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British Heart  
Foundation

# THE NATIONAL AUDIT OF CARDIAC REHABILITATION

## Annual Statistical Report 2017



**FIGHT  
FOR EVERY  
HEARTBEAT**

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## Acknowledgements

**The National Audit of Cardiac Rehabilitation (NACR) is a British Heart Foundation (BHF) strategic project which aims to support cardiovascular prevention and rehabilitation services to achieve the best possible outcomes for patients with Cardiovascular Disease (CVD) irrespective of where they live.**

NACR is very grateful for the continued support from the BHF, which also helps to communicate our findings effectively through this annual report.

The British Association for Cardiovascular Prevention and Rehabilitation (BACPR), as the national body for Cardiac Rehabilitation (CR), shares our vision to ensure that all CR programmes in the UK offer quality CR that is known to benefit patients. We welcome their commitment to offering education and training for CR clinicians and their support with the BACPR/NACR National Certification Programme for CR (NCP\_CR).

The ability of audit to reflect practice and drive change is governed by the quality of its data, which is why we remain grateful to NHS Digital for hosting our CR patient data and for support and expertise with quality assuring data. NHS Digital and NACR work to reduce inequalities and improve services for the betterment of patients.

NACR 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 acknowledgement extends to the CR teams who, in collaboration with patients and carers, have helped improve risk factor management, increase exercise frequency and improve psychosocial wellbeing for tens of thousands of patients in the past 12 months. Thanks also to the Cardiovascular Care Partnership (UK) (CCPUK), the national CVD patient voice, for continued support in helping make NACR and its findings more meaningful for patients and carers.

We would very much like to thank the NACR Steering Committee for their continued support and expertise in shaping recent developments. They are: Martin Cassidy (NHS England), Mel Clark (Patient Representative), Dr Hayes Dalal (Co-Chair National Certification Programme), Frances Divers (Scotland Representative, NHS Lothian), Trevor Fernandes (CCPUK), Dr Jane Flint (Cardiologist), Dr Chris Gale (MINAP Audit Representative), Jenny Hargrave (Director of Innovation in Health and Wellbeing, BHF), Julie Henderson (Head of Analytical Services, NHS Digital), Sally Hinton (Education Director, BACPR), Suzanne Indge (NACR Lead for the All Wales Cardiac Rehab Group), Catherine Kelly (Director – Prevention, Survival and Support, BHF), Dr Mike Knapton (Associate Medical Director, BHF), Alana Laverty (Northern Ireland Representative), Dr Gordon McGregor (Clinical Exercise Physiologist), Dr Joe Mills (BACPR President and Cardiologist), Lorraine Oldridge (BHF National Improvement Lead), Rachel Owen (Wales Representative), Irene Thomson (Scotland Representative, NHS Lothian), Iain Todd (Scotland Representative, NHS Lothian) and Alyson Whitmarsh (Programme Manager, Audit Support Unit, NHS Digital).

A special thank you to Catherine Kelly (Director – Prevention, Survival and Support, BHF) and Dr Mike Knapton (Associate Medical Director, BHF) who have helped the NACR shape its strategic vision alongside that of the BHF.

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## Foreword by the British Heart Foundation (BHF)

### The BHF is encouraged to see that more than half of patients eligible for CR are now taking up this service.

Through its Annual Statistical Report, NACR provides important new insights on the performance and patient outcomes of cardiac rehabilitation (CR) programmes. This enables CR teams, NHS providers, commissioners and policy makers to evaluate progress, share best practice and build momentum in preventing cardiovascular disease.

The 2017 report is no exception. NACR has increased coverage – exceeding 100,000 registered patients for the first time – and represents a more accurate picture of the diversity of patients being treated for cardiovascular diseases. The age of patients receiving CR ranges from 18 to 108 – a much broader population than those studied in CR clinical trials. This lends weight to the evidence for CR and presents an opportunity and a challenge for programmes to consider the different needs of patients when designing services.

The BHF is encouraged to see that more than half of eligible patients are now taking up CR – a world-leading level of participation. However, the 2017 report highlights considerable performance differences between countries, Health Regions and individual programmes in meeting BACPR national minimum standards. Programme or site-level differences in duration of rehabilitation and inconsistencies in pre- and post-assessment practices are cited as likely contributing factors. The increasing ability of NACR to drill down into these data at local and Health Region level will help commissioners and providers of CR better understand barriers to uptake and develop interventions to improve service quality.

We also welcome the additional breakdown in this year's report by gender and age, improving understanding of why some patients do not participate in or complete CR. With a large proportion of eligible patients still not taking up the offer of CR, it will be crucial to understand perceptions, preferences and barriers to improve uptake. As highlighted last year, group-based CR remains the primary delivery mode. The BHF strategy involves working with Health Regions to support innovative forms of CVD prevention delivery – and we look forward to opportunities to pilot new home, web- and community-based CR interventions that better take account of age, gender and ethnicity.

NACR is showing where timely referrals and achieving CR national standards results in optimal patient outcomes, strengthening the case for NHS provision of CR. Improvements in uptake and delivery are only possible thanks to the dedication, expertise and skills of the individual members of the multidisciplinary CR teams across England, Northern Ireland and Wales. I would also like to acknowledge and thank the team at the University of York and colleagues at NHS Digital for producing the quality data needed to measure progress.

We fully endorse the renewed recommendation that programmes use the NACR resource to assess their status in respect of achieving national certification. We look forward to working with NACR and the BACPR to achieve the other recommendations highlighted in this report and build further on this success.

**Dr Mike Knapton, Associate Medical Director, British Heart Foundation**  
**Catherine Kelly, Director – Prevention, Survival and Support, British Heart Foundation**

#### REGISTERED PATIENTS

**101,423**

+6.6%



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

## The proportion of patients completing CR is equivalent to the completion rates seen in well-resourced clinical trials.

The BACPR is very much encouraged by the increase in uptake of CR to over 50% this year, which UK clinical programmes should be very proud of. This represents one of the highest uptake figures globally. We also welcome how NACR is focusing on the quality of service delivery and outcomes, which aligns with our shared vision to improve UK services for the benefit of patients.

The proportion of patients completing CR (77%) is equivalent to the completion rates seen in well-resourced clinical trials. With NACR now reporting on the ‘reasons for not taking part or completing CR’, we have identified a ‘lack of interest’ as being the prime barrier to improving uptake further. The challenge now for clinical teams is to engage this uninterested patient population and find ways to motivate them to start what is a fundamental part of their cardiovascular care.

More patients than ever are now registered with NACR, providing extensive coverage of the NHS patient population. With this knowledge, we can see that recruitment of eligible female patients is lower than expected for many local programmes. The number of heart failure patients starting CR in this audit year was 4,723, which makes up 5.3% of the total patient population receiving CR.

Group-based CR remains the dominant mode offered by programmes, which is taken up by around 82% of patients, with close to 10% taking up home-based and a smaller amount (1%) taking up structured online options. The remainder (7%) are using other undefined modes such as telephone support. A greater range in the modes of delivery offered by all programmes is required to make a step change in uptake in the coming years. The BACPR education and training courses are constantly being updated so that CR programme staff can acquire the skills and competencies to offer a wider evidence-based menu for the mode of delivery.

In this year’s report 83% of patients started their programme with a baseline assessment, which is a four percentage point improvement on last year. Importantly, more patients are receiving assessments at the end of CR with 62% of patients starting CR having a follow-up assessment. This year, 2,851 more patients had a post-CR assessment and while this is encouraging this result is weakened by the knowledge that 7,128 patients completed CR without an assessment. Not having a post-CR assessment not only fails to align with BACPR minimum standards but it also means that patients do not obtain a long-term management goal or plan.

The level of variation in CR programme design and service delivery in this year’s NACR report reiterates the need for local programmes to seek national accreditation through the BACPR/NACR National Certification Programme for CR (NCP\_CR). Benchmarking the extent by which your programme meets the minimum standards can only foster a desire for improvement. Please contact the BACPR and NACR about registering for the NCP\_CR.

**Dr Scott Murray, President, BACPR**  
**Sally Hinton, Executive Director, BACPR**

### TOTAL UPTAKE

**51%**

+1%





# NACR Executive Summary

## This year 83% of patients that started CR had a baseline assessment, a four percentage point improvement on last year.

This year, CR patient numbers registered with NACR have exceeded 100,000 suggesting greater coverage and representation of the eligible populations. The age of patients receiving CR ranged from 18 to 108 years, with a mean age of 70 years for females and 66 years for males. Although the number of females within NACR is up by 1,472 on last year the proportion of the total remains at just under 30%, which is slightly lower than last year. The multi-morbid profile of CR patients is increasing across a range of different conditions, dominated by hypertension at 63%.

This is the second year of reporting at named local programme level informing the Annual Statistical Report on CR for England, Northern Ireland and Wales. Across the three nations more patients, from all diagnostic groups, are receiving CR than previously with a total for the UK of 87,827 patients in this year.

The percentage of patients that start and then finish core CR is 77%, which represents a positive situation for the UK. We have also shown for the first time that the reasons for not completing CR vary depending on age.

Group-based CR dominates the mode of delivery across age, gender and diagnosis (range 64% to 85%) with a slightly higher proportion of males on average (78%) carrying out group-based compared to females (75%). Home-based CR was the next highest mode of delivery at 13.5%, especially in male and female patients aged 75 and above. The average (median) UK duration of CR is nine weeks which is above the minimum standard (eight weeks) and 58% of patients met this requirement.

Tangible gains are evident based on last year's report and its recommendations. This year 83% of patients that started CR had a baseline assessment, which is a four percentage point improvement on last year. Building on last year's report, which set a recommendation of more patients receiving assessments at the end of CR, we can share further success with 62% of patients starting CR having a follow-up assessment, which is a six percentage point increase on last year (2,851 more patients). Notwithstanding these improvements, based on this year's audit data, 7,128 completed CR without an assessment, which fails to align with BACPR and numerous clinical guidance/position statements which recommend pre- and post-CR assessment.

This year's annual report has compared service delivery to six standards which are similar to those in a recent paper and the BACPR core components (Doherty 2017, BACPR 2017). Two standards have reached an agreed minimum standard, delivering to priority groups and duration, which more than half of each country's programmes are meeting ( $\geq 50\%$ ). Regarding the other four standards NACR has utilised country specific averages and has reported against these. The presentation of this data indicates variation in regional service delivery quality but also highlights a need for greater NACR data entry, a core component of the BACPR standards (BACPR 2017).

**PROGRAMMES ARE ACCEPTING ALL TYPES OF PATIENTS: THIS YEAR MORE THAN THREE QUARTERS ACCEPTED ALL FIVE PRIORITY GROUPS.**

**100%**



## KEY RECOMMENDATIONS:

1. Programmes should aim to recruit a greater proportion of eligible female patients.
2. A much bigger proportion of eligible heart failure patients should be referred to CR and supported to take up the offer.
3. A greater range of modes of delivery, beyond just group-based, should be offered to patients.
4. Assessment of patients who complete CR should be at 100%.
5. The duration of CR should meet the minimum requirement of eight weeks.
6. Programmes should seek to have their service accredited as part of the National Certification Programme for CR.

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

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- Jess Hemingway & Karen Cardy, Audit and Research Secretaries
- 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 [www.cardiacrehabilitation.org.uk](http://www.cardiacrehabilitation.org.uk)

# PART ONE: INTRODUCTION AND METHODS

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THE COVERAGE OF UK CR  
PROGRAMMES ENTERING DATA

**74%**

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NUMBER OF PATIENTS  
REGISTERED IN 2015-16

**>100k**



# Introduction

The BHF and NACR, working in collaboration with the BACPR and national associations in England, Northern Ireland, Scotland and Wales, are collectively committed to ensuring that all patients receive the highest quality of care and achieve similar benefits no matter where they live.

For Cardiac Rehabilitation (CR) this is accomplished by comparing data collected by NACR, ideally from all programmes in the UK, with agreed national 'minimum standards' on how best to deliver CR (BACPR 2017). NACR is the only national audit collecting data on the quality of care and clinical outcomes for patients taking part in CR following a Myocardial Infarction (MI), Percutaneous Coronary Intervention (PCI) and Coronary Artery Bypass Graft (CABG). To fulfil this role 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 that 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 recommendations from NICE Clinical Guidance (CG172, CG94 and CG108) and leading British and European cardiovascular professional associations (BACPR 2017, Piepoli et al 2012, SIGN 2017), reinforced by the most recent systematic reviews (CROS 2017, Anderson et al 2016, Taylor et al 2014), are that CR is effective and should be offered to all eligible patients in a timely and appropriate manner. Set against the rapidly changing nature of cardiology and associated innovation in service delivery, some forms of CR in routine practice are arguably less effective in the modern era (West et al 2011, Wood 2012, Doherty & Lewin 2012, Dalal et al 2015).

The most 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. NACR now has sufficient data and statistical power to report national, regional and local performance against agreed minimum clinical standards (BACPR 2017). NACR also generates routine reports used by clinicians, providers and commissioners to evaluate service provision. Local programmes are able to generate similar reports from their data, for their service. A recent paper, using NACR local reporting functions and hospital readmission data, has produced programme level evidence that CR represents a viable business case (Gore & Doherty 2017).

In 2017, NACR reports against agreed minimum standards locally and tests the extent by which services deliver quality CR (Furze 2016). For the second year running the report will present the extent of patient outcomes at a local service level. 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 (NACR 2015) showed that CR is (1) 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 is effective (Anderson et al 2016, NICE 2013, Piepoli et al 2012, Vanhees et al 2012).

