32	15	99
Other		89	63	72	62	28	40	85
Total		86,170	66	70	70	30	13	109

England N = 73,818, Northern Ireland N = 5,232, Wales N = 7,031, Total N = 86,170. These values will differ from the total eligible number as they are based on electronic NACR data only. See table 3 for abbreviations.

**Figure 1**  
Proportion of male and female patients across UK nations and Health Regions



**Figure 2**  
Proportion of male and female patients by age across programmes





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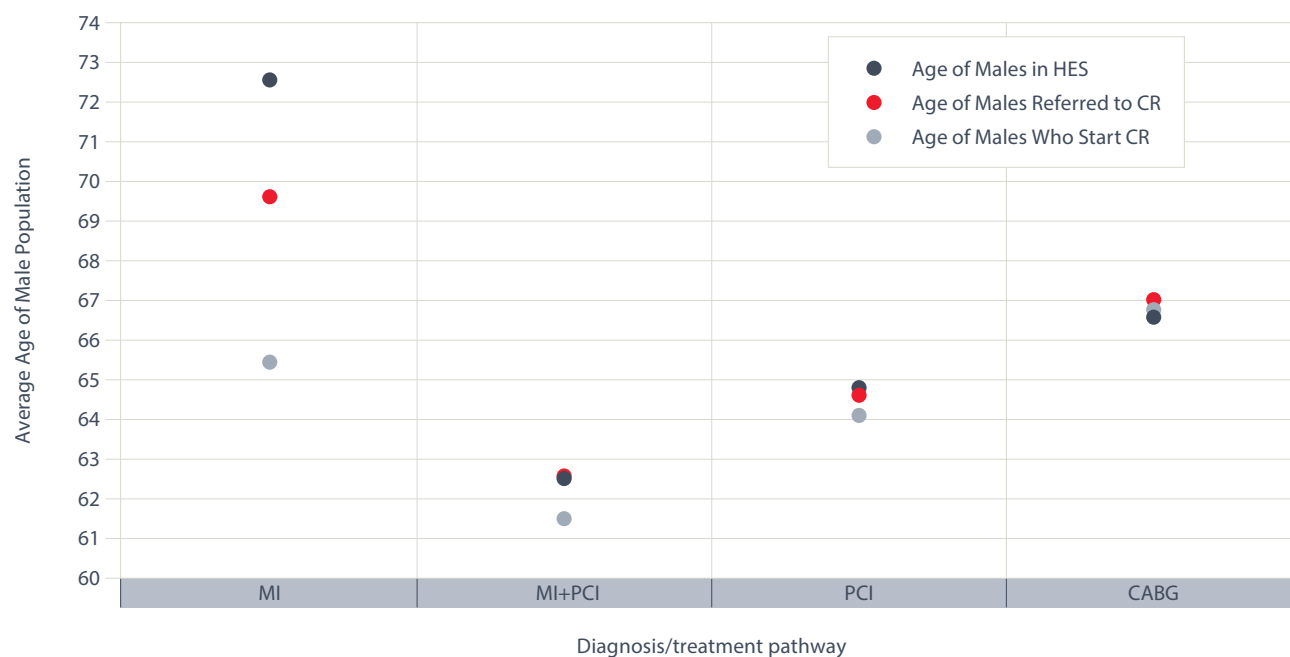
## Patient flow across the four diagnosis/treatment pathways

At a national level it appears that recruitment is not age dependent for patients on CABG, MI+PCI and PCI pathways of care but is negatively influenced by age in the post MI pathway. On average patients entering CR differ between 8 and 9 years from the eligible group (HES data) and the effect is evident in both males and to a greater extent in females. These findings should be of concern as the number of patients on the post MI pathway represents the largest of all the four groups and has the poorest uptake values across the UK (Table 2). In order to better understand the above recruitment trends we have produced a new analysis that shows patient flow, by gender and age, across the four diagnosis/treatment groups (Table 6). HES data represents the point of identification of all eligible patients, by the number of patients referred, and finally by the number starting CR as recorded in the NACR (Table 6). The reason for this approach is that the percentage of patients expected to reside in any one of the diagnosis/treatment groups varies between 20% for CABG to 47% in the post MI (medically managed) group for females and reciprocally for males (Table 6). With such large differences it becomes important to interpret patient flow within each group. The extent of patient flow variability, by age and gender, is most evident in the post MI group for females (Figure 3) and for males (Figure 4). The proportion of patients on the post MI pathway in the UK (33%) is similar to that of other European countries such as Denmark where post MI is 38% (DCRD 2013).

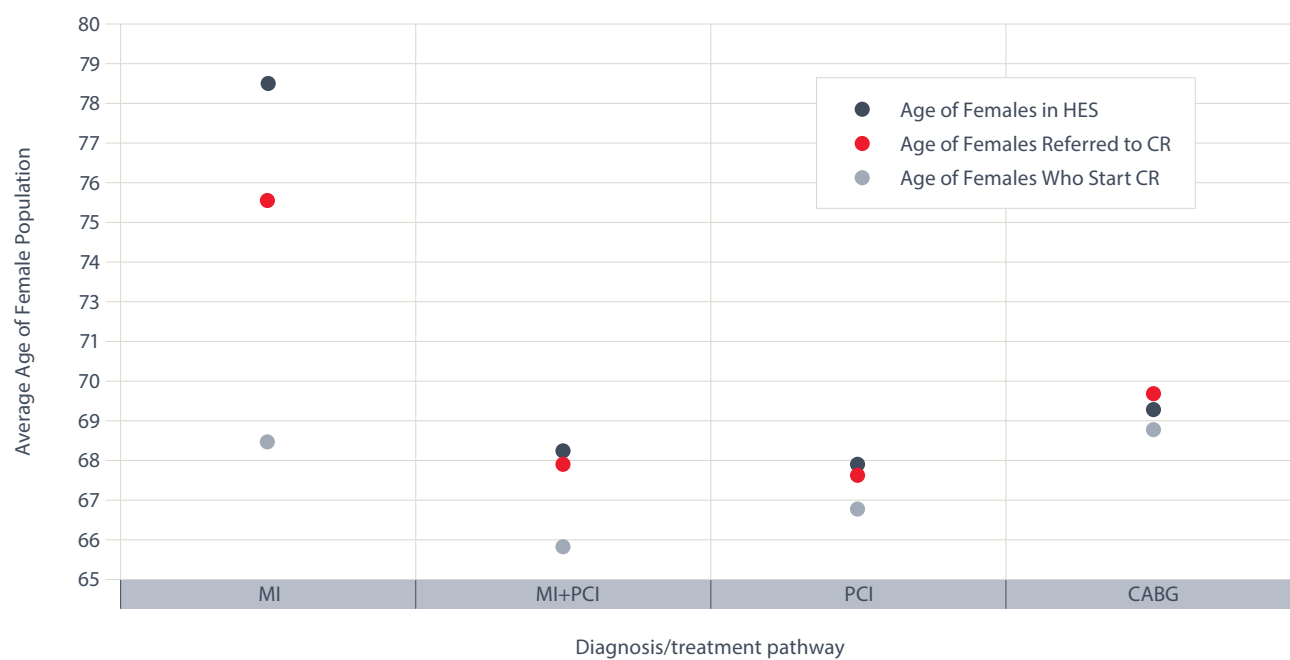
**Table 6**  
Patient flow across four diagnosis/treatment pathways split by gender and age

Gender	Age	MI	MI+PCI	PCI	CABG
HES population (Eligible)					
Male	Mean	73	63	65	67
	Minimum	13	19	12	17
	Maximum	108	100	100	93
	Standard Deviation	14	12	11	10
	% in HES	53	74	74	80
Female	Mean	78	68	68	70
	Minimum	13	20	12	21
	Maximum	107	101	96	93
	Standard Deviation	13	13	11	10
	% in HES	47	26	26	20
Referred to Core Rehab					
Male	Mean	70	63	65	67
	Minimum	15	19	23	19
	Maximum	109	100	103	96
	Standard Deviation	13	12	11	10
	% referred	61	75	74	81
Female	Mean	75	68	68	70
	Minimum	21	20	21	21
	Maximum	107	101	95	92
	Standard Deviation	13	13	11	10
	% referred	39	25	26	19
Started Core Rehab					
Male	Mean	65	61	64	67
	Minimum	21	22	23	32
	Maximum	95	100	103	96
	Standard Deviation	12	12	11	9
	% starting	65	76	74	83
Female	Mean	69	66	67	69
	Minimum	21	21	30	40
	Maximum	97	97	90	88
	Standard Deviation	13	12	10	9
	% starting	35	24	26	17

**Figure 3**  
Patient flow for males split by age and diagnosis/treatment pathway



**Figure 4**  
Patient flow for females split by age and diagnosis/treatment pathway



## Ethnicity, employment and marital status

Although the national demographic profile of CR in the UK remains predominately white British male (Table 7) there is substantial variability at regional and local level. For instance, in Wales two hospitals have between 40% and 50% non-white profiles with any other Asian background being above 30%. Similar locality based profiles exist across the country in some of the major cities such as London and Birmingham. We believe that significant variation in ethnic profile may have implications for how CR programmes are resourced (e.g. translation and interpreter costs). The NACR has produced an online supplement showing local level variation in ethnicity (available from Dec 2015 at [www.cardiacrehabilitation.org.uk](http://www.cardiacrehabilitation.org.uk)).

As reported earlier female gender is under represented in service uptake and this can also be seen across the ethnicity categories (Table 7).

**Table 7**  
Ethnicity by gender

Ethnicity	%	Male %	Female %
British	81	70	30
Irish	2	70	30
Any other White background	4	73	27
White and Black Caribbean	<1	69	31
White and Black African	<1	68	32
White and Asian	<1	73	27
Any other mixed background	<1	69	31
Indian	2	73	27
Pakistani	2	73	27
Bangladeshi	<1	81	19
Any other Asian background	1	77	23
Caribbean	<1	58	42
African	<1	68	32
Any other Black background	<1	67	33
Chinese	<1	70	30
Any other ethnic group	1	78	22
Not Stated	6	72	28
Total	100	70	30

N=68,270

The dominant demographic of CR attenders is married (70%) the remaining categories range from 1% to 11% for the other marital status options (Table 8). The situation for employment status is mostly retired (56%) followed by employed at 27% when part time and full time employment is combined (Table 9). The lower numbers of unemployed people attending CR represents another challenge for CR programmes especially as austerity takes hold.

With an increasingly higher number of day-case PCI procedures for instance >25% in 2014 [www.ucl.ac.uk/nicor/audits/adultpercutaneous/reports](http://www.ucl.ac.uk/nicor/audits/adultpercutaneous/reports) CR programmes need to be more flexible and innovative in recruiting patients who are either returning to work or who never actually had any time off work. Unpublished NACR data analyses have shown that retired patients wait longer to start CR than employed individuals. The reasons or determinants for this finding will be published in future audits and publications.

**Table 8**  
Marital status

Marital Status	%
Married	70
Permanent Partnership	4
Divorced	5
Widowed	11
Separated	1
Total	100

N=58,347

**Table 9**  
Employment status

Employment status	%
Employed Full-time	16
Employed Part-time	4
Self-employed Full-time	5
Self-employed Part-time	2
Unemployed - Looking for Work	2
Government Training Scheme	<1
Looking After Family/Home	2
Retired	56
Permanently Sick/Disabled	4
Temporarily Sick or Injured	9
Student	<1
Other Reasons For Not Working	1
Total	100

N=25,728

## Co-morbidity

Irrespective of the type of initiating event or procedures (e.g. MI, CABG or PCI) co-morbidities are spread across a range of different conditions (Table 10). The characteristics of patients at the point of entry to CR can vary significantly in the context of co-morbidity which is an important consideration when tailoring an intervention for patients. This is evident across a range of baseline variables including BMI, Cholesterol, Blood Pressure (BP), anxiety and depression and, most notably, in terms of fitness as measured using the incremental shuttle walk test (ISWT). Previous NACR data analysis (NACR 2013) has shown that an increasing number of co-morbidities is associated with reduced outcomes following CR compared to patients with less co-morbidity. The BACPR (2012) continues to emphasise that a combination of multiple risk factors and high levels of co-morbidity is best managed by a multi-disciplinary team approach.

**Table 10**  
Co-morbidity profile for CR

Co-morbidity	with 2 or more %
Angina	27
Arthritis	19
Cancer	9
Diabetes	31
Rheumatism	3
Stroke	8
Osteoporosis	3
Hypertension	64
Chronic bronchitis (COPD)	5
Emphysema	4
Asthma	10
Claudication	4
Chronic Back Problems	11
Anxiety	5
Depression	6
Family History of CVD	23
Erectile Dysfunction	4
Hypercholesterolaemia/Dislipidaemia	38
Other Comorbid Complaint	34

N=33,870

## Reasons for not taking part in CR

Of the 23,662 patients with a record for why they did not attend all aspects of CR the main reason for not taking part in core CR was a lack of interest (39%) followed by physical incapacity (10%). Although some patients may genuinely not be interested there are others who might be more interested if the CR programme characteristics matched their preferences. Dalal et al (2007) demonstrated that a menu based approach to CR delivery (e.g. home, community or hospital), aligned with patient choice, yields comparable outcomes. A menu based approach is a logical way to increase uptake. As reported earlier females generally and older patients on the post MI pathway are poorly represented and positive action is required by clinical teams to try and remedy this situation. The number of responses informing the 'reasons for not taking part' analysis was distributed proportionally between males and females.