The NACR 2017 report shows the extent by which CR programmes meet the agreed clinical minimum standards and sets out the typical outcomes achieved by patients following CR at a local programme level.

# Methods for collecting data for NACR Annual Statistical Report

Registration and data input through NACR is one of the six BACPR national minimum standards, which aim to use audit data to quality assure CR delivery and drive service improvement (BACPR 2017). NACR uses a quality approach with extensive data checking and validating, which has reduced the burden of matching and cleaning audit data. Through our work with NHS Digital and representatives from England, Northern Ireland and Wales we have aligned data collection with key indicators, such as timing and duration of CR, across regional health boundaries. We continue to work with clinical leaders in Scotland to complete a feasibility study of CR data collection that will hopefully result in their inclusion in NACR in the near future. The NACR 2017 report uses data from 2015-2016 and reports CR uptake for patients following MI, MI + PCI, PCI and CABG across England, Northern Ireland and Wales.

## **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 of patients receiving CR were estimated using either the previous year's figures for that site (if they confirmed that the service had not changed), or using the average number calculated from those sites that had returned data.

## **NUMBER ELIGIBLE FOR CR**

Uptake was calculated for four diagnosis groups; MI, MI + PCI, PCI and 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 of Heart Failure (HF) patient numbers, the audit was unable to derive valid numerator and denominator values across the nations of the UK for this diagnosis.

## **ENGLAND**

NHS Digital provided individual anonymised patient level Hospital Episode Statistics (HES) data on the number of people with a diagnosis of MI and treatment codes of PCI or CABG. Those with death on discharge recorded were excluded.

## **NORTHERN IRELAND**

The Department of Health provided aggregated data on people discharged alive after having an MI, MI + PCI, PCI or CABG.

## **WALES**

NHS Wales Informatics Service provided aggregated data on people discharged alive after an MI, MI + PCI, PCI or CABG.

## **OTHER COUNTRIES**

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

# Approval process for accessing NHS data for NACR

NACR, through NHS Digital, 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, NHS Digital and the NACR team and ensures the highest quality procedures for collecting, sharing and using only the agreed data about a patient's CR experience. The approval and the role of the national audit are reviewed each year by CAG.

For more information about NACR please visit our web pages.

The Cardiovascular Health Research Group

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

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

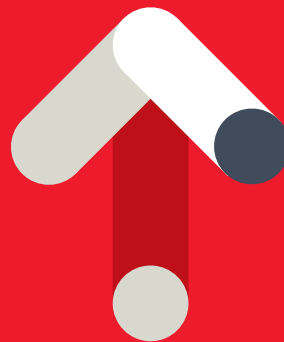


# PART TWO: UPTAKE TO CARDIAC REHABILITATION BY COUNTRY

AVERAGE UPTAKE IN UK  
IN 2015-16

**51%**





**PART TWO: UPTAKE TO CARDIAC REHABILITATION BY COUNTRY**

Programmes continue to offer CR to more patients than ever within the eligible groups of post-MI, MI + PCI, PCI and CABG, which represent the conventional CR population. This is followed by HF and valve surgery patients, who are increasingly accessing services (Table 1).

In 2013, the NHS England CVD Outcomes Strategy (2013) set an ambition of 33% uptake of CR in patients with HF. We are starting to see HF patient numbers increase, with over 90% of programmes now offering CR to these patients, which is a marked difference compared to 2010 when less than 30% of programmes included these patients. Data from the National Cardiology HF Audit run by the National Institute for Cardiovascular Outcomes Research (NICOR) suggests that between 7% and 20% of patients with a HF diagnosis are referred to CR from general or cardiology wards with wide variation in referrals between hospitals. Survival analysis of patients with HF, who are referred to CR, demonstrated improvements of 12% compared to patients not referred to CR (National Heart Failure Audit, NICOR 2017).

Looking forward, as the National Heart Failure Audit does not collect details on actual CR or patient outcomes following CR, NACR is increasingly taking on this role and will report more on HF CR delivery and outcomes in the next two years.

Optimal referral mechanisms will be required if the NHS England uptake target for HF is to be achieved. But our data on mode of delivery for CR suggests that older patients generally, and particularly those with HF, require a more tailored approach to find CR attractive. This is an area where additional work by programmes and commissioners of healthcare will be needed to develop suitable modes of CR delivery for this distinctive population. CR programmes will be encouraged and supported by NACR, BHF and BACPR to pursue innovative service designs based on a strong clinical business case so that 'all eligible patients' can access CR. The BHF Alliance also supports health professionals to apply best practice in service delivery and learn from each other.

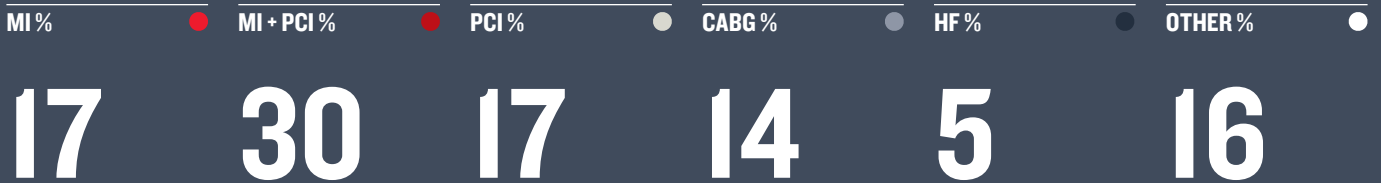
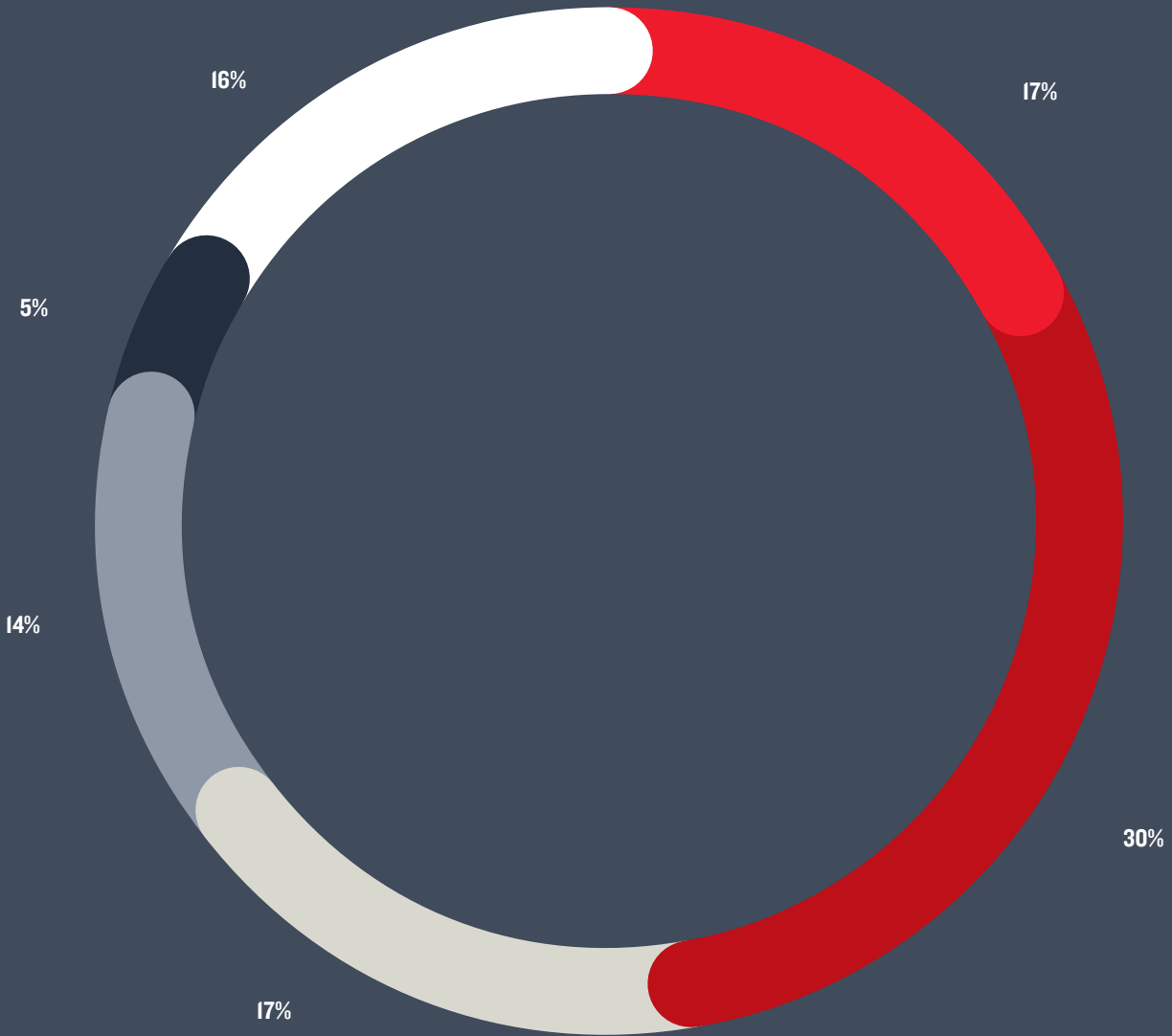
Learn more at: [www.bhf.org.uk/bestpractice](http://www.bhf.org.uk/bestpractice)

**TABLE 1:  
NUMBER AND TYPE OF PATIENTS STARTING CR**

	NUMBER OF PATIENTS			
	ENGLAND	NORTHERN IRELAND	WALES	OTHER
MI	14,182	363	730	42
MI + PCI	23,554	985	1,506	96
MI + CABG	1,945	69	151	27
CABG	9,248	363	531	30
PCI	13,893	554	480	45
MI with HF	170	3	7	2
HF	4,313	46	174	8
Angina	2,362	127	526	7
Valve Surgery	4,186	137	340	13
Other Surgery	445	9	44	-
Cardiac Arrest	111	-	3	1
Pacemaker	248	3	19	6
Implantable Cardioverter Defibrillator	578	11	28	6
Other	2,850	136	406	2
Unknown	1,661	5	40	-
<b>TOTAL</b>	<b>79,746</b>	<b>2,811</b>	<b>4,985</b>	<b>285</b>

Based on data from NACR electronic data entry and the NACR annual survey of programmes.

# Proportion of conventional evidence based patients starting CR



# Uptake to CR services

## **UK**

NACR 2017 is pleased to show that the overall mean uptake to CR in the UK continues to achieve internationally leading levels at 51%. CR practitioners should be proud of the part they have played in making this possible. However, this is not a time to be complacent, as the UK remains short of national uptake recommendations for England (Cardiovascular Disease Outcomes Strategy CVDOS 2013), Northern Ireland (CREST 2006), Scotland (SIGN 2017) and Wales (All Wales Cardiac Rehabilitation Review 2013).

In 2015-16, over 133,000 patients from conventional evidence-based CR populations were deemed eligible for CR in England, Northern Ireland and Wales (Table 2). The recruitment of these patients has improved with 6,242 more events in the audit compared to the previous year when all patient types are considered (Table 5).

The total number of patients taking up CR increased by 2,942, which represents a significant improvement on last year. This shows that programmes are being more inclusive of NICE and BACPR patient groups. Programmes have shown a year-on-year increase in their ability to recruit patients on the MI + PCI, PCI and CABG treatment pathway (Table 2), which has clearly helped push the UK to internationally leading levels of uptake. It would appear, however, that improvements in CR recruitment associated with cardiology intervention pathways (PCI or surgery) comes at a cost for patients on alternative pathways of care. Across all nations, uptake for post-MI patients (e.g. those treated with medication only) remains a concern with less than 40% of all eligible patients on this care pathway taking up the offer of CR.

## **ENGLAND**

Uptake to CR in England has improved by three percentage points and now stands at 52% of eligible patients across the four diagnosis/treatment groups receiving CR, with 3,032 more patients treated compared to last year (Table 2). The main increase is for PCI and CABG with seven percentage point and five percentage point greater uptake respectively. Uptake in post-MI patients has once again dropped by one percentage point compared to last year.

## **NORTHERN IRELAND**

The proportion of patients taking up CR in Northern Ireland is mixed with a nine percentage point increase in patients following MI + PCI achieving a specific uptake value of 64%. However, there was a 13 percentage point drop in the proportion of patients on a conservative post MI pathway taking up CR. Overall there was a three percentage point drop in CR uptake (44% to 41%) from last year.

## **WALES**

CR uptake in Wales has dropped by eight percentage points from 59% to 51% which can be attributed to an eight percentage point drop in patients following MI and a nine percentage point drop in patients on a planned PCI pathway. There was a four percentage point increase in patients on a MI + PCI pathway which led to an overall 96% uptake for this patient group. However, the total number of patients seen across Wales has increased by 40 this year, which combined with the previous increase from 2015 shows a cumulative rise of 377 patients.

**TABLE 2:**  
**CR UPTAKE SPLIT BY COUNTRY AND MAIN DIAGNOSIS/TREATMENT GROUP**

COUNTRY		N	RECEIVING CR	UPTAKE %
Total UK	MI	41,464	15,275	37
	MI + PCI	43,979	26,045	59
	PCI	29,434	14,927	51
	CABG	19,021	12,307	65
<b>Total</b>		<b>133,898</b>	<b>68,554</b>	<b>51</b>
England	MI	36,433	14,182	39
	MI + PCI	40,872	23,554	58
	PCI	26,495	13,893	52
	CABG	17,699	11,193	63
<b>Total</b>		<b>121,499</b>	<b>62,822</b>	<b>52</b>
Northern Ireland	MI	1,779	363	20
	MI + PCI	1,533	985	64
	PCI	1,852	554	30
	CABG	534	432	81
<b>Total</b>		<b>5,698</b>	<b>2,334</b>	<b>41</b>
Wales	MI	3,252	730	22
	MI + PCI	1,574	1,506	96
	PCI	1,087	480	44
	CABG	788	682	87
<b>TOTAL</b>		<b>6,701</b>	<b>3,398</b>	<b>51</b>

# PART THREE: NACR STATISTICS BY COUNTRY, HEALTH REGION AND LOCAL PROGRAMME LEVEL

---

## COVERAGE OF REPORTING IN THIS YEAR'S REPORT

Countries

**3**

Health Regions

**24**

CR Programmes

**224**





**PART THREE: NACR STATISTICS BY COUNTRY, HEALTH REGION  
AND LOCAL PROGRAMME LEVEL**

NACR reports to local programme level as well as the 24 Health Regions for England, Northern Ireland and Wales shown in Table 3 below (abbreviated as indicated throughout the report).

**TABLE 3:  
COUNTRY AND HEALTH REGION REPORTED IN NACR**

COUNTRY	HEALTH REGION	NACR REGIONAL ABBREVIATIONS	
England	Cheshire and Merseyside	C & M	
	East Midlands	EM	
	East of England	E o E	
	Greater Manchester, Lancashire and South Cumbria	GM, L & SC	
	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 (Isle of Man and Channel Islands)	-	-	
	-	-	

## CR programme data by country and Health Region

It is encouraging to report that 74% of programmes are now entering data electronically (224 of all programmes), which is an increase from last year, and is enabling greater audit coverage. Northern Ireland and Wales have very high and consistent data entry performance whereas there are large variations between Health Regions in England (Table 4). By combining data from Tables 1 and 4, we can see that the average number of patients starting CR per programme in the UK is 290, with a per country breakdown of 306, 187, and 208 for England, Northern Ireland and Wales, respectively.

**TABLE 4:**  
**CR PROGRAMME DATA BY COUNTRY AND HEALTH REGION**

COUNTRY	HEALTH REGION	CCG* NUMBER	TOTAL PROGRAMMES	ELECTRONIC NACR DATA	% ENTERING DATA
England	C & M	12	12	11	92
	EM	20	22	15	68
	E o E	19	27	23	85
	GM, L & SC	20	24	20	83
	L	32	36	23	64
	NE	11	21	4	19
	SEC	20	22	18	82
	SW	11	25	18	72
	TV	10	6	6	100
	W	9	7	7	100
	WM	22	28	20	71
	Y & TH	22	31	20	65
	Northern Ireland	BHSCT	N/A	3	3
NHSCT		N/A	4	4	100
SEHSCT		N/A	3	3	100
SHSCT		N/A	3	3	100
WHSCT		N/A	2	2	100
Wales	ABM	N/A	4	4	100
	AB	N/A	4	4	100
	BC	N/A	4	4	100
	C & V	N/A	2	2	100
	CT	N/A	2	2	100
	HD	N/A	4	4	100
	PT	N/A	4	3	75
Other		3	3	1	33
<b>TOTAL</b>			<b>303</b>	<b>224</b>	<b>74</b>

NB: CCG\* Clinical Commissioning Groups.

PT (Powys Teaching Health Board) has been removed from future tables due to insufficient NACR data.

See Table 3 for abbreviations

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

There were 6,242 more patient events registered on NACR compared to last year, reaching a total of 101,423. This is the first year these have exceeded 100,000 – making NACR increasingly representative of the eligible population, and suggesting that findings from the annual report are more likely to reflect clinical practice.

The most recent Cochrane Review of CR effectiveness by Anderson et al (2016) is based on patients with a mean age of 56 years (range from 49 to 71) whereas the patient population seen in routine practice, as captured by NACR, has an average age of 67 years (18 to 108). The number of patients above 75 years of age entered into the audit was 12,248 which once again reiterates the difference to the Randomised Controlled Trials research population, where virtually no patients above 71 years were recruited. UK CR programmes should be commended for the age range of patients recruited which clearly encompasses the Cochrane age ranges but more importantly extends to younger and older patients.

**TABLE 5:**  
NACR DEMOGRAPHICS FOR AGE AND GENDER BY COUNTRY AND HEALTH REGION

COUNTRY	HEALTH REGION	N	AGE	MALE		FEMALE		AGE	
				%	AGE	%	MINIMUM	MAXIMUM	
England	C & M	6,386	66	67	70	33	18	101	
	EM	7,455	66	71	69	29	18	100	
	E o E	8,138	67	72	72	28	18	101	
	GM, L & SC	13,055	65	68	70	32	18	104	
	L	15,796	63	71	68	29	18	96	
	NE	296	66	66	69	35	30	97	
	SEC	7,416	66	71	71	29	18	100	
	SW	6,962	67	72	71	28	18	100	
	TV	2,608	66	75	70	25	18	100	
	W	6,788	67	70	71	30	18	99	
	WM	6,430	66	69	71	31	19	108	
Y & TH	6,906	65	70	70	30	21	101		
<b>Total</b>		<b>88,236</b>	<b>66</b>	<b>70</b>	<b>70</b>	<b>30</b>	<b>18</b>	<b>108</b>	
Northern Ireland	BHSCT	1,476	64	73	68	27	18	94	
	NHSCT	906	67	69	71	31	21	93	
	SEHSCT	1,073	65	74	69	26	22	96	
	SHSCT	896	64	72	69	28	26	91	
	WHSCT	492	64	75	66	25	34	92	
<b>Total</b>		<b>4,843</b>	<b>65</b>	<b>73</b>	<b>68</b>	<b>27</b>	<b>18</b>	<b>96</b>	
Wales	ABM	1,123	66	69	69	31	20	95	
	AB	1,063	65	69	67	31	23	97	
	BC	2,351	66	67	69	33	20	101	
	C & V	1,176	65	67	68	33	20	92	
	CT	628	65	67	68	33	26	95	
	HD	1,130	67	64	70	36	18	95	
<b>Total</b>		<b>7,471</b>	<b>66</b>	<b>67</b>	<b>69</b>	<b>33</b>	<b>18</b>	<b>101</b>	
Other		111	64	67	64	33	29	86	
<b>TOTAL</b>		<b>101,423</b>	<b>66</b>	<b>70</b>	<b>70</b>	<b>30</b>	<b>18</b>	<b>108</b>	

See Table 3 for Health Region abbreviations

BRITISH HEART FOUNDATION

On average, across all three nations, the proportion of females and males accessing CR remains roughly the same as last year at around 30% and 70% respectively, although considerable variation exists within each country (Table 5, Figure 1 a-c). The proportion of women below 75 years accessing CR was 25%, versus 40% for women above 75 years of age. This variability highlights the requirement for programmes to tailor the CR intervention using a wider range of core components to better meet the needs of patients of different ages and gender (Al Quait and Doherty 2016). Further variability is seen in the ability of programmes to recruit women between countries with England (Figure 1a) showing a range of 18.8% to 47.6%, Northern Ireland 16.5% to 30.1% (Figure 1b) and Wales 24.8% to 38.4% (Figure 1c).

FIGURE 1 a-c: PROPORTION OF MALE AND FEMALE PATIENTS BY AGE AND COUNTRY/PROGRAMME

Fig 1a. ENGLAND

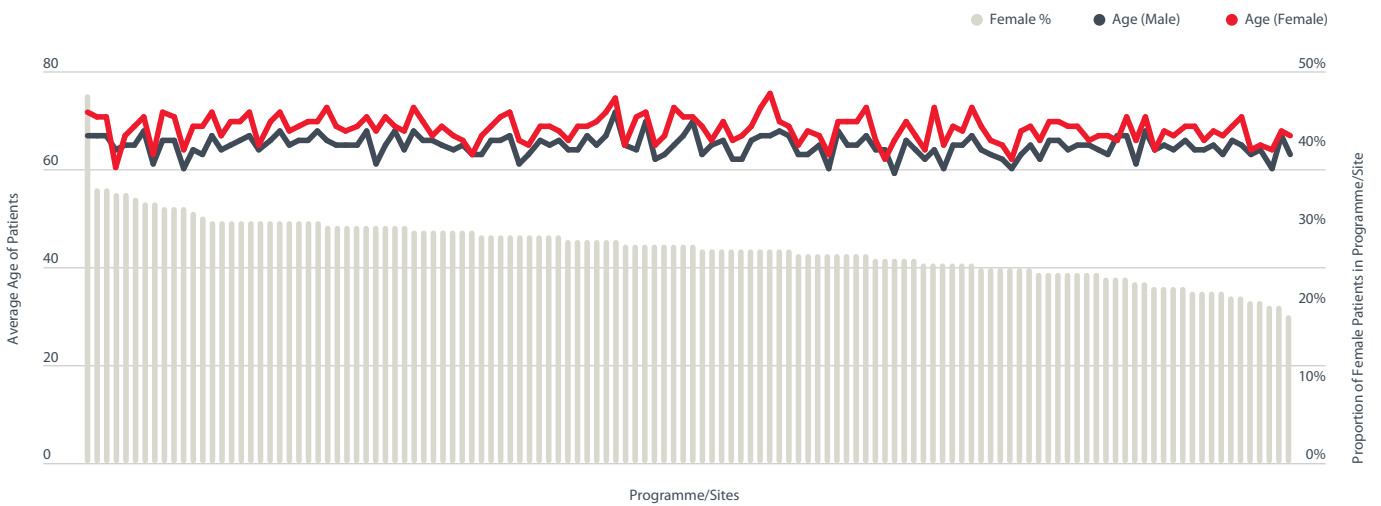


Fig 1b. NORTHERN IRELAND

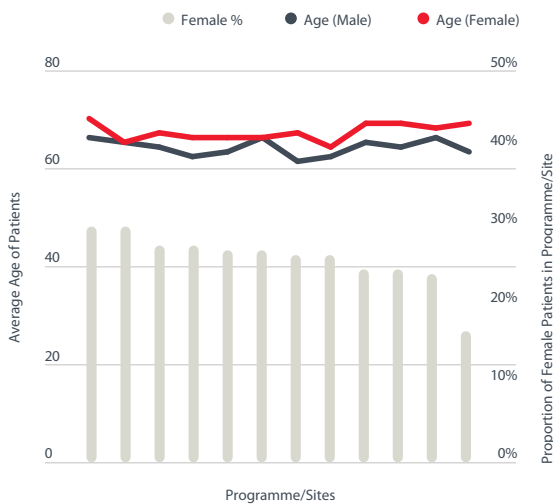
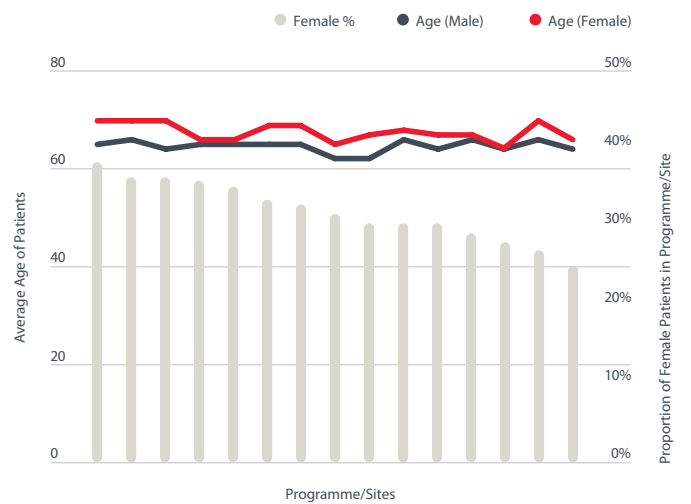


Fig 1c. WALES



## Ethnicity, employment and marital status

The ethnicity of patients attending CR remains predominately White-British and male (Table 6) although there is variability at regional and at a local programme level. Variation in ethnic profile may have implications for how CR programmes are resourced (e.g. translation and interpreter costs). NACR has produced an online supplement showing local level variation in ethnicity available from <http://www.cardiacrehabilitation.org.uk/current-annual-report.htm>

**TABLE 6:**  
**ETHNICITY BY GENDER**

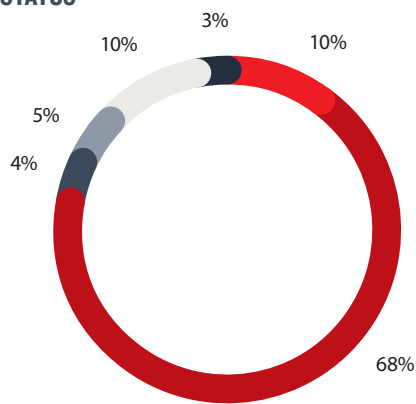
ETHNICITY		%	MALE %	FEMALE %
White	British	79	70	30
	Irish	1	69	31
	Any other White background	3	73	27
Mixed	White and Black Caribbean	<1	61	39
	White and Black African	<1	72	28
	White and Asian	<1	74	26
	Any other mixed background	<1	73	27
Asian or Asian British	Indian	3	74	26
	Pakistani	2	75	25
	Bangladeshi	1	78	22
	Any other Asian background	1	77	23
Black or Black British	Caribbean	1	57	43
	African	<1	65	35
	Any other Black background	<1	73	27
Other	Chinese	<1	71	29
	Any other ethnic group	1	73	27
	Not stated	6	72	28
<b>TOTAL</b>		<b>100</b>	<b>71</b>	<b>29</b>

N = 81,043

Being married remains the dominant social status demographic of CR at 68% and the remaining categories range from 3% to 10% for the other marital status groups (Table 7). The dominant employability demographic is retired (56%), followed by employed at 28% when part-time and full-time employment are combined (Table 8).