**Table 11**  
Reasons for not taking part in CR

	Acute Hospital %	Intermediate (Phase II) %	Core delivery %	Long term maintenance %
Patient not interested/refused	14	28	39	35
Ongoing investigation	2	3	5	7
Physical incapacity	3	3	10	9
Returned to work	0	0	3	6
Local exclusion criteria	4	7	3	0
Language barrier	0	0	0	0
Holidaymaker	0	0	0	0
Mental incapacity	2	2	1	0
No transport	0	0	1	0
Died	3	5	2	0
Not referred	9	2	1	7
Too ill	3	3	4	2
Rehab not needed	11	4	3	4
Rehab not appropriate	9	11	7	18
Staff not available	7	2	1	0
Rapid transfer to tertiary care	4	0	0	0
DNA/no contact	4	17	9	5
Transfer to another programme	1	3	2	0
No service available	0	1	1	1
Transfer for PCI/treatment	1	0	0	0
Transfer to DGH/Trust	2	1	1	0
Other	17	5	6	3
Unknown	2	1	1	1
Total	100	100	100	100
	N=5,147	N=3,718	N=13,276	N=1,521

## Reasons for not completing CR

The data on reasons for not completing CR (N=9343 patients) remains difficult to interpret as so few programmes report this data and in those that do 'DNA/unknown reason' dominates the responses entered by clinical teams. In those programmes that collected data on non-completion 2,285 patients did not give a reason for not attending core CR which is a missed opportunity for patients to give feedback to help improve these programmes. In order to improve services and reduce poor adherence, CR programmes would benefit from gaining more insight into why patients do not complete a tailored programme of CR. The NACR Team will investigate this in future reports and publications.

Return to work, as a reason for not completing CR, could be perceived as a positive or negative outcome in that for some it could mean that they feel ready for work whereas others may feel pressured into returning to work due to financial difficulties or job security.

**Table 12**  
Reasons for not completing CR

Reason For Not Completing	Acute Hospital %	Intermediate (Phase II) %	Core delivery %	Long term maintenance %
DNA unknown reason	4	27	35	44
Returned to work	<1	2	8	16
Left this area	4	2	2	2
Achieved aims	0	<1	0	0
Planned/emergency intervention	27	4	2	1
Too ill	8	10	12	17
Died	29	7	2	0
Other	24	39	32	16
Hospital Re-Admission	<1	3	2	2
Unknown	2	5	6	2
	N=1,066	N=1,662	N=6,530	N=84



## Part four

# ANALYSIS BASED ON NATIONAL MINIMUM STANDARDS

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## Analysis based on national minimum standards

The BACPR (2012) and NICE service guidance (CMG 39 & 40) recommend that CR programmes should be offered early and underpinned by assessment prior to, and on completion of, CR. The duration and frequency of CR, based on NICE guidance (NICE CG 172, 2013) and Cochrane Review (Heran et al 2011) should ideally be 12 weeks (or no less than 8 weeks) at a frequency of twice per week. The CR team should be multi-disciplinary with professionals that possess the skills and competences to support patients in achieving the desired health behaviour change and enabling these same skills, in patients and their carers, as part of a long term self-management approach (BACPR 2012).

## Is CR delivered early enough to meet national guidance?

NICE, the Department of Health and the BACPR state that CR should start within 28 days of referral for most patients following post MI (medically managed) and PCI. The timeframe for patients undergoing CABG is six weeks or 42 days. Table 13 and Figure 8 show that, for the vast majority of Health Regions, patients are waiting too long before starting CR. Local reporting (Figure 9) shows considerable variation with some programmes meeting the recommended timings and many others doing less well in delivering timely CR.

**Table 13**  
Median wait time from referral to start of CR (days)

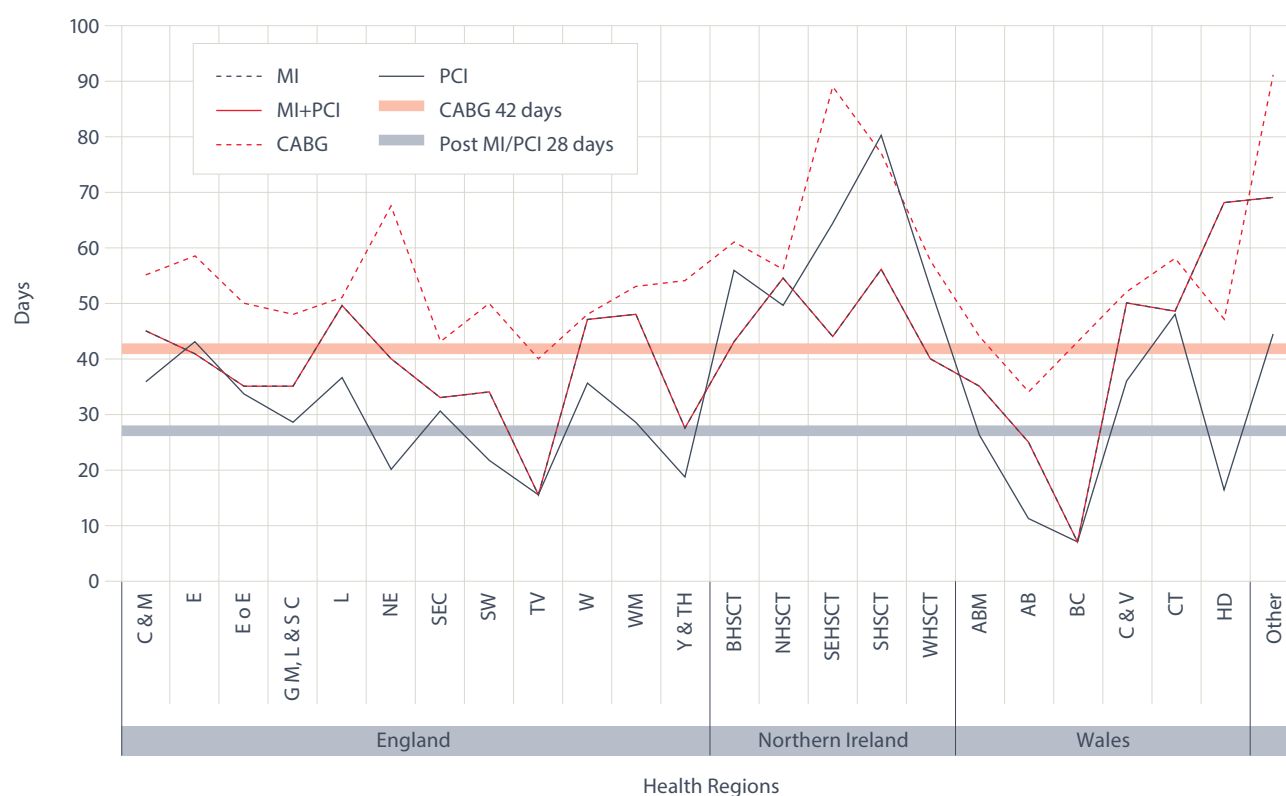
Country	Health Regions	MI	MI+PCI	PCI	CABG	Heart Failure	Angina	Valve Surgery	Other
England	C & M	45	45	36	55	55	45	52	58
	EM	41	41	43	59	35	86	50	65
	E o E	35	35	34	50	49	28	48	48
	G M, L & S C	35	35	29	48	32	32	46	50
	L	50	50	37	51	29	29	49	49
	NE	40	40	21	68	23	38	37	50
	SEC	33	33	31	43	35	35	40	42
	SW	34	34	22	50	9	29	48	49
	TV	16	16	16	40	38	19	30	52
	W	47	47	36	48	28	50	49	45
	WM	48	48	29	53	29	49	47	44
	Y & TH	28	28	19	54	19	10	45	34
Northern Ireland	BHSCT	43	43	56	61	58	47	66	41
	NHSCT	55	55	50	56	n/c	52	76	93
	SEHSCT	44	44	65	89	58	51	83	63
	SHSCT	56	56	81	77	n/c	126	119	50
	WHSCT	40	40	53	58	n/c	100	59	74
Wales	ABM	35	35	27	44	15	21	46	39
	AB	25	25	12	34	24	17	32	22
	BC	7	7	8	7	17	57	5	19
	C & V	50	50	36	52	n/c	33	58	43
	CT	49	49	48	58	28	47	56	59
	HD	68	68	17	47	30	24	35	33
Other		69	69	45	91	n/c	58	80	99
Total		38	38	32	50	33	37	46	47

England N=29,562, Northern Ireland N=1,671, Wales N=3,426, Total N=34,723. These values will differ from the total eligible number as they are based on electronic NACR data only. See table 3 for abbreviations.

Although at a national and regional level CABG patients are, on average, waiting longer before starting CR (Figure 5) around 20% of local programmes are offering CR much earlier to CABG patients (Figure 6). Research has shown that bypass patients can safely commence CR earlier than existing guidelines recommend (Eder et al 2010) which might partly explain this finding at a local CR programme level.

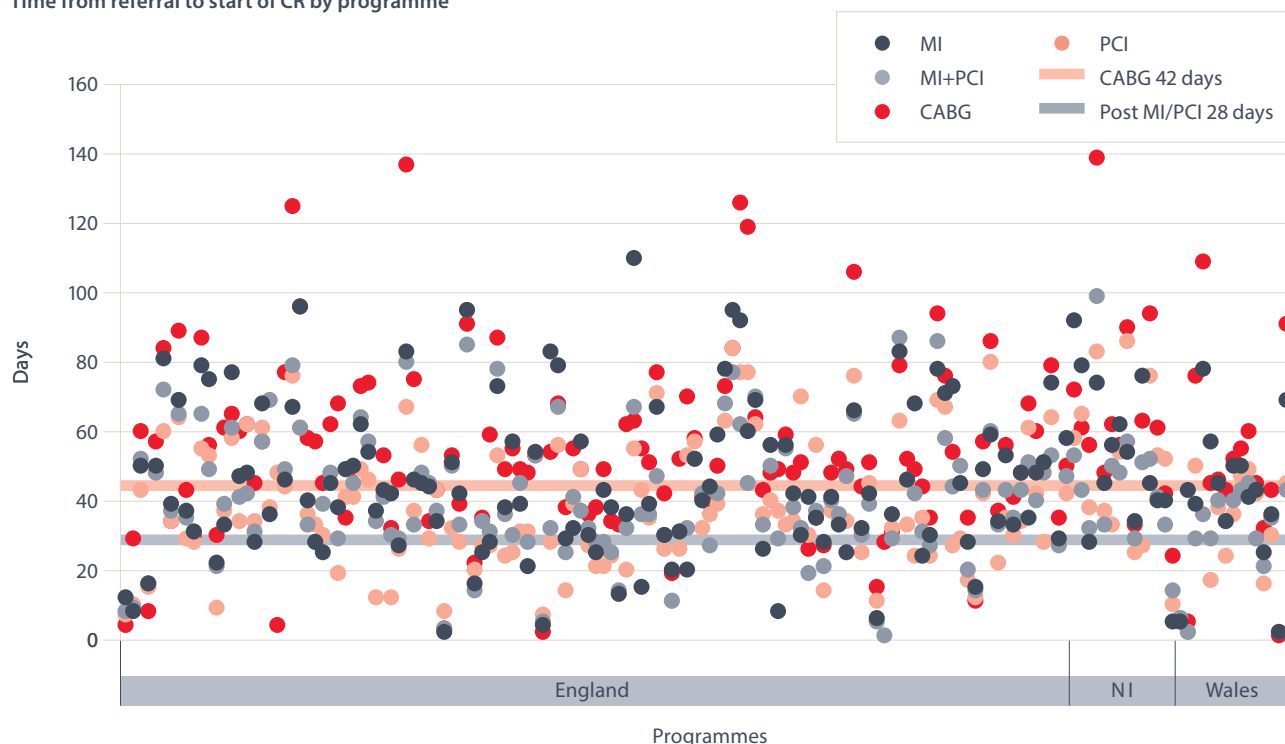
Based on the new local reporting approach there is an obvious need for many CR programmes to redesign their service to enable early commencement of CR. Some programmes are already achieving this which means it can be done despite austerity measures impacting on resources. The BHF 'Innovative Service Redesign' scheme is one example of an approach that has helped CR services make the necessary changes to improve care for patients. As stated previously, the NACR considers 2015 to be the new baseline for CR in the UK and will look to monitor change in 'time to starting CR' in future reports.

**Figure 5**  
Time from referral to start of CR by Health Region



**Figure 6**

Time from referral to start of CR by programme



## Do CR programmes carry out pre and post assessment in accordance with national guidance?

The BACPR Minimum Standards (BACPR 2012) and Department of Health CR Commissioning Pack (2010) stipulate that all patients should undergo a pre and post CR assessment. Specifically assessment 1 (pre CR) is used to inform a tailored intervention and assessment 2 (post CR) is used to evaluate the impact of the intervention and inform a long-term maintenance plan for the patient.

The analysis of the percentage of patients with pre and post assessments has two aspects:

1. Report baseline assessment in relation to the number of patients with an initiating event (e.g. MI, CABG, PCI,) which helps judge the extent by which programmes meet BACPR Minimum Standard 3 (identify all eligible patients) and Standard 4 to carry out a baseline assessment and tailor CR intervention based on patient need.
2. Report the percentage of patients that started CR with an assessment and had a post CR assessment. This helps clarify a further part of BACPR Minimum Standard 4 which states that programme completion is defined by completion of formal assessment at the end of programme.

## Baseline assessment in relation to the number of patients eligible for CR

The extent of baseline assessment, in relation to the number of patients with an initiating event registered with the NACR, is now at 50% which is down by 1% on last year. What this means is that only half of all eligible patients have an assessment which is a situation at odds with the BACPR minimum standard requiring a tailored CR intervention. The extent by which CR programmes in the Health Regions of the UK achieve this requirement varies regionally with many Health Regions (14 of the 24 regions) demonstrating above average performance. Notably there is one region where the percentage of eligible patients assessed is at 96%.

**Table 14**  
Percentage of patients with an initiating event and assessment 1 (pre CR)

Country	Health Regions	Initiating event records (N)	% Assessment 1 (Pre CR)
England	C & M	5,666	39
	EM	6,138	28
	E o E	8,081	50
	G M, L & S C	12,313	46
	L	11,217	53
	NE	600	55
	SEC	5,994	58
	SW	8,386	59
	TV	1,754	69
	W	4,487	63
	WM	7,167	40
	Y & TH	4,471	58
Northern Ireland	BHSCT	1,890	51
	NHSCT	901	80
	SEHSCT	1,006	53
	SHSCT	819	71
	WHSCT	698	17
Wales	ABM	750	61
	AB	1,329	50
	BC	2,003	23
	C & V	1,391	41
	CT	673	45
	HD	995	77
Other		90	96
Total		88,819	50

These values will differ from the total eligible number as they are based on electronic NACR data only.  
See table 3 for abbreviations.

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## Proportion of patients starting CR with a record of pre and post CR assessment

Unlike the previous section that reported 50% of assessments were undertaken in the context of eligible patients, this section focuses on the number and percentage of patients that start CR and finish CR with an assessment (Table 15 and Figure 7). The range in percentage assessment is 15% to 99% for assessment 1 and zero to 88% for assessment 2 across the Health Regions. The BACPR standards stress the importance of the CR intervention starting with an assessment yet, of those that start CR, only 76% have an assessment at baseline and 53% have a post CR assessment (Figure 8). The extent of variation by programme is huge especially for post CR assessment where a substantial number don't carry out or at least don't record any form of post intervention assessment.

The percentage completion based on those that start is encouraging at 83%.

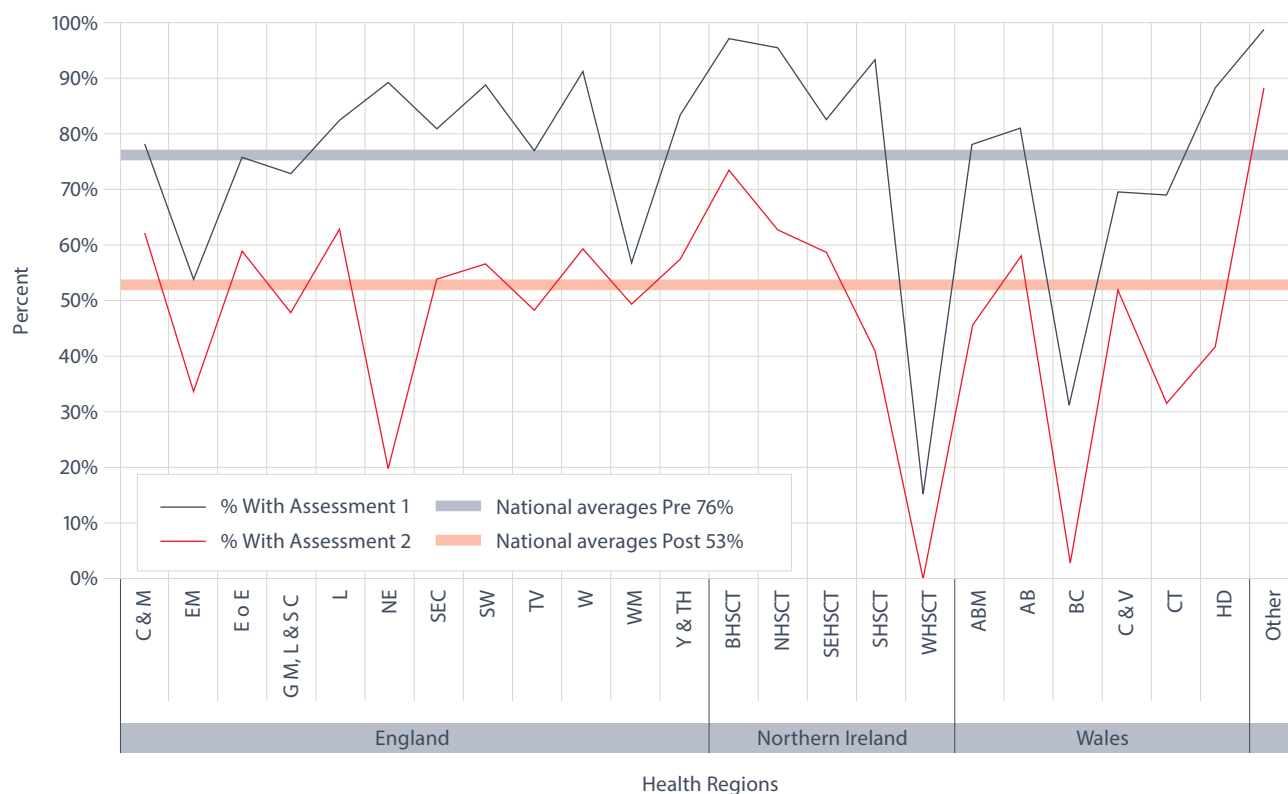
**Table 15**  
**Percentage starting CR with a record of pre and post assessment by Health Region**

Country	Health region	Starting Rehabilitation (N)	% with Pre (Assessment 1)	% with Post (Assessment 2)
England	C & M	2,219	78	62
	EM	1,314	54	34
	E o E	4,671	76	59
	G M, L & S C	5,308	73	48
	L	5,151	82	63
	NE	121	89	20
	SEC	3,196	81	54
	SW	3,824	89	57
	TV	1,285	77	48
	W	1,952	91	59
	WM	3,524	57	49
	Y & TH	1,663	83	57
Northern Ireland	BHSCT	528	97	73
	NHSCT	400	96	63
	SEHSCT	458	83	59
	SHSCT	327	93	41
	WHSCT	158	15	0
Wales	ABM	397	78	46
	AB	1,141	81	58
	BC	1,330	31	3
	C & V	289	70	52
	CT	410	69	31
	HD	410	88	42
Other		85	99	88
Total		40,161	76	53

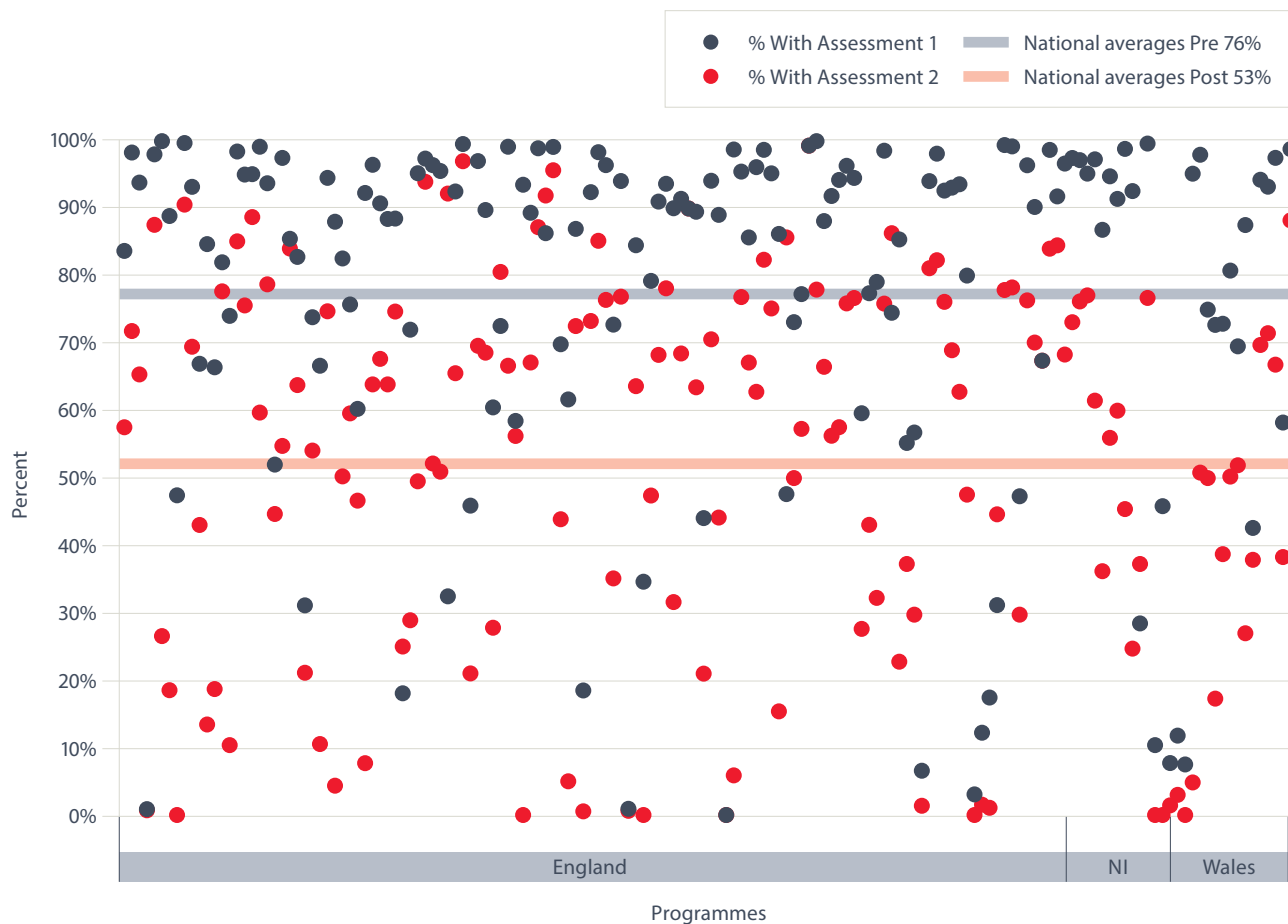
England N=34,228, Northern Ireland N=1,871, Wales N=3,977, Total N=40,076. These values will differ from the total eligible number as they are based on electronic NACR data only. See table 3 for abbreviations.



**Figure 7**  
Percentage of patients with a pre and post CR assessment by Health Region



**Figure 8**  
Percentage of patients with a pre and post CR assessments by programme



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## Is the timing of baseline assessment (pre CR) aligned with national guidance?

National guidance recommends that CR assessment should start early and has been defined by the Department of Health and agreed by NICE as within 28 days of initiating event (5 days to validate the patient record, 5 days to send a referral letter, 8 days for the re-offer if required and 10 days from a referral being accepted by the patient). The 28 days is seen as best practice, and 47 days (based on NACR average), is the BACPR minimum standard and will be used in the National Certification scheme in 2016. The NACR report shows that the majority of programmes managing MI+PCI patients reside between the best practice and minimum standard (Table 16 and Figure 9). At a local level the situation is more variable with a tendency for a much longer waiting time (Figure 10).