The BHF research group in York recently published a paper, using CR completion data from NACR, which showed that employment status – in this case ‘being unemployed’ – was associated with poorer outcomes following CR (Harrison et al 2016).

**TABLE 7:  
MARITAL STATUS**



MARITAL STATUS	%
● Single	10
● Married	68
● Permanent Partnership	4
● Divorced	5
● Widowed	10
● Separated	3
<b>TOTAL</b>	<b>100</b>

N = 59,923

**TABLE 8:  
EMPLOYMENT STATUS**

EMPLOYMENT STATUS	%
Employed Full-time	17
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	8
Student	<1
Other Reasons For Not Working	1
<b>TOTAL</b>	<b>100</b>

N = 34,708

## Morbidities profile

The number of CR patients with two or more co-morbidities (multi-morbid) is increasing across a range of different conditions (Table 9). Hypertension is the most common co-morbidity, affecting 63% of CR patients, followed by hypercholesterolaemia and diabetes. Previous NACR data analysis has shown that the extent of patient benefit from CR decreases as the number of morbidities increase (NACR 2013). Therefore, multi-morbid presentation should be an important consideration when carrying out baseline assessments and tailoring an intervention for patients. This is something the BACPR emphasises as best managed by a multidisciplinary team approach (BACPR 2017).

**TABLE 9:  
MORBIDITIES PROFILE FOR CR**

MORBIDITY CATEGORY	WITH 2 OR MORE MORBIDITIES %
Angina	23
Arthritis	18
Cancer	9
Diabetes	32
Rheumatism	3
Stroke	7
Osteoporosis	2
Hypertension	63
Chronic bronchitis (COPD)	5
Emphysema (COPD)	4
Asthma	10
Claudication	3
Chronic Back Problems	10
Anxiety	7
Depression	8
Family History	31
Erectile Dysfunction	3
Hypercholesterolaemia/Dislipidaemia	42
Other Comorbid Complaint	35

N= 43,399

# Reasons for not taking part in CR

An essential step in supporting patients to attend CR is the realisation of its importance. The responsibility for this rests both with the service and the patient, which is why NACR asks clinicians to record 'reasons for not taking part in CR'. With over 30,000 patients recording a response across all aspects of the patient journey we see that a 'lack of interest' remains as the main reason for not taking part in CR (Table 10). The number of responses informing the 'reasons for not taking part' analysis was distributed proportionally between males and females.

As stated in previous NACR reports, some patients may genuinely not be interested in CR. There are three times as many patients suggesting a 'lack of interest' for core delivery of CR (phase III) as that seen for the early (phase I) part of the patient journey. Although a 'lack of interest' can be a genuine reason, CR service providers should try to offer an attractive range of CR options, preferably matched to patient preferences (Dalal et al 2007). A menu-based approach for the mode of delivery is a logical way to increase interest.

**TABLE 10:**  
**REASONS FOR NOT TAKING PART IN CR**

REASON FOR NOT TAKING PART	EARLY* %	INTERMEDIATE %	CORE DELIVERY** %	LONG TERM MAINTENANCE %
Patient not interested/refused	14	25	39	54
Ongoing investigation	2	3	4	0
Physical incapacity	3	5	9	7
Returned to work	<1	<1	3	4
Local exclusion criteria	5	8	3	4
Language barrier	<1	<1	<1	<1
Holidaymaker	<1	1	1	0
Mental incapacity	9	1	1	<1
No transport	<1	<1	1	<1
Died	4	5	2	<1
Not referred	5	1	<1	1
Too ill	3	3	4	1
Rehab not needed	5	5	3	5
Rehab not appropriate	9	8	8	2
Staff not available	7	<1	<1	0
Rapid transfer to tertiary care	2	<1	<1	0
Did not attend (DNA)/no contact	6	21	13	17
Transfer to another programme	2	3	2	<1
No service available	<1	<1	<1	0
Transfer for PCI/treatment	1	<1	<1	<1
Transfer to Hospital/Trust	15	1	1	0
Other	5	5	5	4
Unknown	1	3	1	<1
<b>TOTAL</b>	<b>100</b> N=8,144	<b>100</b> N=5,783	<b>100</b> N= 17,282	<b>100</b> N=571

\* Early (previously known as phase I)

\*\* UK Core Delivery (previously known as phase III) is equivalent phase II in Europe



## Reasons for not completing CR

The audit's approach to reporting of CR completion and 'reasons for not completing CR' has changed this year with a stronger emphasis on 'age and gender' trends. Recent research and NACR audit findings have shown that older and younger patients vary in their likelihood to engage and attend CR depending on their gender (in press). We aim to apply the same analysis to CR completion. The percentage of patients that complete core CR is 77%, which is a strong position for UK CR. Most well-resourced clinical trials have shown a dropout rate of 20-30% between pre- and post-CR assessment, which suggests that routine practice, as delivered in the UK, has good adherence.

The data on the reason for patients not completing core CR (N = 8,670 patients) is collected for 80% of non-completers. This shows that a greater percentage of patients below 75 years did not attend (DNA) compared to those aged 75 years or above, and this was seen in both males and females. The two other dominant reasons for not completing were being 'too ill' especially for the over 75s (>21%) and 'returned to work', which is a more frequent reason in patients aged below 75 years, especially for males (12%). Planned or emergency interventions or hospital re-admissions played a small part in non-completion of CR.

**TABLE II:**  
**REASONS FOR NOT COMPLETING CR BY AGE AND GENDER**

GENDER	REASONS FOR NOT COMPLETING	<75 YEARS	75+ YEARS
		%	%
Male	DNA Unknown Reason	43	23
	Returned to Work	12	1
	Left This Area	2	2
	Achieved Aims	<1	1
	Planned/Emergency Intervention	2	2
	Too Ill	9	22
	Died	1	5
	Other	24	41
	Hospital Re-Admission	2	2
	Unknown	6	3
<b>Total</b>		<b>100</b>	<b>100</b>
Female	DNA Unknown Reason	38	22
	Returned to Work	6	<1
	Left This Area	2	2
	Achieved Aims	<1	<1
	Planned/Emergency Intervention	2	1
	Too Ill	15	21
	Died	2	3
	Other	29	42
	Hospital Re-Admission	2	4
	Unknown	6	4
<b>TOTAL</b>		<b>100</b>	<b>100</b>

<75 Male N = 4,973 Female N = 1,755 75+ Male N = 1,214 Female N = 728  
Patients with reason for not completing recorded.

# Mode of delivery in modern UK CR

There is strong evidence that CR can be delivered successfully through different modes such as centre/group or individually as part of a facilitated home-based programme (Anderson et al 2017, Dalal et al 2010). Web-based options are also being investigated at this present time through the WREN trial. Based on the need for a tailored approach to CR and the evidence that patient preference is important, NACR has taken a fresh approach to understanding the importance of the mode of CR delivery in clinical practice. The new approach splits mode of delivery by gender and age (Table 12), which are two factors known to influence patient choice. The table also separates out HF patients as this diagnosis is thought to impact on the type of service offered by providers and may help inform patient preference.

Group-based CR dominates the mode of delivery across age, gender and diagnosis (range 64% to 85%) with a slightly higher proportion of males on average (78%) carrying out group-based compared to females (75%). Home-based CR (including the Heart Manual) is higher in the conventional CR patient group with slightly higher use in females compared to the HF group. This is hardly surprising as there is no valid HF-specific home-based programme with an evidence base. The REACH-HF trial (Taylor et al 2015) is testing the hypothesis that home-based CR is effective in patients with HF. Web-based CR is also slowly emerging as an option in the conventional CR patient group.

**TABLE 12:**  
**MODE OF DELIVERY SPLIT BY AGE, GENDER AND DIAGNOSIS/TREATMENT GROUPS**

GENDER	MODE OF DELIVERY	ALL DIAGNOSIS/TREATMENT GROUPS		HEART FAILURE	
		<75 YEARS %	75+ YEARS %	<75 YEARS %	75+ YEARS %
Male	Group-based	82	72	84	74
	Home-based	8	12	4	6
	Web-based	<1	<1	<1	<1
	Home Visits	6	11	5	14
	Telephone	15	19	15	17
	Other Mode	30	30	39	42
Female	Group-based	79	64	85	73
	Home-based	9	15	3	7
	Web-based	<1	<1	<1	<1
	Home Visits	8	14	4	18
	Telephone	17	23	12	13
	Other Mode	31	32	36	39
Total	Group-based	81	70	85	74
	Home-based	8	13	4	6
	Web-based	<1	<1	<1	<1
	Home Visits	7	12	5	15
	Telephone	16	20	14	16
	Other Mode	30	31	38	41

N=56,396 patients with a mode of delivery completed

# PART FOUR: ANALYSIS BASED ON NATIONAL MINIMUM STANDARDS

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CARDIAC REHABILITATION IS  
INCREASING IN DURATION – THIS  
YEAR ACROSS ALL THREE COUNTRIES  
MORE THAN HALF PROVIDED AN EIGHT  
WEEK OR LONGER SERVICE.

Wales %

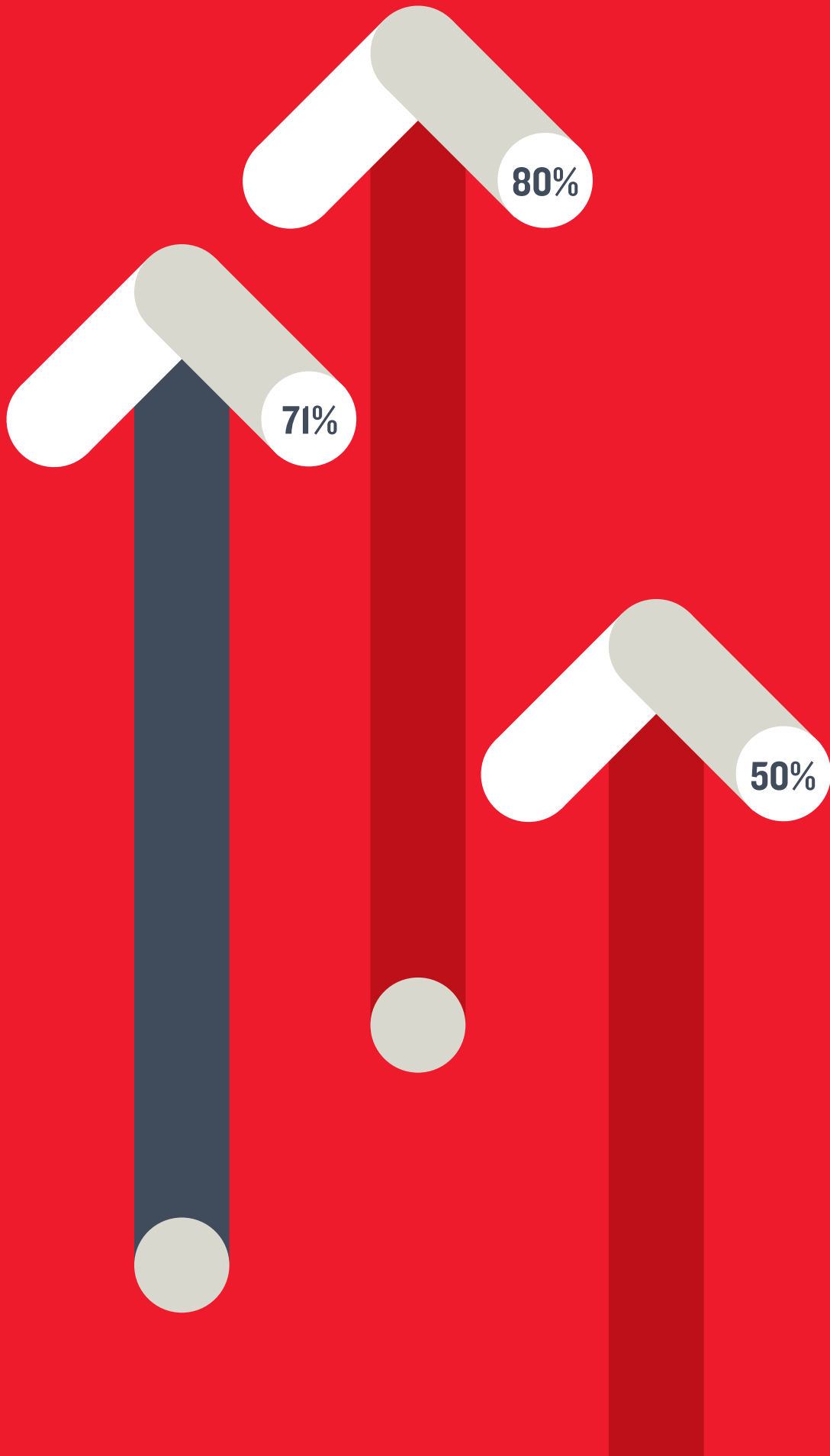
80

England %

71

Northern Ireland %

50



**PART FOUR: ANALYSIS BASED ON NATIONAL  
MINIMUM STANDARDS**

In 2017, the BACPR released its new standards and core components (BACPR 2017). The six standards for cardiovascular prevention and rehabilitation are:

1. The delivery of six core components by a qualified and competent multidisciplinary team, led by a clinical coordinator.
2. Prompt identification, referral and recruitment of eligible patient populations.
3. Early initial assessment of individual patient needs which informs the agreed personalised goals that are reviewed regularly.
4. Early provision of a structured cardiovascular prevention and rehabilitation programme (CPRP), with a defined pathway of care, which meets the individual's goals and is aligned with patient preference and choice.
5. Upon programme completion, a final assessment of individual patient needs and demonstration of sustainable health outcomes.
6. Registration and submission of data to NACR and participation in the National Certification Programme for Cardiovascular Rehabilitation (NCP\_CR).