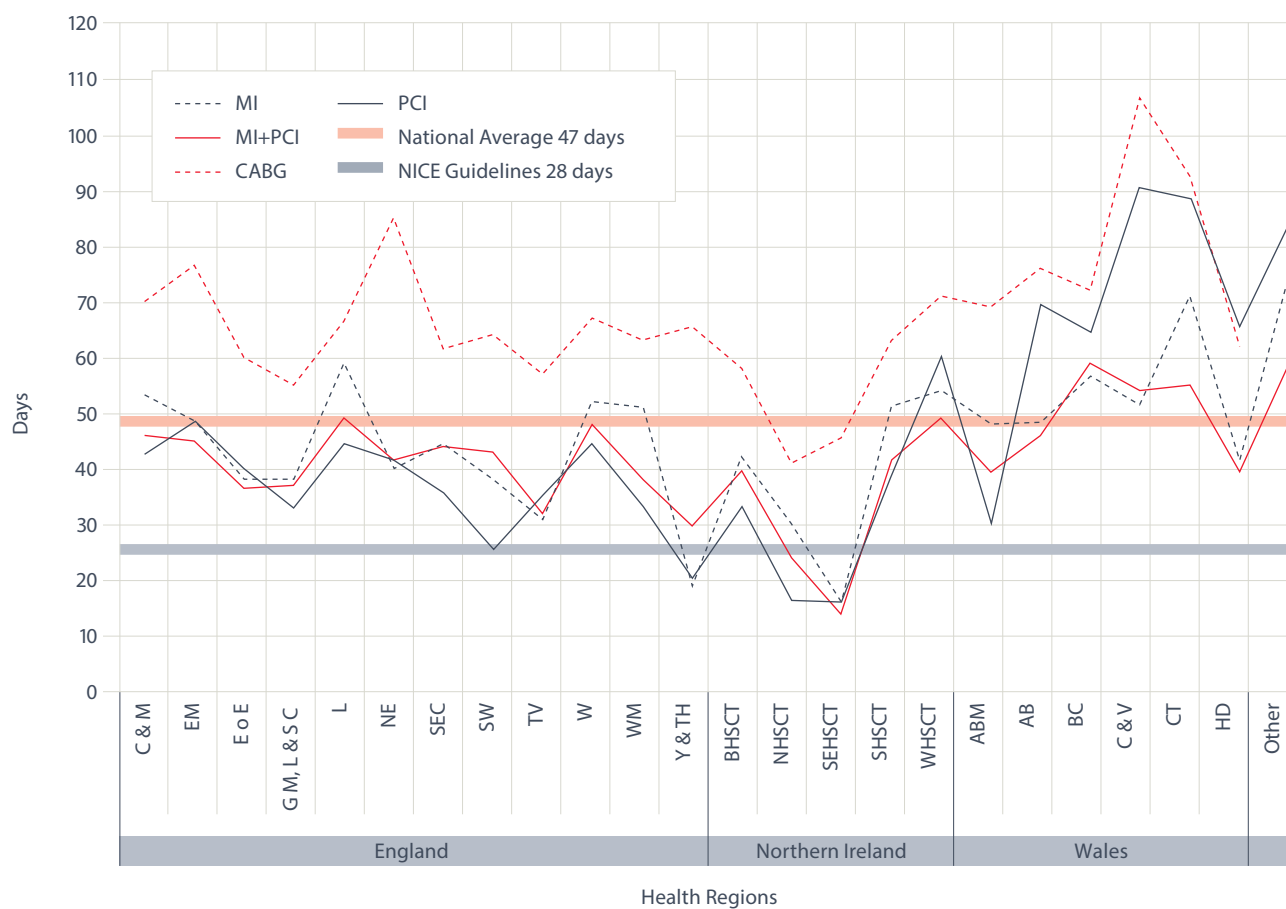
**Table 16**  
Median wait time from initiating event to pre CR assessment (days)

Country	Health region	MI	MI+PCI	PCI	CABG	Heart Failure	Angina	Valve Surgery	Other
England	C & M	53	46	43	70	77	64	67	73
	EM	48	45	49	77	47	97	64	71
	E o E	38	37	40	60	9	34	58	64
	G M, L & S C	38	37	33	55	35	36	55	58
	L	59	49	45	67	53	52	65	63
	NE	40	42	42	85	43	65	65	75
	SEC	45	44	36	62	64	42	60	67
	SW	38	43	26	64	14	36	55	67
	TV	31	32	36	57	62	40	57	83
	W	52	48	45	67	43	56	67	70
	WM	51	38	34	63	74	51	58	59
	Y & TH	19	30	21	66	36	14	67	35
Northern Ireland	BHSCT	42	40	34	58	15	32	61	65
	NHSCT	30	24	17	41	37	26	42	31
	SEHSCT	16	14	17	46	38	77	28	32
	SHSCT	51	42	39	63	n/c	30	63	60
	WHSCT	54	49	61	71	50	63	69	66
Wales	ABM	48	40	31	69	30	78	75	64
	AB	48	46	70	76	91	55	81	43
	BC	57	59	65	72	n/c	59	103	93
	C & V	52	54	91	107	113	70	95	106
	CT	71	55	89	93	n/c	170	134	79
	HD	42	40	66	62	n/c	105	66	83
Other		75	59	85	n/c	n/c	71	119	112
Total		43	41	39	63	41	48	60	63

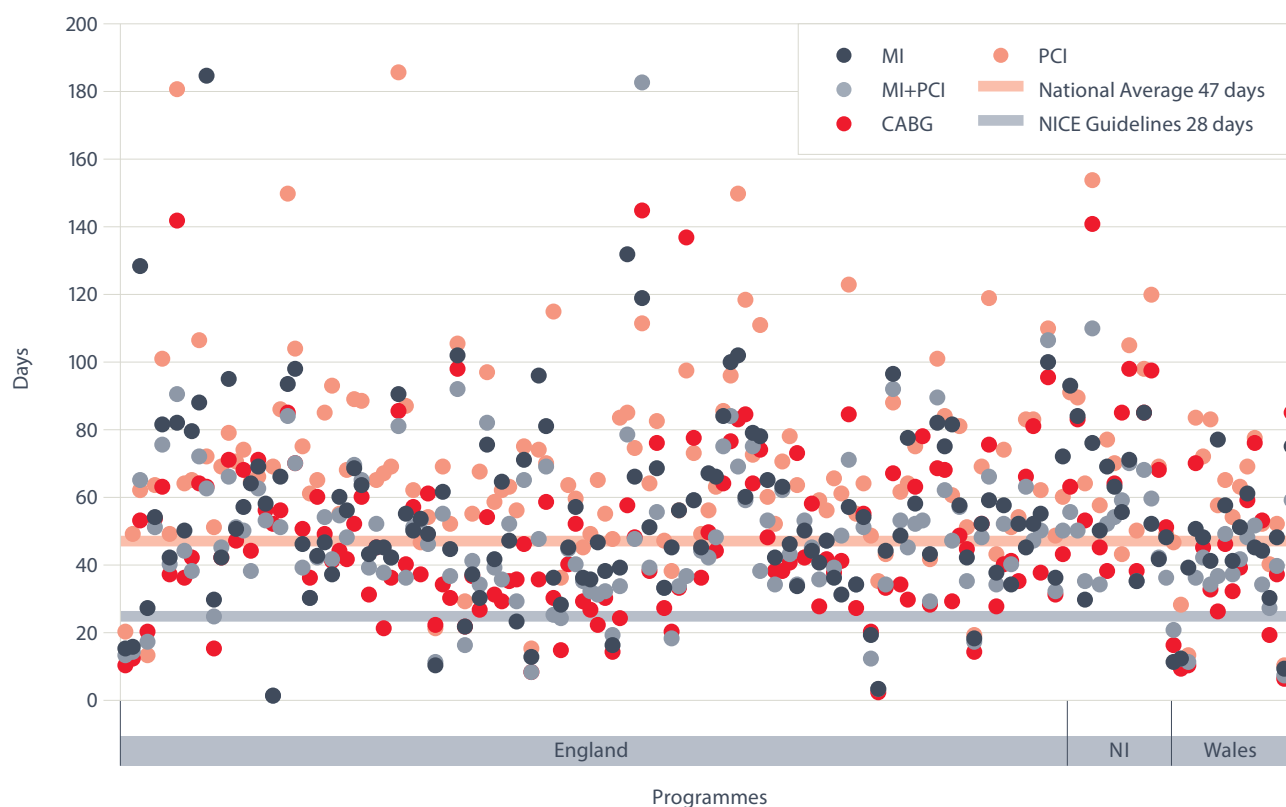
England N=34,050, Northern Ireland N=3,570, Wales N=2,254, Total N=39,959. These values will differ from the total eligible number as they are based on electronic NACR data only. See table 3 for abbreviations.

**Figure 9**

Median wait time from initiating event to assessment 1 (pre CR) by Health Region

**Figure 10**

Median wait time from initiating event to assessment 1 (pre CR) by programme



## Is the duration of CR meeting national guidance?

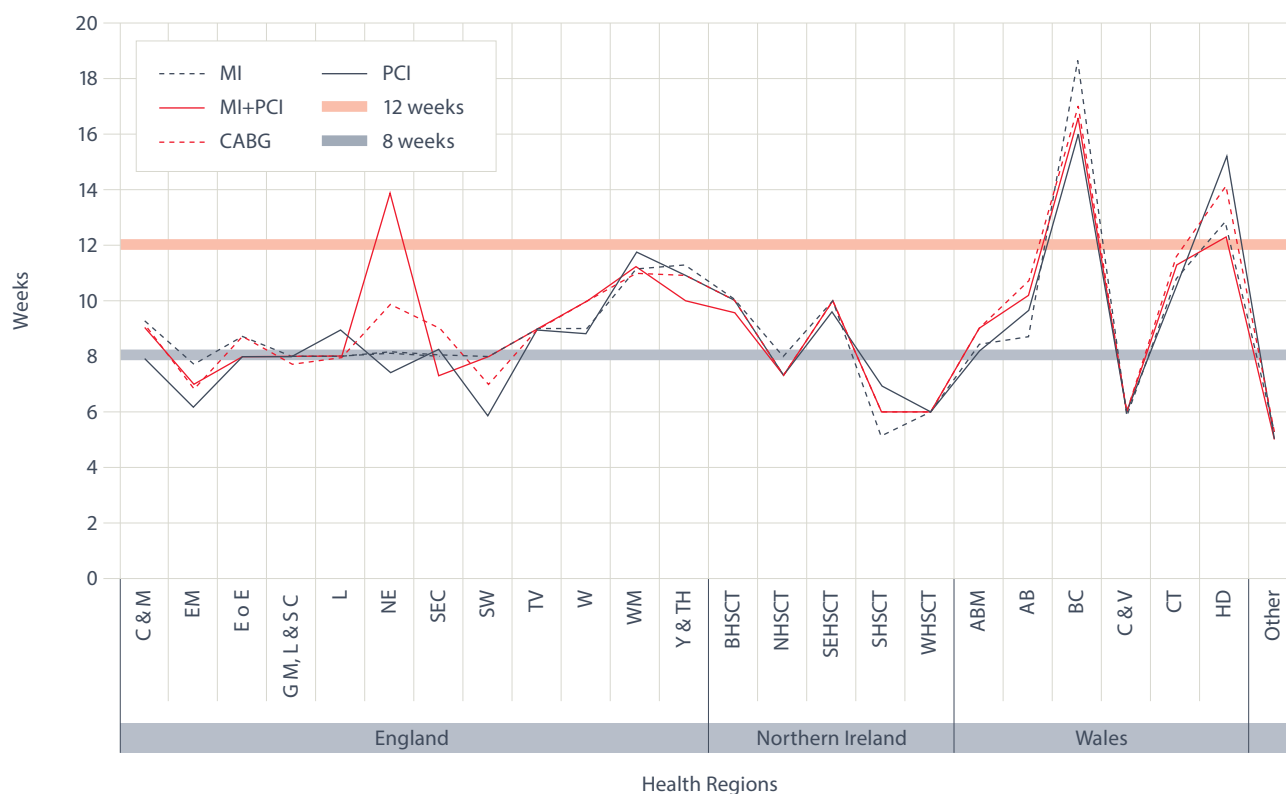
The evidence base for CR, from NICE (CG 172) and Cochrane Reviews (Heran et al 2011), states that the duration of CR should be 12 weeks (or 84 days), with two sessions per week, and that an absolute minimum, which might bring about the desired effect, is eight weeks (or 56 days). Overall the duration at a regional level looks reasonable with most regional median values within or above the 8 to 12 week evidence based range. The median duration of CR for nine of the SCNs in England is below the basic minimum standard and well below the evidence-based preferable duration of 84 days or 12 weeks (Table 17 & Figure 11). The above trend alters substantially at local level with many programmes running for less than 8 weeks duration and 12 programmes delivering CR at duration below the 5 weeks which is an uncontested short duration (Figure 12).