Results from BHF led research, using NACR data, has shown that timely CR is associated with greater patient benefit, in terms of physical and psychosocial outcomes, compared to CR offered late (Fell et al 2016, Sumner et al 2017). The BACPR (2017) NICE service guidance (CG172, CG108) and SIGN (2017) 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 CG172) and Cochrane Review (Anderson et al 2016) should ideally be 12 weeks (or no less than eight weeks) at a frequency of twice per week. The CR team should be multidisciplinary with professionals that possess the skills and competences to support patients in achieving the desired health behaviour change and to enable these same skills, in patients and their carers, as part of a long term self-management approach (BACPR 2017).

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

Timely CR, delivered soon after discharge from acute services or as part of a step change in clinical treatment for CVD, is a key recommendation of SIGN (2017), and NICE CG172 and forms one of the minimum standards of the BACPR. Table 13 shows that waiting times vary substantially within each country and between each country.

In England the national wait time average (median) is 28 days for MI/PCI (MI and/or PCI) and 41 days for CABG patients. The national averages for Northern Ireland were 30 and 42 days for MI/PCI and CABG, respectively. Wales has the lowest wait times at 23 days for MI/PCI and 38 days for CABG patients. A recent BMJ clinical update noted that 90% of patients admitted with STEMI (ST segment elevation myocardial infarction) have a primary PCI and are discharged within three days allowing little time for referral to CR from hospital. It is hoped that a combination of primary and community care will alleviate this problem through early engagement (Dalal F et al 2017).

Variation in the timing of CR by country is not surprising as the health delivery infrastructure is commissioned, funded and incentivised differently. Our research has shown that the solutions to poor CR engagement are as much to do with service level factors in each country as they are with patient choice (Al Quait, Doherty 2017). What this means for the national audit is that UK national averages are potentially unreasonable benchmarks and that nation-specific averages are preferable as they are more likely to reflect a norm for high and low service performance relevant to the health delivery system for each country.

From 2017 onwards NACR will include more country-specific reporting to enable in-country analysis and evaluation of how their own programmes are performing. All three nations have different approaches to service-level funding and commissioning with additional variation in key performance indicators. The ability to address service-level quality and inequalities in delivery and patient outcomes is dependent on the infrastructure, resources and financial models supporting CR services. In-country reporting will also enable each nation to more clearly identify average trends and high/low performance within their service delivery infrastructure which can be used to inform country-specific benchmarking and shared learning. To this end, NACR now uses nation-specific averages for wait time, duration and percentage assessment in this report.

Although Scotland is not presently entering data into NACR we are pursuing a new data governance application which, if successful, will allow a pilot study of data sharing between Lothian NHS CR services and NHS Digital in 2018.

**TABLE 13:**  
**TIME (DAYS) FROM POST DISCHARGE REFERRAL TO START OF CR BY COUNTRY, HEALTH REGION AND DIAGNOSIS/TREATMENT**

COUNTRY	HEALTH REGION	MI AND/OR PCI	CABG
England	C & M	36-	57-
	EM	32-	41+
	E o E	24+	42-
	GM, L & SC	26+	39+
	L	30-	42-
	SEC	29-	38+
	SW	34-	41+
	TV	28+	50-
	W	25+	43-
	WM	29-	36+
	Y & TH	19+	35+
<b>Total</b>		<b>28</b>	<b>41</b>
Northern Ireland	BHSCT	27+	40+
	NHSCT	37-	48-
	SEHSCT	28+	38+
	SHSCT	47-	78-
<b>Total</b>		<b>30</b>	<b>42</b>
Wales	ABM	42-	63-
	AB	35-	41-
	BC*	6+	4+
	C & V	36-	44-
	CT	19+	25+
	HD	78-	96-
<b>Total</b>		<b>23</b>	<b>38</b>
Other	Other	42	58
<b>TOTAL</b>		<b>28</b>	<b>41</b>

N=26,332 - or + nation specific referral time criteria: - = not met, + = met

\* figures confirmed by clinical team lead

NE and WHSCT have been removed due to insufficient NACR data

**PART FOUR: ANALYSIS BASED ON NATIONAL  
MINIMUM STANDARDS**

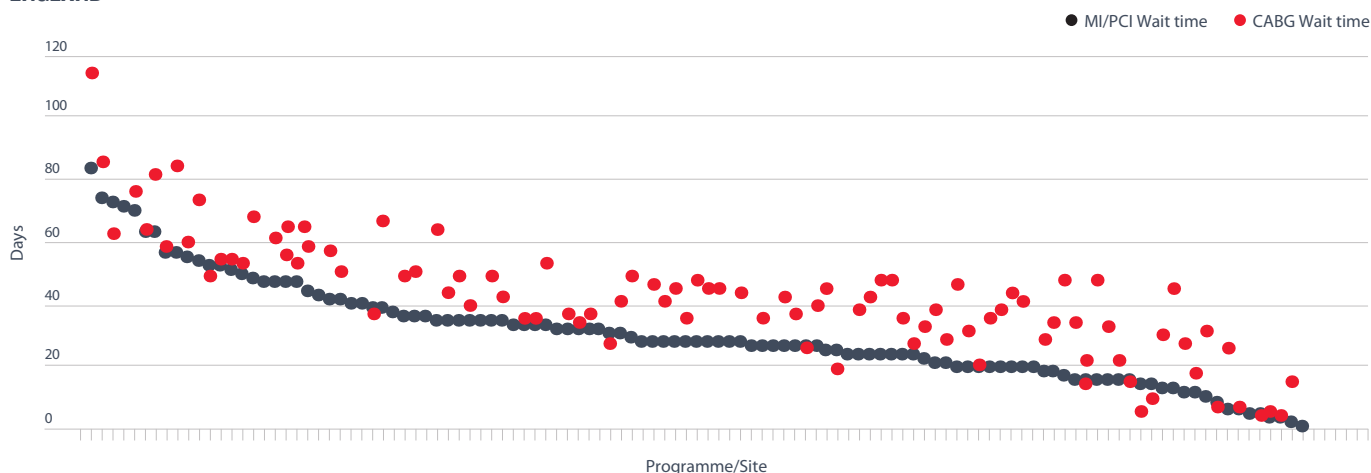
There is considerable variation at local programme level in all three nations. However, one common feature is that for all but 15 programmes, patients with MI/PCI wait for shorter periods than those with CABG (Figure 2 a-c.). For England (Figure 2a), around half of all MI/PCI and CABG patients start CR within a reasonable time frame with some indicating that patients are started within just a few days. There are around ten programmes in England with shorter CR wait times (<8 days) for MI/PCI and CABG patients, which either reflects very early CR or a misunderstanding about what constitutes the start of CR. The situation for Wales (Figure 2c) is similar to that of England whereas the trend in Northern Ireland is different (Figure 2b). In Northern Ireland none of the programmes offer CR earlier than 27 days for MI/PCI and 38 days for patients following CABG. Their wait times are within guideline recommended periods which reinforces our concern that in England and Wales some programmes may have a different understanding of what constitutes starting CR.

There is more work for CR providers and the NACR team to do in clarifying what is understood by starting CR such as: when a first assessment takes place, whether goal setting has happened for an individual patient and when does an actual CR intervention, based on assessment, commence.

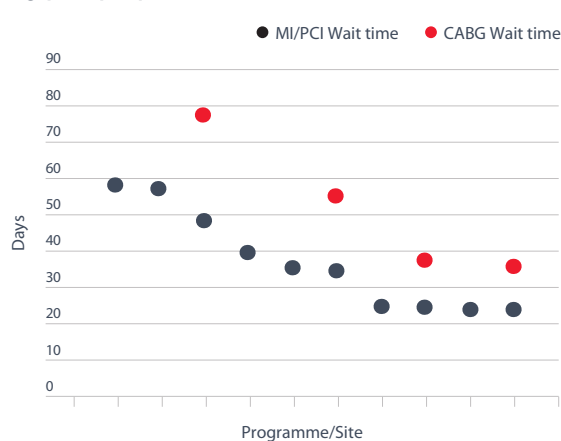
As the health landscape changes, innovation in service delivery is important and so is the need to capture such changes through audit. In order to support innovations in service delivery the BHF Alliance offers programmes the ability to share practice at [www.bhf.org.uk/alliance](http://www.bhf.org.uk/alliance).

**FIGURE 2 a-c: TIME FROM REFERRAL TO START OF CR BY PROGRAMME AND COUNTRY**

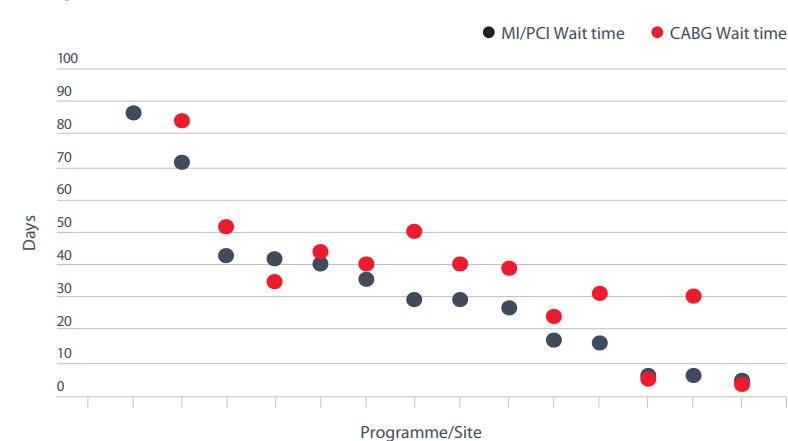
**Fig 2a.  
ENGLAND**



**Fig 2b.  
NORTHERN IRELAND**



**Fig 2c.  
WALES**



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

There has been a positive shift this year in the number of patients starting CR with a comprehensive assessment, which is encouraging news as assessment is a key recommendation of SIGN 2017 and NICE CG172 and forms one of the minimum standards of the BACPR. This year, 83% of patients that started CR had a baseline assessment which is a four percentage point improvement on last year (Table 14). Building on last year's report, which set a recommendation that more patients should be assessed at the end of CR, we can share more success with 62% of patients starting CR now having a follow-up assessment which is a six percentage point increase on last year (2,851 more patients). Slight variation exists between the nations with Northern Ireland showing a greater proportion of assessments at baseline whereas England has the higher number of assessments following CR.

More CR teams should capitalise on this trend and strive to assess all patients that complete CR. In this year's annual report we see 77% of patients completing rehabilitation; based on the BACPR minimum standards all of these should have had an assessment (BACPR 2017). However, 15% of patients completed CR without an assessment (7,128 patients): this means programmes cannot be assessed for improving outcomes. A further implication for those patients completing CR without a follow-up assessment is that they will not have had quantifiable notification of their progress which we know is important as part of successful health behaviour change. This also has implications for a tailored long-term management plan that would normally build on the progress of their initial CR goals.

**TABLE 14:**  
**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	2,845	83	62
	EM	3,733	86	64
	E o E	4,067	83	65
	GM, L & SC	5,872	73	56
	L	4,970	90	62
	SEC	4,304	86	65
	SW	4,303	93	60
	TV	1,732	80	69
	W	2,366	89	71
	WM	2,983	63	53
	Y & TH	3,407	90	73
<b>Total</b>		<b>40,582</b>	<b>83</b>	<b>63</b>
Northern Ireland	BHSCT	573	98	62
	NHSCT	593	90	61
	SEHSCT	610	88	67
	SHSCT	327	83	39
	WHSCT	114	74	68
<b>Total</b>		<b>2,217</b>	<b>90</b>	<b>60</b>
Wales	ABM	684	94	81
	AB	860	95	64
	BC	1,867	60	38
	C & V	299	92	73
	CT	421	78	54
	HD	363	82	52
<b>Total</b>		<b>4,494</b>	<b>78</b>	<b>54</b>
Other	Other	107	99	89
<b>TOTAL</b>		<b>47,520</b>	<b>83</b>	<b>62</b>

England N=40,582, Northern Ireland N=2,217, Wales N=4,494, Total N=47,520 (includes Other)  
NE has been removed due to insufficient NACR data



## Is the duration of CR meeting national guidance?

Successful health behaviour change programmes involving exercise training, physical activity, risk factor management and psychosocial wellbeing interventions all require time to achieve the desired goals set by patients. The most recent CR effectiveness Cochrane Review (Anderson et al 2016) of 63 clinical trials found that the median duration was six months (range one to 48 months). In routine clinical practice, where funding is more likely to be a determinant of CR duration, the range is three months in the USA, five months in Canada and recommended at a minimum of 12 weeks across Europe. In all these countries the preferred frequency is two to three formal sessions per week (Suaya et al 2007, Vanhees et al 2012). What is clear from this is that duration, at or above 12 weeks, is common to successful CR programmes which in essence give patients sufficient time to make the required lifestyle changes.

The median duration for CR in this year's report was nine weeks (Table 15) which is one week above the BACPR recommended minimum standard of eight weeks (BACPR 2017).

The percentage of patients who received at least eight weeks of CR was 71% in Wales (range 49% to 85%), 59% in England (range 35% to 80%) and 46% in Northern Ireland (range 12% to 75%) (Table 15, Figure 3 a-c). In-country variation for the duration of CR is high with some locations running very short programmes and therefore having potentially too little time to support health behaviour change.

The interaction between duration (length) and CR dose (frequency of sessions) is not yet understood, and ongoing analysis of programme data aims to produce a more meaningful interpretation of this relationship and its impact on patient outcomes.

**TABLE 15:**  
**MEDIAN LENGTH OF CR (DAYS)**

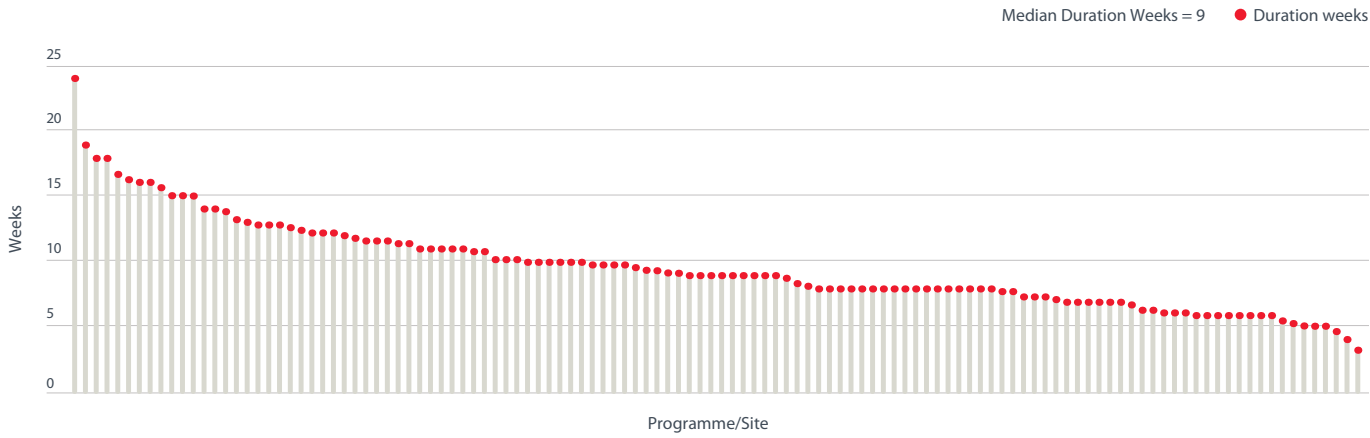
COUNTRY	HEALTH REGION	TOTAL PROGRAMME DURATION (DAYS)	% MEETING OR GREATER THAN 56 DAYS (BACPR 2017)
England	C & M	63	58
	EM	49	35
	E o E	70	68
	GM, L & SC	63	57
	L	61	53
	SEC	57	50
	SW	63	54
	TV	63	58
	W	63	57
	WM	80	80
Y & TH	84	74	
<b>Total</b>		<b>63</b>	<b>59</b>
Northern Ireland	BHSCT	80	74
	NHSCT	52	39
	SEHSCT	70	75
	SHSCT	42	12
	WHSCT	49	28
<b>Total</b>		<b>59</b>	<b>46</b>
Wales	ABM	63	62
	AB	77	81
	BC	113	79
	C & V	56	49
	CT	100	85
	HD	82	72
	<b>Total</b>		<b>77</b>
Other	Other	38	11
<b>TOTAL</b>		<b>63</b>	<b>58</b>

N= 36,250

NE has been removed due to insufficient NACR data

**FIGURE 3 a-c: DURATION OF CR BY PROGRAMME**

**Fig 3a.**  
**ENGLAND**



# Summary of CR programmes against national averages for service delivery performance indicators

Last year the NACR Statistical Report introduced service-level metrics to assess the overall performance against six key indicators and published a peer-reviewed version of this approach and analysis (Doherty et al 2017). This year we have expanded further to report these metrics for each nation (Table 16). Currently there are two agreed minimum standards: (1) CR offered to all six priority groups and (2) duration of CR of at least eight weeks (56 days).

The other four standards (which are pre-CR assessment 1, post-CR assessment 2, and wait time to CR for CABG and MI/PCI patients) are based on the national averages, year-on-year, for each country. We have utilised country-specific averages and compared programmes within countries for meeting their national averages (Tables 16). As CR service quality improves in respect of these four standards, evidenced through increased national averages, the BACPR and NACR will agree a minimum standard for assessment and timeliness of CR. For this section, we have reported the extent by which programmes meet the six standards for each Health Region and country in Figure 4a-c.

The NACR approach to nation-specific analysis of programme quality allows national leads and CR programmes in each country to see where their strengths and weaknesses reside and use this to help inform their strategy for improvement. This approach reflects the context, infrastructure and resources for each country, which will help set realistic expectations. In this year's analysis, it is clear that a fully inclusive approach to all patient priority groups, as seen in Wales, and shorter duration of CR, as seen in Northern Ireland, were influential in defining high and low performance category allocations.

**TABLE 16:  
PERCENTAGE OF PROGRAMMES ACHIEVING CR PERFORMANCE INDICATORS**

KEY PERFORMANCE INDICATORS		STANDARD	CR PROGRAMMES/SITES MEETING STANDARDS		
			ENGLAND %	NORTHERN IRELAND %	WALES %
Agreed minimum standards	Receiving All Priority Groups	Each group >0	85	75	100
	Duration	56 (days)	71	50	80
Standards based on 2015-16 national averages	% with Pre (Assessment 1)	England 83% Northern Ireland 90% Wales 78%	51	67	65
	% with Post (Assessment 2)	England 63% Northern Ireland 60% Wales 54%	47	42	59
	Referral to Start MI/PCI	England 28% Northern Ireland 30% Wales 23%	37	42	29
	Referral to Start CABG	England 41% Northern Ireland 42% Wales 38%	39	58	41

Future NACR reports will include an evaluation of the frequency of CR sessions. Our recent analysis revealed considerable variation in how a 'CR session' is carried out or recorded in NACR. For instance, we know that many programmes run supervised exercise training and education sessions back-to-back (same period of time) yet record this as one session on NACR. To help CR programmes understand what constitutes an auditable 'CR session' the BACPR and NACR will produce a joint position statement by Spring 2018.

**THE ANALYSIS OF NATIONAL MINIMUM STANDARDS FOR HEALTH REGIONS IN ENGLAND**

Figure 4a shows an overall trend towards most regions (ten out of 12) meeting three to six standards (light grey and beige). Between 8% to 67% of CR programmes, in seven Health Regions, either do not meet any of the standards or do not submit data (red bars).

**THE ANALYSIS OF NATIONAL MINIMUM STANDARDS FOR CR FOR HEALTH AND SOCIAL CARE TRUSTS IN NORTHERN IRELAND**

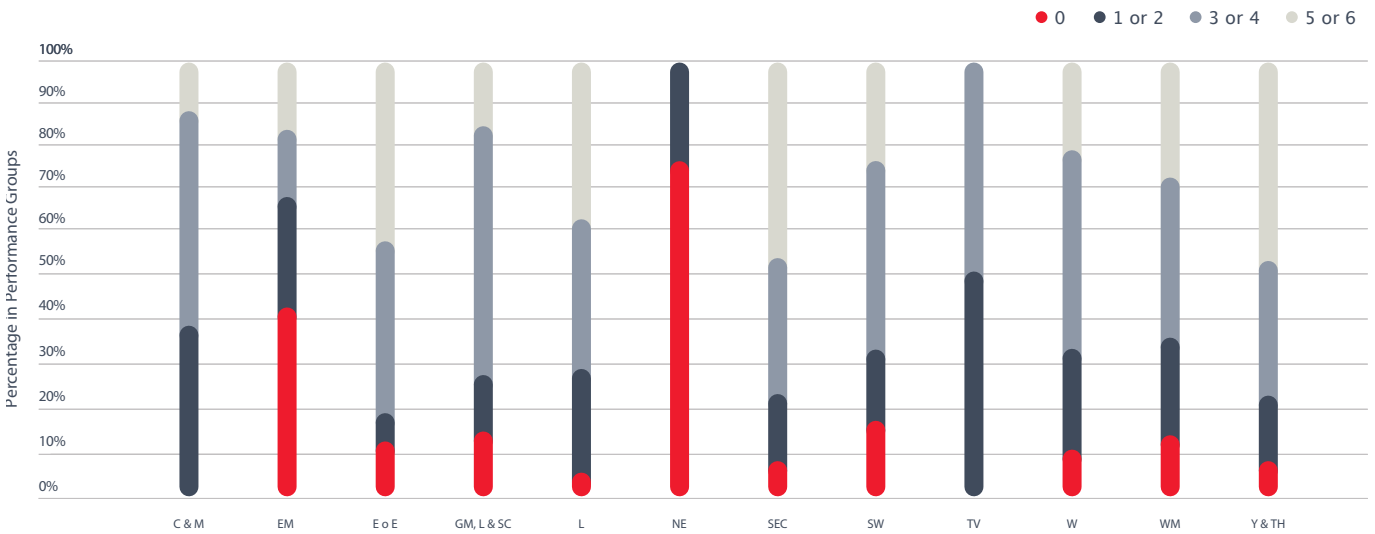
Of the five Health and Social Care Trusts all programmes in one Trust met most of the standards (beige bar) whereas in one other Trust 50% of programmes failed to meet any of the standards or meet just one to two of the standards (Figure 4b). The situation for the three other Trusts was orientated to meeting one to six of the standards.

**THE ANALYSIS OF NATIONAL MINIMUM STANDARDS FOR CR FOR HEALTH BOARDS IN WALES**

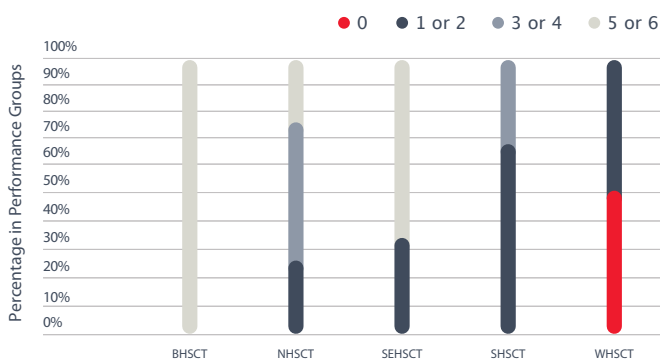
Of the seven Health Boards three had significant positive trends in meeting five to six standards (beige bars), five met three to four standards (light grey bars) and two had a range to 50% to 100% (red bars) not meeting any of the standards (Figure 4c).

**FIGURE 4 a-c: PERCENTAGE OF PROGRAMMES ACHIEVING PERFORMANCE INDICATOR SPLIT BY HEALTH REGION**

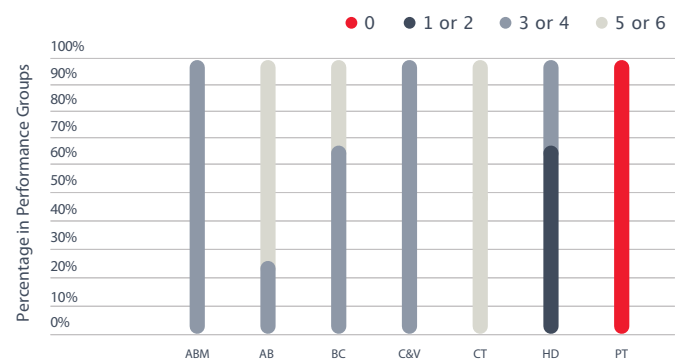
**Fig 4a. ENGLAND**



**Fig 4b. NORTHERN IRELAND**



**Fig 4c. WALES**



## Is CR delivered by a multidisciplinary team as recommended by national guidance?

The BACPR 2017 recommends that CR is delivered by a multidisciplinary team (MDT) of skilled and experienced staff who aim to support a multi-morbid patient population to achieve optimal outcomes from CR (Table 9). The overall range of professionals supporting CR is comprehensive, however, the variation across different countries is considerable (Table 17).

There are no obvious shifts from previous years, however, there was a significant improvement of 17 percentage points in the secretarial support on last year, which is encouraging as this is often seen as one of the major staffing deficits of the core CR team. This change was most evident in Wales with a 39 percentage point increase. The only significant reduction in staffing was in the occupational therapist role which fell by nine percentage points.