**Table 17**  
Median length of CR (days)

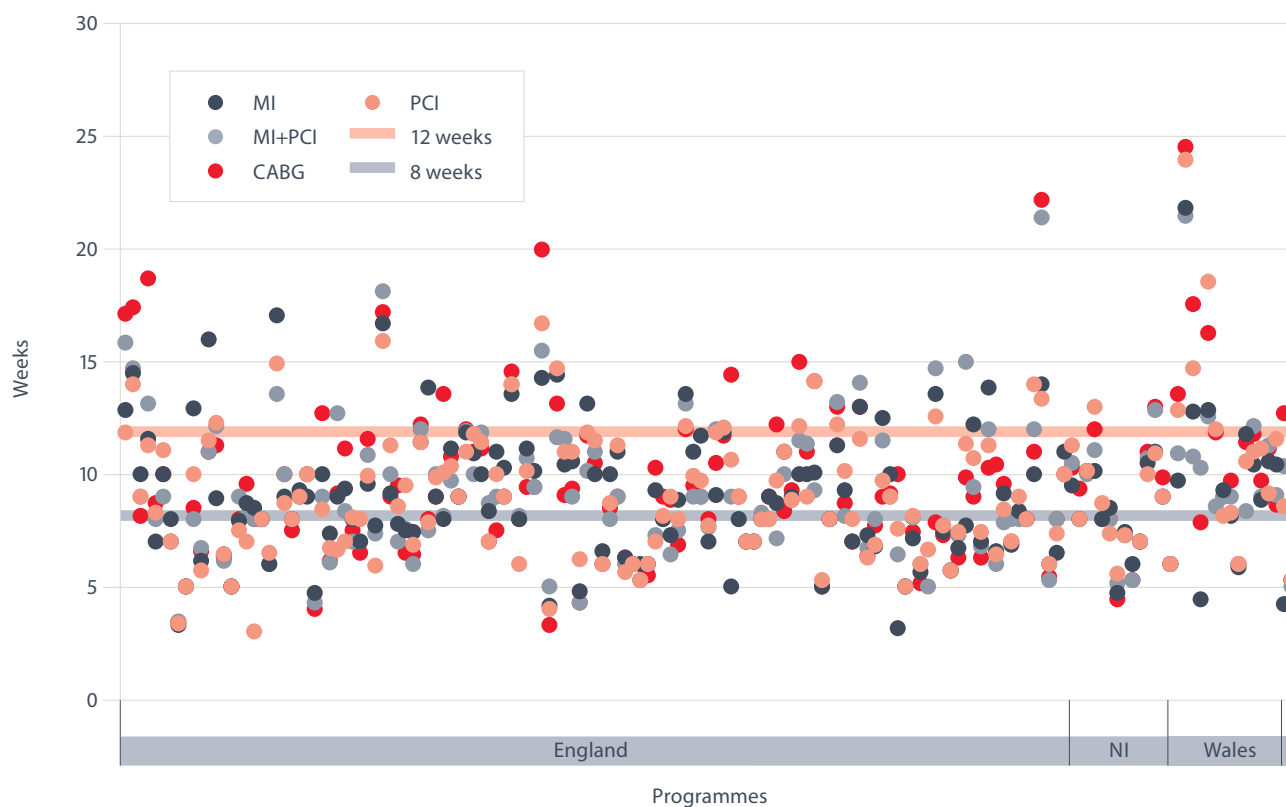
Country	Health Regions	MI	MI+PCI	PCI	CABG	Heart Failure	Angina	Valve Surgery	Other
England	C & M	65	63	56	64	70	57	63	66
	EM	54	49	44	48	42	42	45	49
	E o E	61	56	56	61	85	72	56	56
	G M, L & S C	56	56	56	54	77	63	58	56
	L	56	56	63	56	70	56	56	57
	NE	57	97	53	69	79	51	28	56
	SEC	56	51	58	63	57	56	63	56
	SW	56	56	42	49	141	78	66	63
	TV	63	63	63	63	63	64	65	67
	W	63	70	62	70	91	69	70	62
	WM	78	78	83	77	115	77	77	84
	Y & TH	79	70	77	77	108	82	82	90
Northern Ireland	BHSCT	71	67	70	70	46	77	70	72
	NHSCT	56	52	51	51	n/c	51	52	56
	SEHSCT	70	70	68	70	132	91	72	76
	SHSCT	36	42	49	42	n/c	53	42	42
	WHSCT	42	42	42	42	n/c	42	49	42
Wales	ABM	59	63	58	63	84	77	63	64
	AB	61	71	68	75	85	64	78	72
	BC	131	116	112	119	99	112	135	115
	C & V	41	42	42	42	n/c	47	42	40
	CT	76	80	75	81	108	67	99	77
	HD	90	86	107	99	98	81	81	96
Other		37	35	37	37	n/c	35	35	35
Overall median		63	59	57	61	78	65	63	63

England N=23,399, Northern Ireland N=1,222, Wales N=2,372, Total N=27,051. These values will differ from the total eligible number as they are based on electronic NACR data only. See table 3 for abbreviations.

**Figure 11**  
Duration of CR programmes by Health Region



**Figure 12**  
Duration of CR programmes by programme



## Is CR delivered by a multi-disciplinary team as recommended by national guidance?

One of the major short falls in staffing reported last year was for a psychologist which has now increased by 8% (Table 18). The number of doctors involved has also gone up by 3% which now means that 10% of programmes have a doctor who has allocated time to contribute to their multi-disciplinary team (MDT). The largest increase in staffing profile is for secretarial support which is now evident in 70% of programmes. This is particularly encouraging for the timely entry of data into the NACR which is essential for local and national audit of services. The BACPR continues to emphasise that the ability to deliver to the core components of CR requires the appropriate skills and expertise in the MDT which is not evident in all programmes.

A more detailed breakdown of CR staffing, by programme, is available on the NACR webpage.

[www.cardiacrehabilitation.org.uk](http://www.cardiacrehabilitation.org.uk)

**Table 18**  
Staffing profile for CR programmes across the UK

Category	England N=223		Northern Ireland N=15		Wales N=20		Other N=3		UK total N=261	
	N	%	N	%	N	%	N	%	N	%
Nurse	214	96	14	93	20	100	3	100	251	96
Physiotherapist	139	62	13	87	16	80	2	67	170	65
Dietitians	123	55	12	80	13	65	1	33	149	57
Psychologist	43	19	3	20	2	10	0	0	48	18
Social Worker	2	1	0	0	0	0	0	0	2	1
Counsellor	14	6	0	0	1	5	1	33	16	6
Doctor	19	9	4	27	2	10	0	0	25	10
Health Care Assistant	39	17	4	27	2	10	0	0	45	17
Secretary	168	75	9	60	19	95	1	33	197	75
Administrator	26	12	0	0	0	0	0	0	26	10
Exercise Specialist	125	56	0	0	7	35	0	0	132	51
Occupational Therapist	59	26	5	33	12	60	1	33	77	30
Pharmacist	92	41	12	80	12	60	2	67	118	45
Physiotherapy Assistant	64	29	1	7	4	20	1	33	70	27

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## Part five

# EVALUATION OF CLINICAL OUTCOMES FOLLOWING CR BY COUNTRY, HEALTH REGION AND LOCAL PROGRAMME



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## Evaluation of clinical outcomes following CR by country, Health Region and local programme

Analysis by country and Health Region is routine in the NACR report however local programme level reporting and the interpretation of findings at a local level is new for this year. In light of this local reporting approach the BHF Research Group carried out an analysis using NACR data to investigate the impact of the volume of patient throughput on patient outcome. The key finding is that volume does not determine patient outcome which means that improvement of access to CR through more localised services can be achieved without diminishing the outcomes for patients (Doherty et al 2015).

## Analysis of CR contribution to smoking cessation

The total number of patients entering CR as a non-smoker is 93% which is the highest it has been in the last five years (Table 19). CR contribution to smoking cessation remains positive with around 2 percentage point change improvement however the ability to support patients in quitting smoking varies across the 24 Health Regions with 5 regions showing small negative impact (Figure 13). The situation at a local level (Figure 14) is of more of a concern with around a third of programmes having a negative impact (-1 to -4 % point change) and one programme with a negative point change of -7%. We know from the literature and clinical practice that maintaining non-smoker status is difficult however programmes should strive to support patients who have decided to quit to achieve a sustained non-smoker status.

**Table 19**  
Percentage of non-smokers

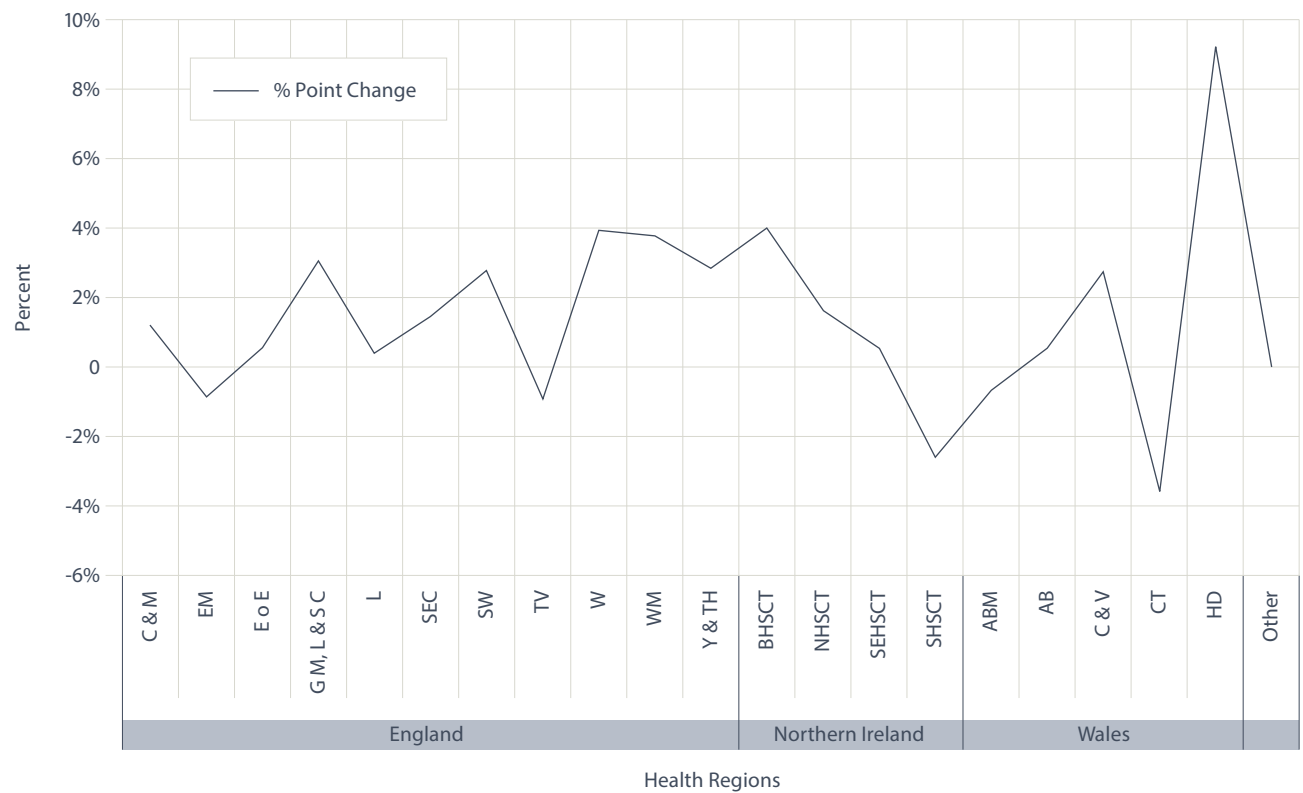
Country	Health Regions	Pre %	Post %	% Point Change
England	C & M	92	94	1
	EM	95	94	-1
	E o E	93	93	1
	G M, L & S C	93	96	3
	L	95	95	0
	SEC	96	97	1
	SW	93	96	3
	TV	98	97	-1
	W	93	97	4
	WM	89	93	4
	Y & TH	88	91	3
Northern Ireland	BHSCT	85	89	4
	NHSCT	96	98	2
	SEHSCT	95	96	1
	SHSCT	95	92	-3
Wales	ABM	97	97	-1
	AB	96	97	1
	C & V	93	96	3
	CT	89	86	-4
	HD	89	98	9
Other		96	96	0
Total		93	95	2

England N=12,346, Northern Ireland N=773, Wales N=863, Total N=14,053

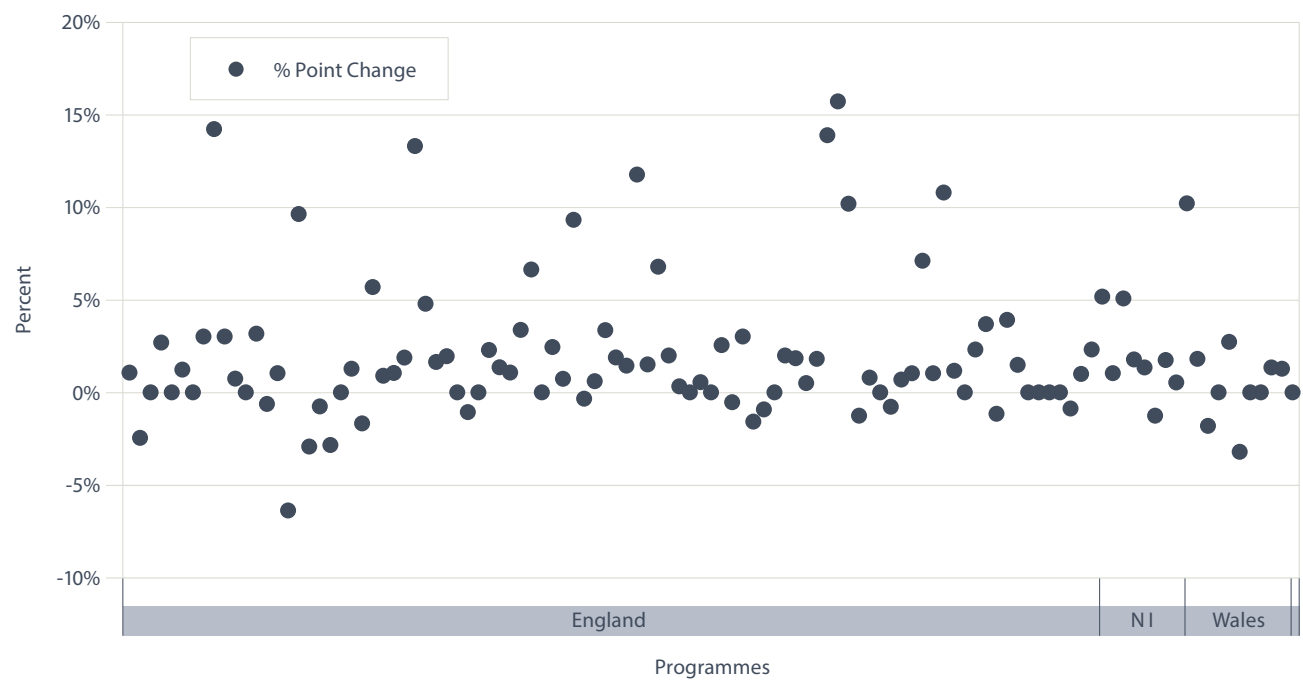
NB: NE, WHSCT, BC and PT are not shown in any outcomes tables as there is insufficient data

See table 3 for abbreviations.