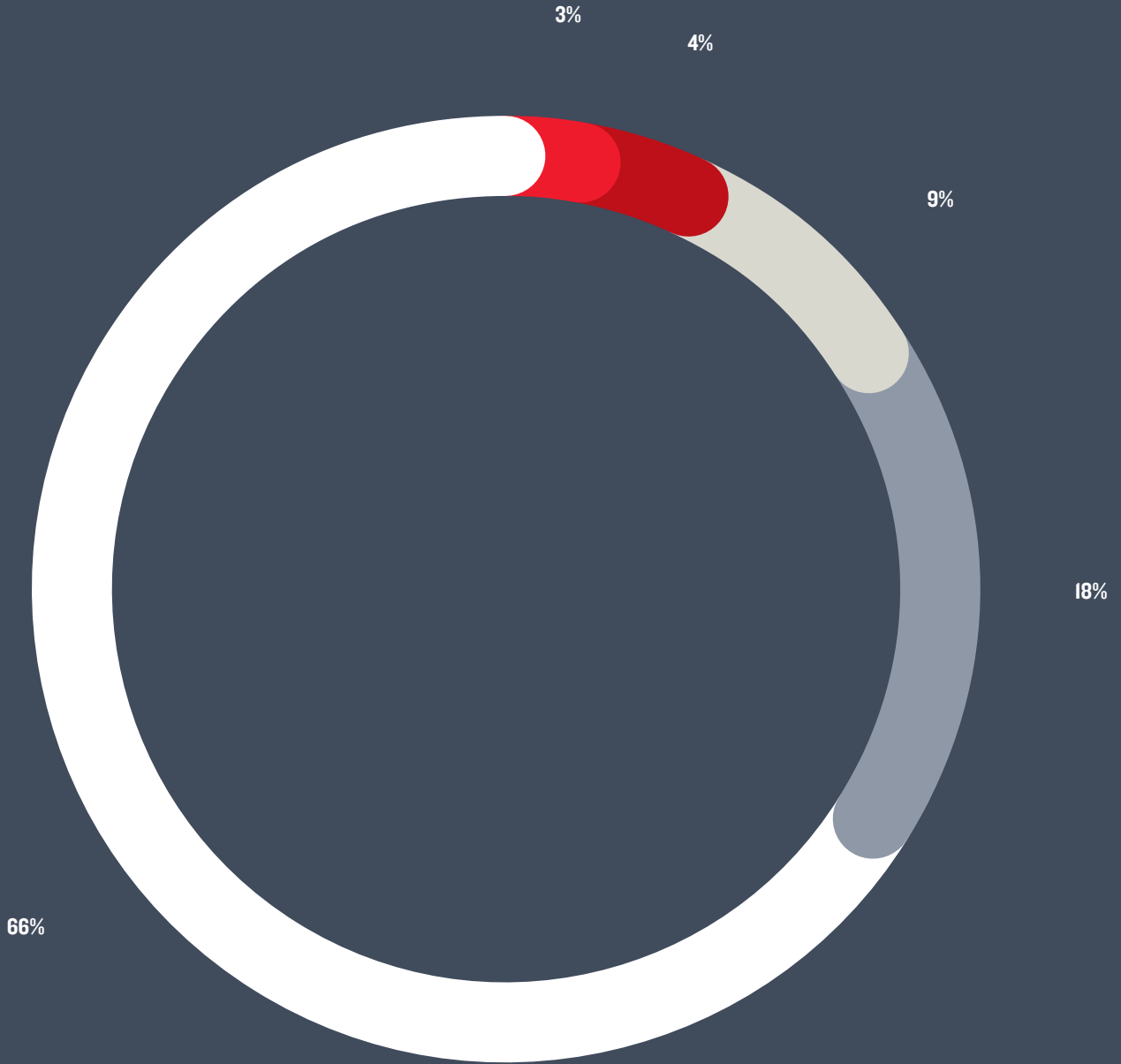
A more detailed breakdown of CR staffing by programme/site is available on the NACR webpage: [www.cardiacrehabilitation.org.uk/current-annual-report.htm](http://www.cardiacrehabilitation.org.uk/current-annual-report.htm)

NACR this year has reported the level of MDTs present at local programmes. The chart shows the proportion of different members of staff per programme nationally. The BACPR state that a programme, to achieve the variety of patient aims, needs to comprise of at least three different disciplines. There are 93% of programmes with three or more staff disciplines, which is a positive situation for the UK. However, 9% of programmes fail to meet this essential core component.

**TABLE 17:**  
**STAFFING PROFILE FOR CR PROGRAMMES ACROSS THE UK**

CATEGORY	ENGLAND		NORTHERN IRELAND		WALES		UK TOTAL	
	N	%	N	%	N	%	N	%
Nurse	194	97	10	91	20	100	227	97
Physiotherapist	134	67	11	100	18	90	165	71
Dietician	94	47	7	64	11	55	114	49
Psychologist	29	15	6	55	2	10	37	16
Social Worker	0	0	0	0	0	0	0	0
Counsellor	19	10	0	0	2	10	21	9
Doctor	16	8	4	36	0	0	21	9
Health Care Assistant	33	17	0	0	1	5	34	15
Secretary	153	77	8	73	19	95	181	77
Administrator	15	8	0	0	0	0	15	6
Exercise Specialist	114	57	1	9	9	45	124	53
Occupational Therapist	47	24	1	9	12	60	61	26
Pharmacist	72	36	10	91	11	55	95	41
Physiotherapy Assistant	55	28	1	9	5	25	62	26

# Breakdown of the multidisciplinary team



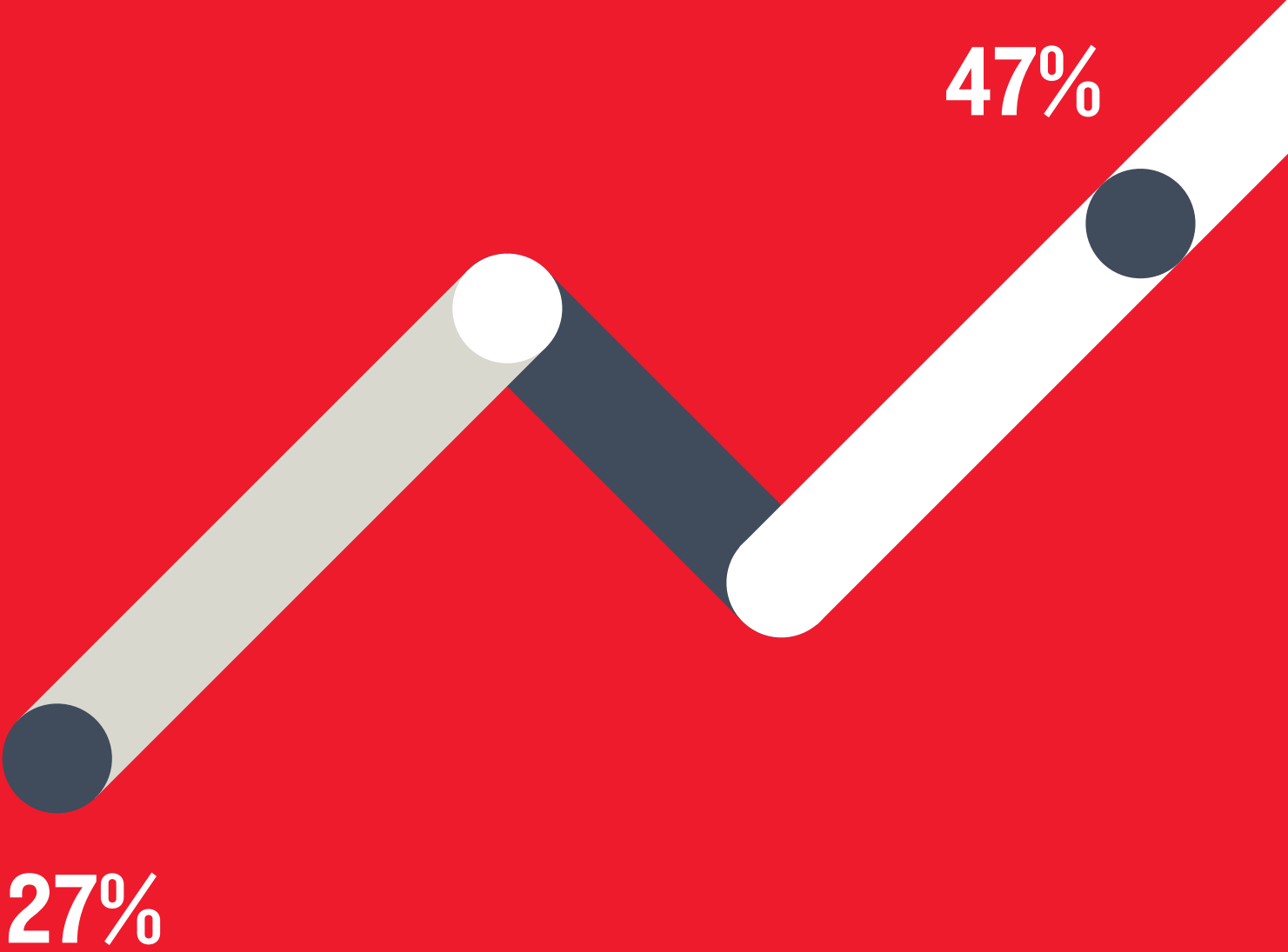
WITH 1 MEMBER OF STAFF (MOS) %    WITH 2 MOS %    WITH 3 MOS %    WITH 4 MOS %    WITH 5 MOS OR ABOVE %

**3**      **4**      **9**      **18**      **66**

# PART FIVE: EVALUATION OF PATIENT OUTCOMES FOLLOWING CR BY COUNTRY, HEALTH REGION AND LOCAL PROGRAMME

THE RANGE OF IMPROVEMENTS  
IN PHYSICAL ACTIVITY LEVELS  
IN PATIENTS FOLLOWING  
CR IN 2015-16.

27%–  
47%





**PART FIVE: EVALUATION OF PATIENT OUTCOMES FOLLOWING CR  
BY COUNTRY, HEALTH REGION AND LOCAL PROGRAMME**

Based on the success of last year's local reporting approach we have continued this and extended it to individual graphical reports for each country. The approach shows baseline values per programme in one colour with the percentage change following CR as a different colour using the same graphical bar.

## Analysis of CR contribution to smoking cessation

The total number of patients entering CR as non-smokers is on average 93.6%, which is similar to last year (range 85.9% to 98.8%) (Table 18, Figure 5a-c) with proportions comparable in each of the three nations at baseline.

Supporting patients to stop smoking remains a top priority and there are some programmes doing rather well at it with a 12.5 percentage point reduction in the number of patients smoking following CR while other programmes are not demonstrating any change or even worse, some are seeing an increase in the number of patients identified as smokers post-CR. The mean change for the UK was 1.4 percentage points with a range of -0.2 to 2.9 percentage points across England, Northern Ireland and Wales.

The CR contribution to smoking cessation at a national level remains positive overall; however, the range of change was -0.5 to 4.8 percentage points for England, 0.0 to 12.5 percentage points for Northern Ireland and -1.3 to 2.1 percentage points for Wales (Table 18).

The situation at a local level (Figure 5 a-c) is more complex and varied with 15 programmes showing a negative impact in England (Figure 5a), one in Northern Ireland (Figure 5b) and three negative values in Wales (Figure 5c). Further clarification around the varying smoking states need to be investigated as some of the negative change could be explained by patients reverting back to smoking. The scale of the challenge, in terms of smoking status at the point patients enter CR, is very different from programme to programme.

**TABLE 18:  
PERCENTAGE OF NON-SMOKERS**

COUNTRY	HEALTH REGION	PRE %	POST %	POINT CHANGE %
England	C & M	93.6	94.5	0.8
	EM	93.5	93.8	0.4
	E o E	95.9	96.0	0.1
	GM, L & SC	94.9	95.6	0.7
	L	93.7	95.2	1.5
	SEC	95.8	96.3	0.6
	SW	94.6	96.6	2.0
	TV	96.0	95.5	-0.5
	W	94.5	96.4	1.9
	WM	91.6	96.0	4.4
	Y & TH	85.9	90.7	4.8
<b>Total</b>		<b>93.5</b>	<b>95.0</b>	<b>1.5</b>
Northern Ireland	BHSCT	92.3	92.6	0.2
	NHSCT	88.1	97.2	9.1
	SEHSCT	94.7	94.7	0.0
	SHSCT	98.8	100.0	1.2
	WHSCT	87.5	100.0	12.5
<b>Total</b>		<b>92.3</b>	<b>95.2</b>	<b>2.9</b>
Wales	ABM	96.2	95.3	-0.9
	AB	94.0	94.0	0.0
	BC	96.1	94.8	-1.3
	C & V	96.8	96.8	0.0
	CT	88.1	88.1	0.0
	HD	95.8	97.9	2.1
<b>Total</b>		<b>95.4</b>	<b>95.2</b>	<b>-0.2</b>
Other	Other	97.7	94.3	-3.4
<b>TOTAL</b>		<b>93.6</b>	<b>95.0</b>	<b>1.4</b>

England N=19,167, Northern Ireland N=1,137, Wales N=1,533, Total N=21,924 (includes Other)  
NE and PT are not shown in any outcomes tables as there is insufficient data.  
See Table 3 for abbreviations.  
In all of the following tables the total percentage may be slightly above 100% due to rounding.