**Figure 13**  
Percentage change in non-smokers post CR by Health Region



**Figure 14**  
Percentage change in non-smokers post CR by programme



## Analysis of CR contribution to exercise status per week

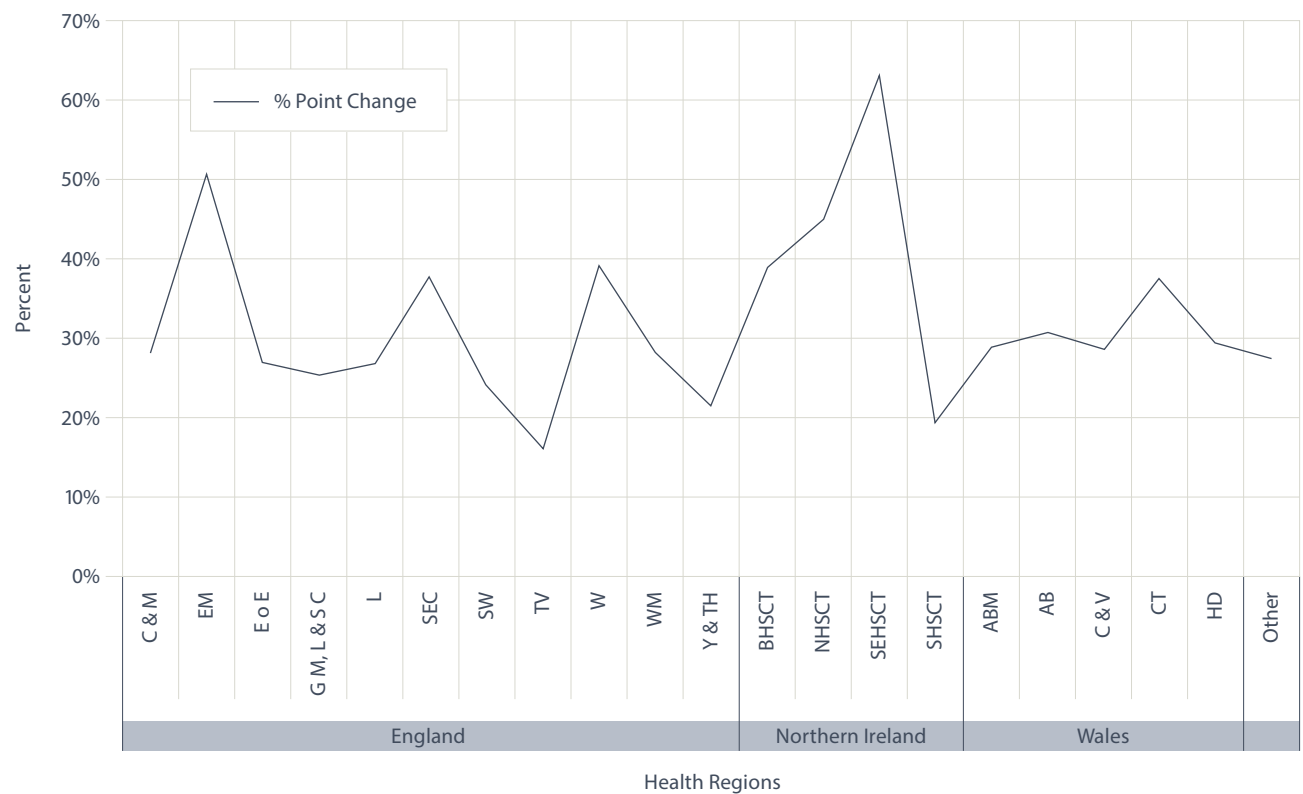
Physical activity status of 150 minutes per week is a recommendation from the Chief Medical Officers (CMOs) across all nations in the UK, and a basic minimum standard for the BACPR (2012). The pre CR baseline status meeting the recommendation of 150 minutes is 37% which is perhaps not surprising after a cardiac event (Table 20). The percentage change across all Health Regions is variable but positive (Figure 15). The local perspective has even greater variability with some real success with a percentage improvement of >50% and the majority achieving between 20% to 40% improvement yet there are a small minority of programmes failing to support patients to sustain their exercise levels (Figure 16).

**Table 20**  
Proportion of patients exercising 150 minutes per week pre and post CR

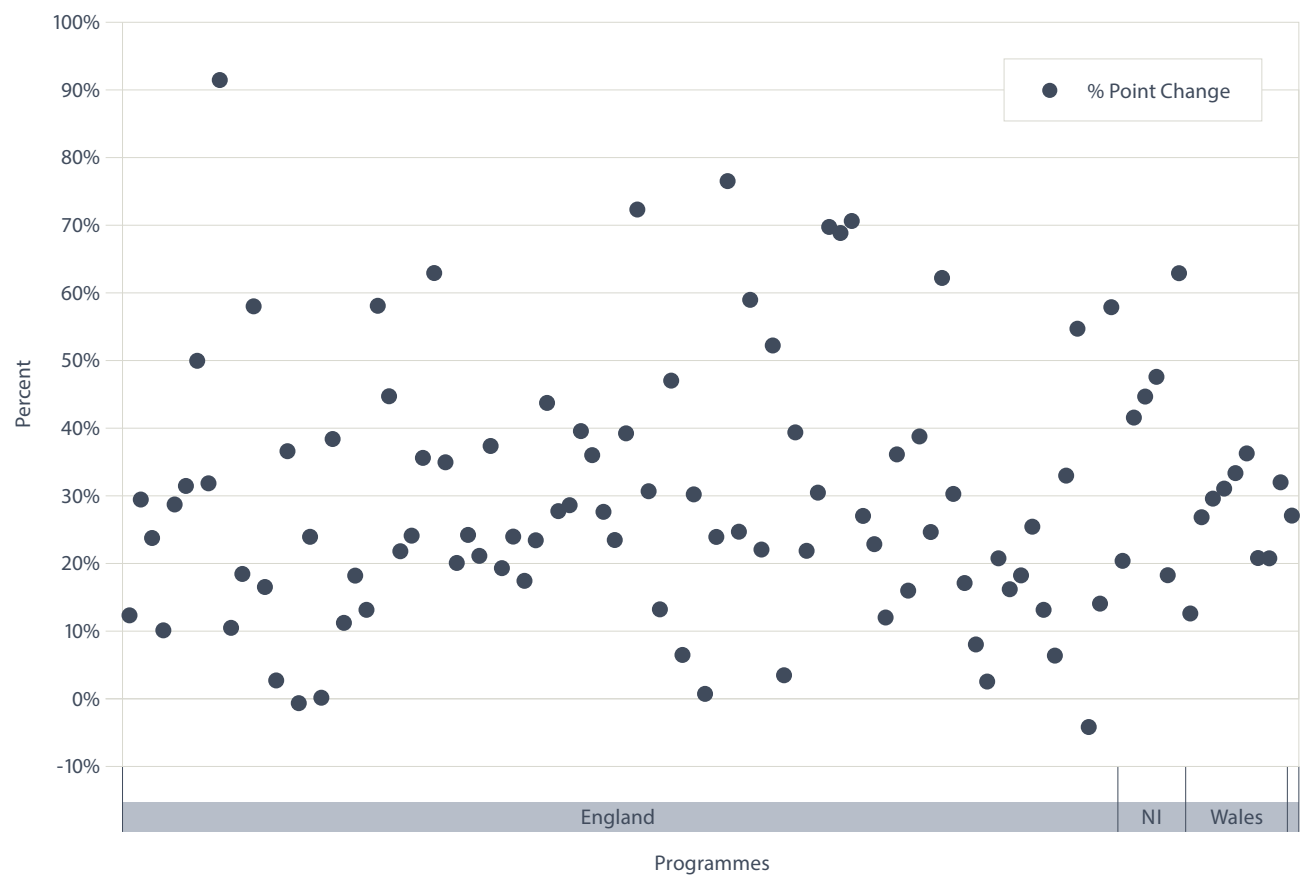
Country	Health Regions	Pre %	Post %	% Point Change
England	C & M	35	63	28
	EM	28	78	51
	E o E	42	69	27
	G M, L & S C	42	67	25
	L	38	64	27
	SEC	35	73	38
	SW	35	59	24
	TV	39	55	16
	W	38	77	39
	WM	50	78	28
	Y & TH	27	49	22
Northern Ireland	BHSCT	33	72	39
	NHSCT	40	85	45
	SEHSCT	23	86	63
	SHSCT	68	87	19
Wales	ABM	37	66	29
	AB	36	67	31
	C & V	43	71	29
	CT	17	54	38
	HD	35	65	29
Other		71	99	27
Total		37	67	30

England N=10,266, Northern Ireland N=580, Wales N=615, Total N=11,534  
See table 3 for abbreviations.

**Figure 15**  
Percentage change in 150 minutes exercise status post CR by Health Region



**Figure 16**  
Percentage change in 150 minutes exercise status post CR by programme



## Analysis of CR contribution to BMI

A significant change in BMI continues to be a difficult milestone for CR to achieve (Table 21 and Figure 17) with zero percentage change in the total population achieving a BMI <30 across most regions. The high performing regions are countered by the low performing regions and this effect is even greater when reported locally (Figure 18). On analysis of mean change in BMI there is an overall improvement of 0.4 Kg/m<sup>2</sup> which albeit in the right direction is insufficient to move most patients from a BMI value above 30 to below 30.

**Table 21**  
Percentage of patients with BMI <30 pre and post CR

Country	Health Regions	Pre %	Post %	% Point Change
England	C & M	70	69	-1
	EM	69	69	0
	E o E	72	72	0
	G M, L & S C	75	75	0
	L	75	76	1
	SEC	75	77	2
	SW	74	74	0
	TV	71	73	2
	W	69	72	2
	WM	69	71	2
	Y & TH	71	71	0
Northern Ireland	BHSCT	65	63	-2
	NHSCT	64	60	-4
	SEHSCT	71	73	2
	SHSCT	71	69	-2
Wales	ABM	68	66	-2
	AB	64	63	-1
	C & V	72	72	0
	CT	71	81	10
	HD	69	76	7
Other		60	61	1
Total		72	72	0

England N=11,907, Northern Ireland N=819, Wales N=816, Total N=13,615  
See table 3 for abbreviations.



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## Analysis of CR contribution to anxiety levels

It is reassuring to see that many patients following a cardiac event are managed sufficiently well, as inpatients, do not suffer high levels of anxiety (Table 22a). There is however significant clinical levels of anxiety and depression that require CR programmes to support. The movement of patients from clinically anxious to borderline and normal categories is well distributed and beneficial across the Health Regions (Table 22a and 22b). Overall there was a percentage point shift from patients in the clinically anxious group to the lower categories (-3) and a 3 percentage point shift (-3) to patients in the borderline anxiety category to the normal category (Table 22b and Figure 19). Although national and regional values suggest that most patients benefit there is huge variation in the extent of this improvement at a local level (Figure 20). The majority of programmes are doing well and some are doing exceptionally well however in around 20% of programmes their efforts are not associated with benefit in terms of patients successfully managing their levels of anxiety. We accept that there will be individual patients that have benefited which are not showing up in these broader analyses but it has to be said that we have applied the same rules to all programmes.



**Table 22a**

Percentage of patients by HADS anxiety categories pre and post CR

Country	Health Regions	Pre			Post		
		Normal %	Borderline %	Clinically Anxious %	Normal %	Borderline %	Clinically Anxious %
England	C & M	71	15	13	78	14	8
	EM	74	16	10	78	13	9
	E o E	72	16	11	81	12	7
	G M, L & S C	70	18	12	76	15	9
	L	68	16	15	74	15	10
	SEC	74	15	12	79	12	9
	SW	72	17	11	79	12	9
	TV	80	13	8	82	13	5
	W	77	15	9	81	13	6
	WM	68	20	12	79	14	7
	Y & TH	71	15	14	76	13	11
Northern Ireland	BHSCT	61	17	22	69	19	12
	NHSCT	79	13	9	81	11	9
	SEHSCT	75	16	9	86	11	3
	SHSCT	70	11	19	81	8	11
Wales	ABM	77	12	11	81	13	6
	AB	66	19	15	77	13	9
	BC	91	0	9	82	0	18
	C & V	67	14	19	76	15	9
	CT	65	19	16	71	13	16
	HD	70	19	11	76	15	8
Other		66	23	11	78	9	12
Total		71	16	12	78	13	9

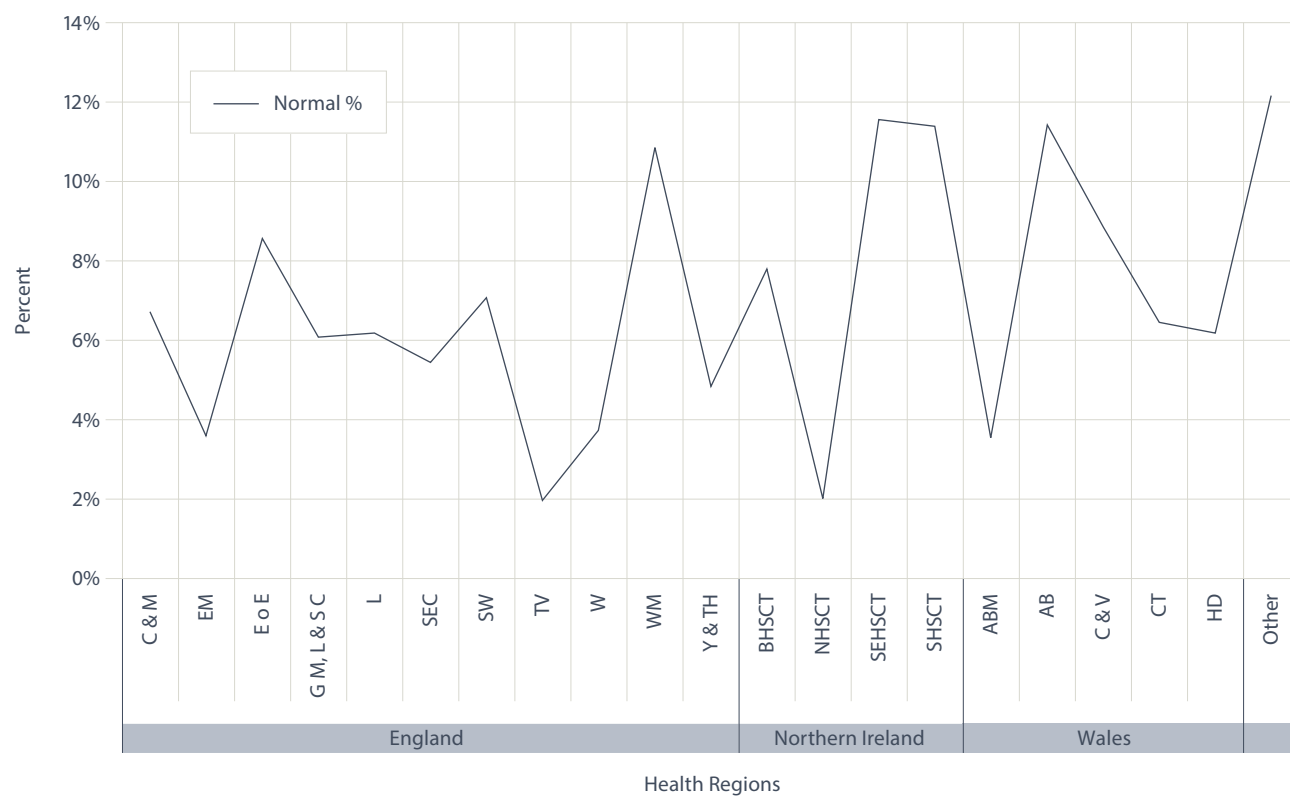
England N=10,354, Northern Ireland N=632, Wales N=823, Total N=11,883  
See table 3 for abbreviations.

**Table 22b**  
Percentage point change in HADS anxiety categories following CR

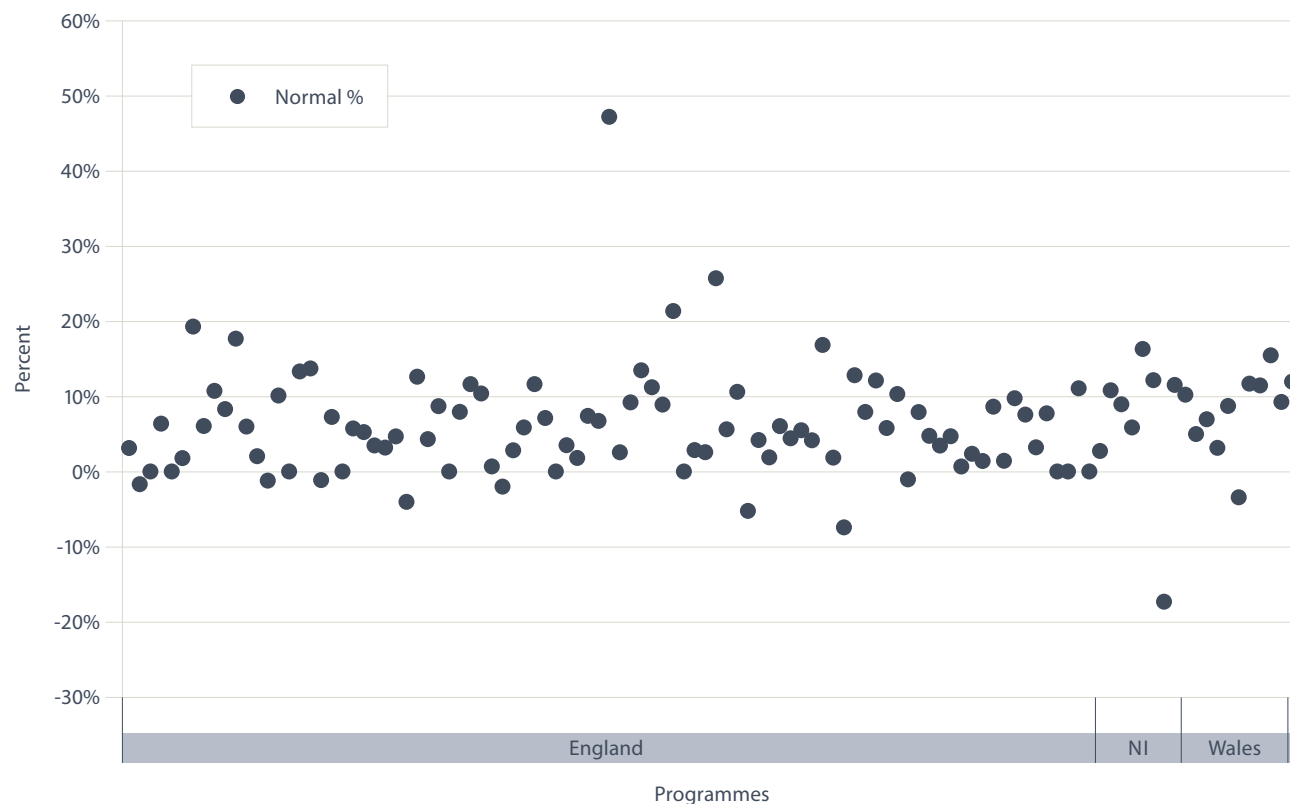
Country	Health Regions	Point Change		
		% Normal	% Borderline	% Clinically anxious
England	C & M	7	-1	-5
	EM	4	-3	-1
	E o E	9	-4	-4
	G M, L & S C	6	-3	-3
	L	6	-1	-5
	SEC	5	-3	-3
	SW	7	-5	-2
	TV	2	0	-2
	W	4	-1	-2
	WM	11	-6	-4
	Y & TH	5	-2	-2
Northern Ireland	BHSCT	8	2	-10
	NHSCT	2	-2	0
	SEHSCT	12	-5	-6
	SHSCT	11	-4	-8
Wales	ABM	4	1	-5
	AB	11	-6	-5
	C & V	9	1	-10
	CT	6	-6	0
	HD	6	-3	-3
Other		12	-14	1
Total		7	-3	-4

England N=10,354, Northern Ireland N=632, Wales N=812, Total N=11,883  
See table 3 for abbreviations.

**Figure 19**  
Change in anxiety post CR by Health Region (% Normal)



**Figure 20**  
Change in anxiety post CR by programme (% Normal)



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## Analysis of CR contribution to levels of depression

Depression is a powerful prognostic determinant that also defines the extent to which patients will take up and complete a programme of CR. Table 23a and Figure 21 show how the ability of patients to manage depressive symptoms improves following CR for almost all nations and Health Regions. The change in the size of the effect is 6% overall with an equivalent shift of 3% from higher to lower categories (Table 23b) across all regions. Overall the variability is much less in depression than was found for anxiety in the previous analysis.

The ability of local programmes to support patients in successfully managing depression varies from programme to programme (Figure 22). The trend for the majority is one of moderate to high performance with some programmes demonstrating big changes but, as with previous analyses, underperformance is clearly evident at a local level. The NACR analysts have applied the same rules to all regions and programmes which makes the findings in the report worthy of consideration.

**Table 23a**

Percentage of patients by HADS depression categories pre and post CR

Country	Health Regions	Pre			Post		
		Normal %	Borderline %	Clinically Depressed %	Normal %	Borderline %	Clinically Depressed %
England	C & M	82	10	8	89	8	3
	EM	80	14	6	88	8	4
	E o E	83	11	7	89	7	4
	G M, L & S C	79	12	9	85	9	6
	L	75	15	9	82	11	7
	SEC	83	12	5	91	6	3
	SW	84	11	5	88	8	4
	TV	89	9	3	92	7	1
	W	88	8	4	89	8	3
	WM	78	16	7	86	10	3
	Y & TH	84	11	5	88	7	5
Northern Ireland	BHSCT	77	10	13	84	11	4
	NHSCT	87	7	5	89	9	3
	SEHSCT	89	5	6	94	5	1
	SHSCT	82	10	8	90	8	3
Wales	ABM	84	10	6	87	9	4
	AB	76	16	8	88	10	3
	C & V	85	8	8	87	13	0
	CT	78	15	7	78	11	11
	HD	80	10	10	81	11	8
Other		89	7	4	95	3	3
Total		81	12	7	87	8	4

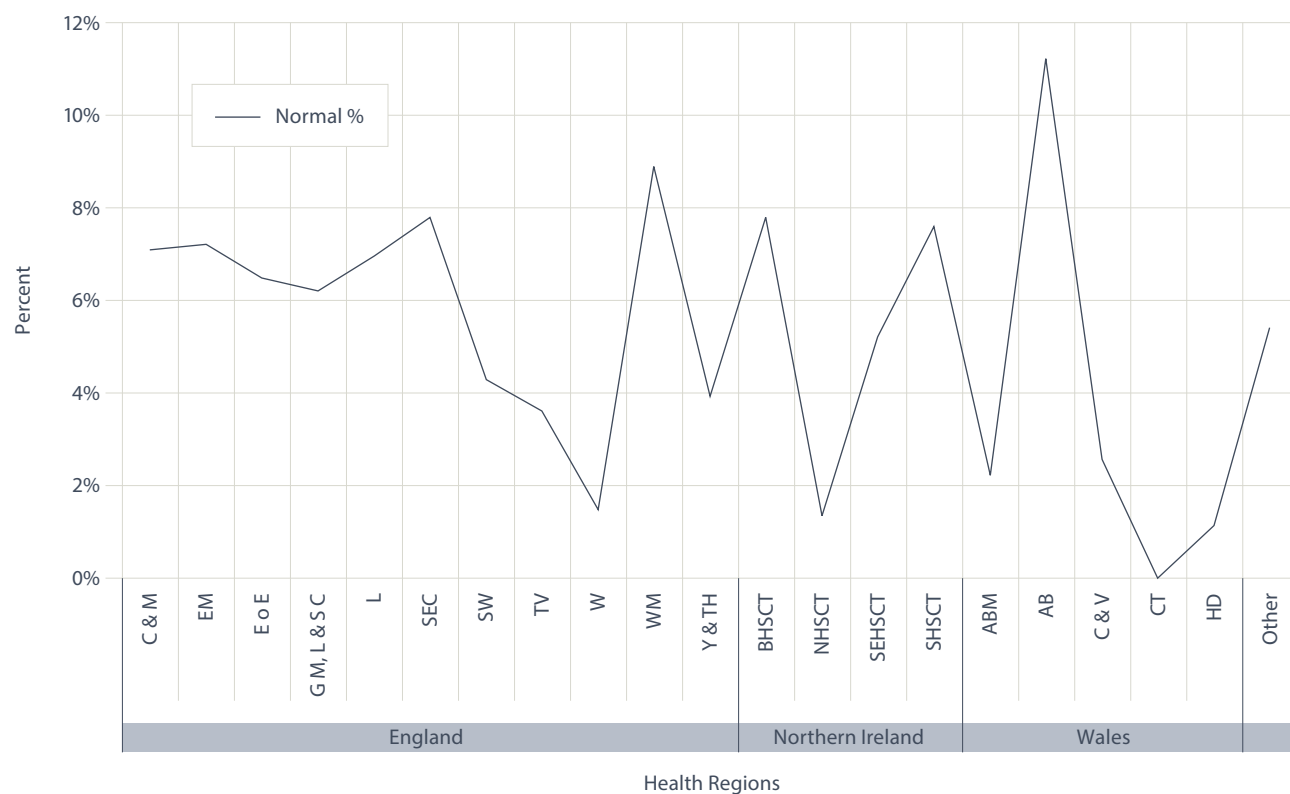
England N=10,345, Northern Ireland N=632, Wales N=807, Total N=11,869  
See table 3 for abbreviations.

**Table 23b**  
Percentage point change in HADS depression following CR

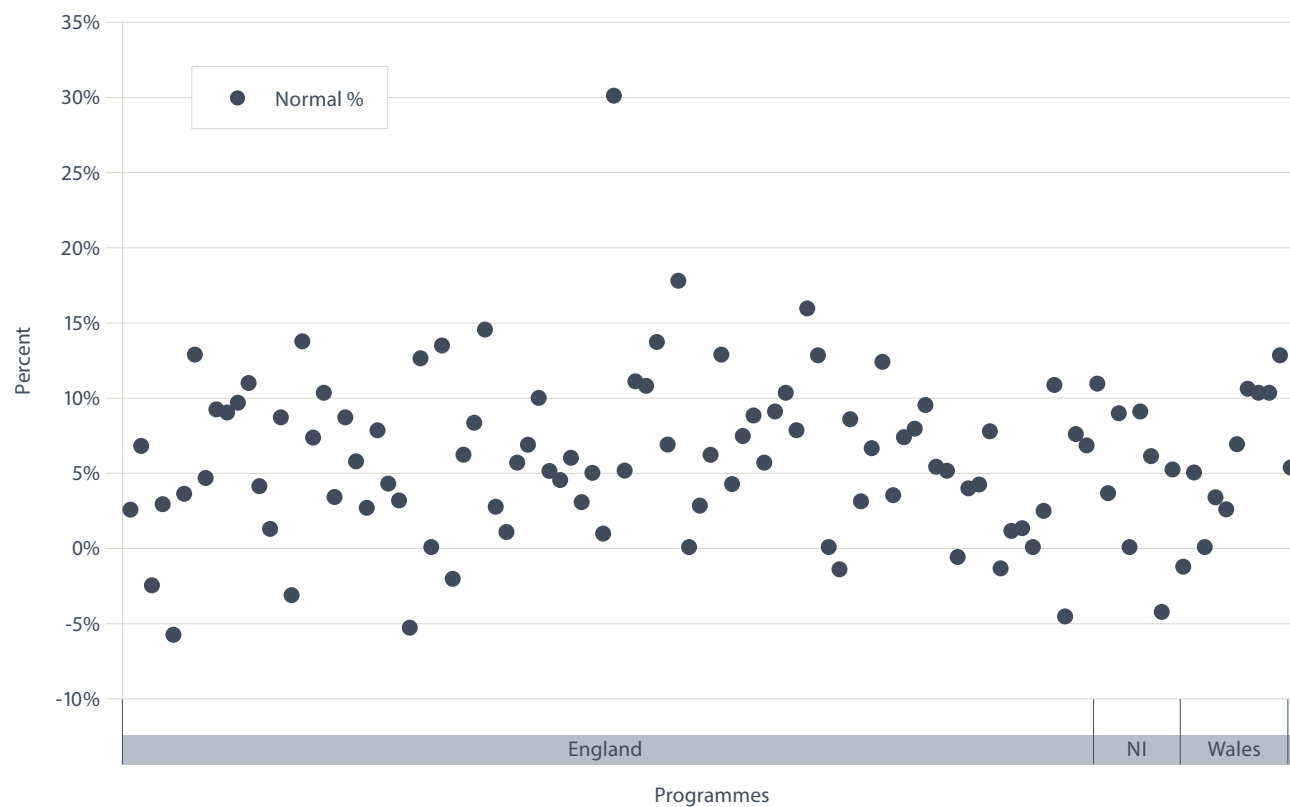
Country	Health Regions	Point change		
		% Normal	% Borderline	% Clinically Depressed
England	C & M	7	-2	-5
	EM	7	-6	-1
	E o E	6	-3	-3
	G M, L & S C	6	-3	-3
	L	7	-4	-3
	SEC	8	-6	-2
	SW	4	-3	-1
	TV	4	-2	-2
	W	1	0	-1
	WM	9	-5	-3
	Y & TH	4	-4	0
Northern Ireland	BHSCT	8	1	-9
	NHSCT	1	1	-3
	SEHSCT	5	-1	-5
	SHSCT	8	-3	-5
Wales	ABM	2	-1	-1
	AB	11	-6	-5
	C & V	3	5	-8
	CT	0	-4	4
	HD	1	1	-2
Other		5	-4	-1
Total		6	-3	-3

England N=10,345, Northern Ireland N=632, Wales N=807, Total N=11,869  
See table 3 for abbreviations.

**Figure 21**  
Change in depression post CR by Health Region (% Normal)



**Figure 22**  
Change in depression post CR by programme (% Normal)



## Analysis of CR contribution to additional risk factors

Certain reported variables in the NACR are too small in number to analyse between regions or at local programme level which means that only a partial analysis is possible. Table 24 reports on these variables showing that lipid management, the proportion of patients with normal cholesterol, improved by over 25 percentage points after attending CR. Smaller positive changes were seen for waist circumference of 4 and 2 for blood pressure improvement. The Shuttle Walk Test, which is a highly valid field test of fitness in patients undergoing conventional CR, showed that 16% more patients achieved the minimum clinical difference of >70m following CR (Houchen-Wollof 2015). An even stronger benefit was seen in the Six Minute Walk Test of walking endurance (aimed at patients with heart failure) showed that 50% more patients achieved a minimum clinical difference of >25m (Gremeaux 2011).

The large variation seen at local service level throughout this annual report highlights that many CR programmes are not being delivered in a timely manner over the required duration which is contrary to NICE (CG 172) and Cochrane Reviews (Heran et al 2011).

**Table 24**  
Additional CR outcomes

Outcome measures	% of patients achieving target reading	Pre %	Post %	% Point Change
Cholesterol N=2231 (Total)	<4.0 mmol/l	37	64	27
N=N/A (LDL)	<2.0 mmol/l	N/A	N/A	N/A
Blood Pressure N=13985	Systolic <140 and diastolic <90	68	70	2
Waist				
N=52758 (Male)	102cm	64	68	4
N=23338 (Female)	<88cm	41	44	3
Alcohol N=8240		93	94	1
Outcome measures	% of patients achieving target change Post CR	No	Yes	
Shuttle Walk Test N=2432	Clinical difference of >70m	42	58	
Six Minute Walk Test N=1954	Clinical difference of >25m	25	75	



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## Analysis of CR contribution to normal health related quality of life

Health related quality of life, as measured using the Dartmouth COOP tool, changed positively nationally and regionally by an average of around 30% benefit for self-perception of fitness to only 1% improvement in the perception of social support (Table 25). The perception of 'physical fitness' by patients post cardiac event is particularly low at 42% which may partly explain why this group (those with the lowest score of perceived fitness) benefitted the most.

Overall seven of the eight subsets of quality of life changed positively across all Health Regions with only 'social support' having a slightly negative impact with a 2% drop between pre and post values. This was also evident in last year's report where a 3% drop was reported. The 'social support' question asks if you needed support was it there? The five possible responses range from 'Yes, as much as I wanted' to 'No not at all'. Forces beyond the patient and CR programme control could impact on this response.

This level of data and the number of sub-sections in the quality of life measure is too varied to carry out a meaningful local level report.

Table 25

Percentage of patients with normal health related quality of life (Dartmouth COOP) score pre and post CR

Country	Health Regions	Physical fitness		Feelings		Daily Activities		Social Activities	
		Pre %	Post %	Pre %	Post %	Pre %	Post %	Pre %	Post %
England	C & M	41	75	87	91	86	96	83	95
	EM	32	71	83	90	85	95	78	93
	E o E	46	76	85	91	87	96	85	95
	G M, L & S C	39	73	83	89	82	95	78	92
	L	42	74	82	89	85	95	81	92
	SEC	40	77	87	90	84	96	82	95
	SW	51	77	81	89	85	95	82	95
	TV	48	81	91	94	85	97	82	96
	W	54	81	88	91	88	97	87	96
	WM	41	75	83	94	80	96	79	93
	Y & TH	23	55	86	90	86	95	86	94
Northern Ireland	BHSCT	44	77	78	83	85	94	79	93
	NHSCT	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c
	SEHSCT	53	85	86	94	89	99	87	98
	SH & SCT	24	70	80	93	76	97	78	94
Wales	ABM	31	57	86	91	83	91	84	93
	AB	41	69	83	92	85	96	81	93
	C & V	54	77	83	91	94	99	91	99
	CT	43	71	93	89	86	89	86	89
	HD	32	64	91	89	88	95	89	93
Other		74	93	86	90	93	99	84	94
Total		42	74	85	90	85	95	82	94

England N=9,068, Northern Ireland N=473, Wales N=773, Total N= 10,389

See table 3 for abbreviations.

Table 25 (continued)

Percentage of patients with normal health related quality of life (Dartmouth COOP) score pre and post CR

Country	Health Regions	Pain		Overall Health		Social Support		Quality of Life	
		Pre %	Post %	Pre %	Post %	Pre %	Post %	Pre %	Post %
England	C & M	78	81	60	77	88	86	95	98
	EM	76	79	56	73	85	89	96	96
	E o E	81	85	69	83	87	85	96	98
	G M, L & S C	76	84	60	77	87	85	94	98
	L	74	81	63	76	84	83	94	97
	SEC	80	87	68	81	90	86	95	97
	SW	66	79	66	82	86	87	91	98
	TV	77	84	68	87	92	87	97	99
	W	78	85	66	84	90	86	94	98
	WM	78	86	61	81	90	88	95	98
	Y & TH	78	81	67	78	92	91	93	97
Northern Ireland	BHSCT	72	80	67	80	85	85	94	95
	NHSCT	n/c	n/c	n/c	n/c	n/c	n/c	n/c	n/c
	SEHSCT	81	92	73	92	84	90	97	99
	SH & SCT	76	83	75	88	91	92	90	99
Wales	ABM	74	80	66	78	88	86	95	99
	AB	72	78	61	82	83	85	95	99
	C & V	75	77	61	84	88	90	96	99
	CT	75	75	75	75	82	79	100	96
	HD	75	75	63	74	90	88	97	95
Other		77	74	72	86	96	94	93	97
Total		77	83	64	80	87	86	94	98

England N=9,068, Northern Ireland N=473, Wales N=773, Total N= 10,389

See table 3 for abbreviations.

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## Part six

# RECOMMENDATIONS AND ACTIONS

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## Recommendations and actions

The NACR 2015 annual report is the first to describe and evaluate CR against key indicators locally which is seen as an important step in enabling programmes and commissioners to make informed judgements about the quality and outcomes of CR. This new approach has revealed that although regional trends have their uses they can be misleading in that they can mask unacceptable variation at a local level.

### Recommendations:

1. CR programmes need to recruit more female patients.
2. Greater emphasis on recruiting older Post MI (medically managed) patients.
3. Increase the number of pre and post CR assessments for all core components.
4. CR should start earlier for all patient groups.
5. The duration of CR should be aligned with national guidance.

### Actions:

- The NACR in collaboration with the BHF will work with commissioning groups, Health Regions and local CR providers to address the stated recommendations.
- BACPR educational materials will emphasise different approaches to improve access for different condition pathways most notably post MI patients and older patients particularly.
- All programmes should review the appeal of their own CR offer/menu in light of the low uptake of female participants.
- The NACR and the HSCIC will work with programmes not submitting data to overcome barriers to direct data entry or data upload. This includes supporting programmes using new third party software (e.g. SystemOne) to upload data.
- The BACPR and the NACR will continue at pace with the national CR certification programme with an aim to certify at least 25 programmes over the next year.
- The BHF, the NACR and HSCIC will complete an ongoing feasibility study in Scotland which aims to enter the first set of data by July 2016.

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