FIGURE 5 a-c: PERCENTAGE CHANGE IN NON-SMOKERS POST-CR BY PROGRAMME

Fig 5a.  
ENGLAND

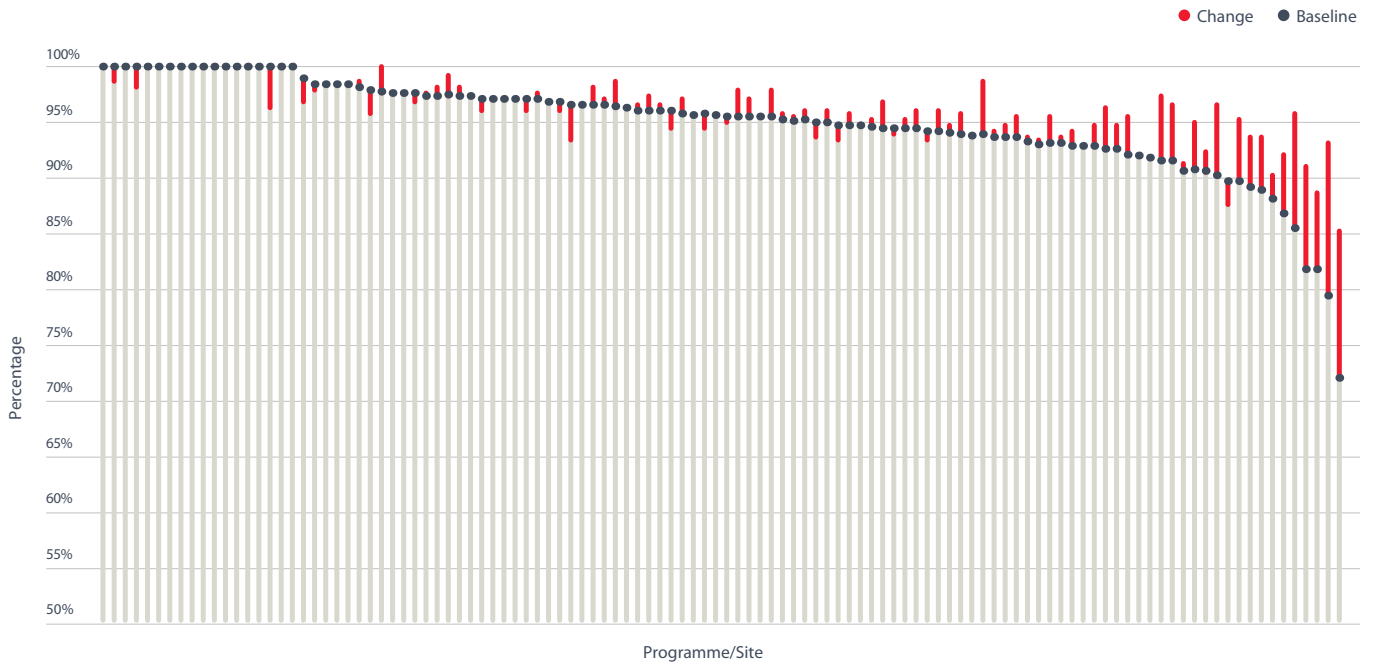


Fig 5b.  
NORTHERN IRELAND

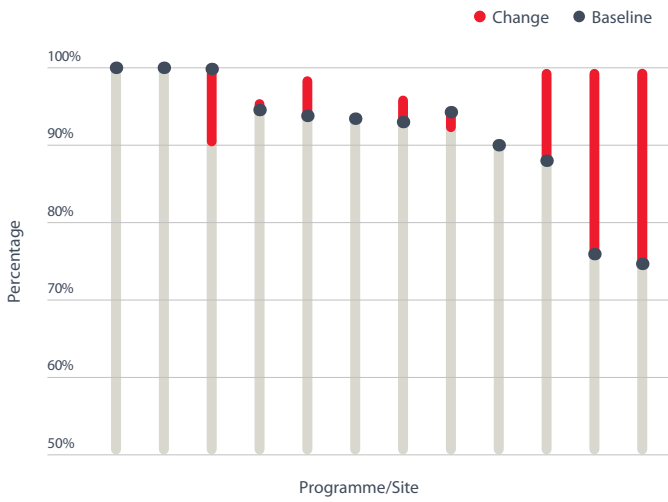
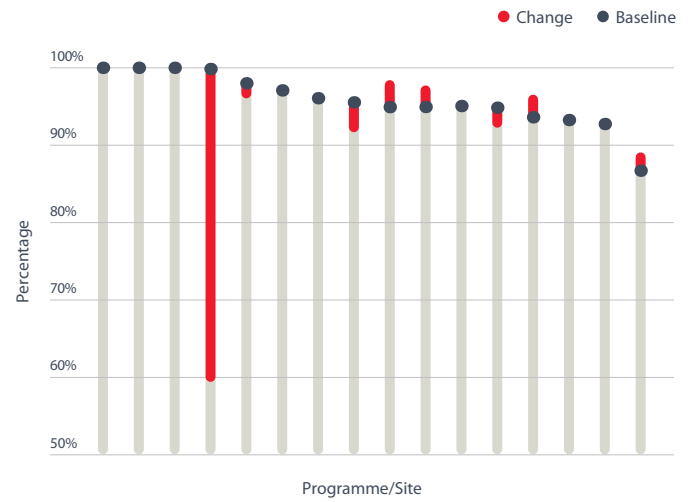


Fig 5c.  
WALES



## Analysis of CR contribution to physical activity status

Although physical fitness improvement as measured by fitness testing (e.g. shuttle walk test) is an expected outcome from CR, it is not inevitable that this leads to an increase in physical activity status, which is a measurement of how much physical activity (e.g. walking, light housework) an individual does in an average week. The Chief Medical Officers (CMOs) for all nations of the UK recommend 150 minutes per week of moderate intensity physical activity as part of a public health initiative. This requirement has been adopted as a basic minimum requirement for the BACPR (2017) and SIGN (2017).

In this audit period, 41.6% of patients at baseline CR met the recommendation of 150 minutes which increased to 70% following CR (Table 19). The average percentage point change for each nation was 27.5, 41.3 and 27.0 for England, Northern Ireland and Wales respectively (Table 19) all of which indicates a positive outcome following CR (Figure 6 a-c). The extent of change in Northern Ireland was strongly positive (>41%) with 13% greater change compared to other nations.

The profile of physical activity status at the point patients enter CR is very different at a local level. For instance, the baseline activity state ranged from 8% of patients meeting the 150 minute recommendation in one programme to 90% in another. This makes simple comparisons of percentage point change at a programme level difficult to judge, as the potential for change is greater in those programmes with low baseline activity levels. On the other hand, these patients may have habituated being less active which could mean they are less likely to change. The same could also be applied to those less active patients in the high baseline groups as they too may be less likely to change.

This year we have again reported physical activity status at a named programme level. This is an important lifestyle risk factor and a UK wide recommendation. The audit is keen to receive feedback on this recent addition to reporting as we move forward with this, and HADS, at a named local programme level. The report is available from <http://www.cardiacrehabilitation.org.uk/current-annual-report.htm>

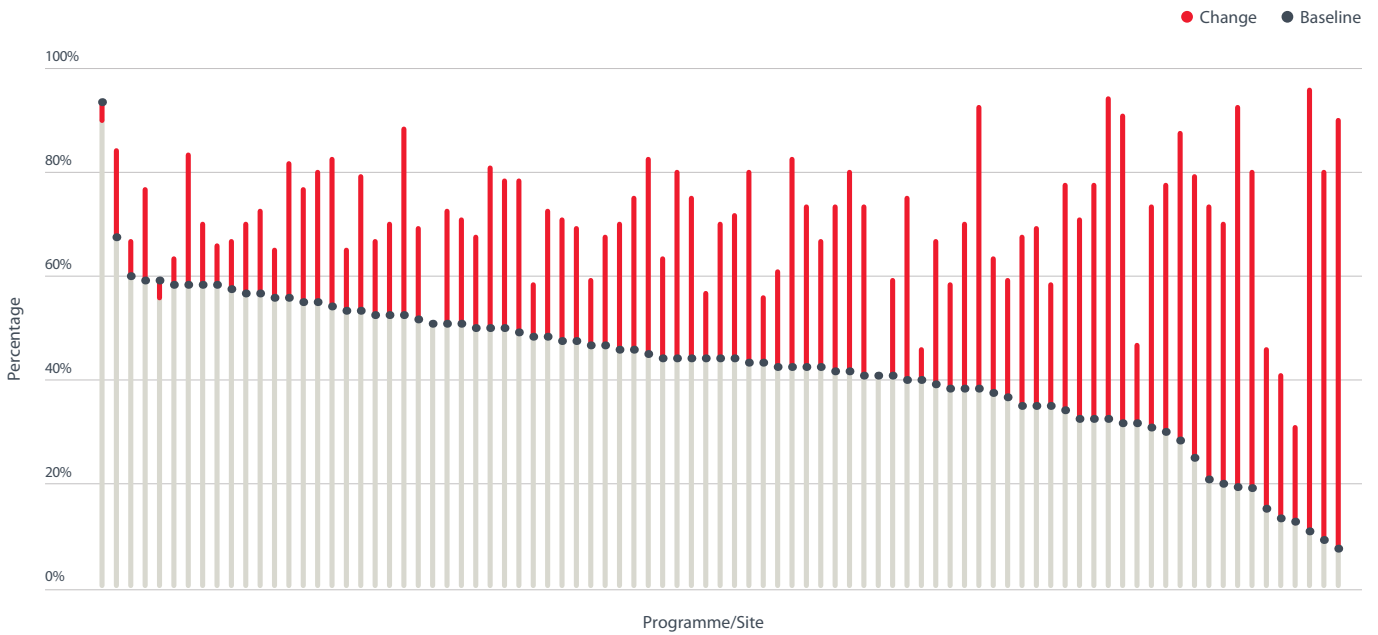
**TABLE 19:**  
**CHANGE IN PHYSICAL ACTIVITY STATUS (150 MINUTES PER WEEK) FOLLOWING CR BY HEALTH REGION**

COUNTRY	HEALTH REGION	PRE %	POST %	POINT CHANGE %
England	C & M	36.2	66.9	30.6
	EM	42.4	58.5	16.1
	E o E	42.3	73.6	31.3
	GM, L & SC	45.3	72.4	27.1
	L	39.8	69.8	30.0
	SEC	40.8	71.4	30.6
	SW	52.3	73.1	20.7
	TV	43.7	75.0	31.3
	W	43.5	75.9	32.4
	WM	41.1	80.8	39.7
Y & TH	38.4	60.5	22.1	
<b>Total</b>		<b>42.4</b>	<b>69.8</b>	<b>27.5</b>
Northern Ireland	BHSCT	32.7	75.1	42.4
	NHSCT	38.6	73.7	35.1
	SEHSCT	20.3	61.3	41.0
	SHSCT	40.0	86.7	46.7
<b>Total</b>		<b>28.6</b>	<b>69.9</b>	<b>41.3</b>
Wales	ABM	39.1	66.5	27.4
	AB	37.8	64.5	26.7
	BC	29.4	62.2	32.8
	C & V	44.4	72.8	28.4
	CT	31.4	66.7	35.3
	HD	43.3	58.3	15.0
<b>Total</b>		<b>38.9</b>	<b>65.9</b>	<b>27.0</b>
Other	Other	53.6	94.0	40.5
<b>TOTAL</b>		<b>41.6</b>	<b>69.7</b>	<b>28.1</b>

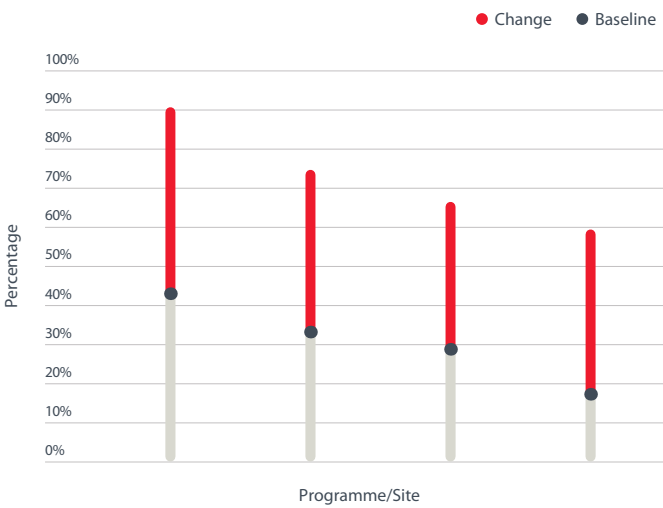
England N=14,369, Northern Ireland N=675, Wales N=1,179, Total N=15,830 (includes Other)  
WHSCT has been removed due to insufficient NACR data

**FIGURE 6 a-c: CHANGE IN PHYSICAL ACTIVITY STATUS (150 MINUTES PER WEEK) FOLLOWING CR BY PROGRAMME**

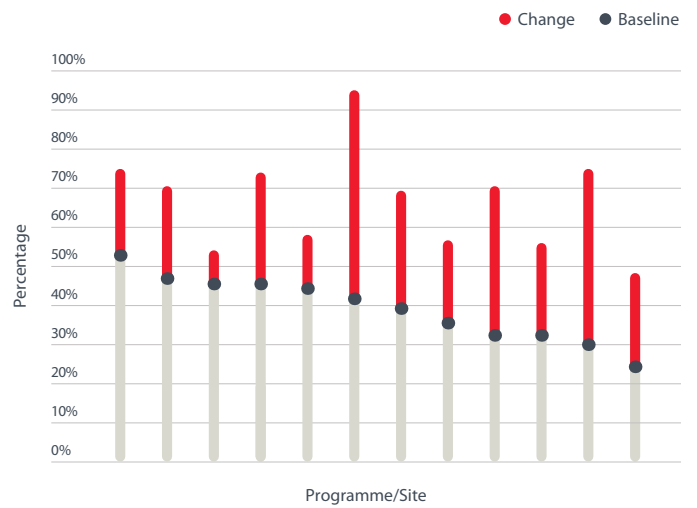
**Fig 6a.**  
**ENGLAND**



**Fig 6b.**  
**NORTHERN IRELAND**



**Fig 6c.**  
**WALES**



## Analysis of CR contribution to Body Mass Index (BMI)

Around a third of the CR population begin rehabilitation with a BMI greater than 30. A key aim of CR and a goal for most patients is to bring BMI below a value of <30 (BACPR 2017).

The average change seen across countries is low, with an increase of only 0.3 to 0.8 percentage points in patients in patients with BMI <30. This highlights the difficulty in addressing this risk factor (Table 20 and Figure 7 a-c.) Regional and local programme variation exists with a range of change of -1.2 to 7.6 percentage points which suggests that some programmes may be doing slightly better than others, and could highlight an opportunity for sharing best practice.

However, the ability for a programme to make substantial change in patients' BMI may also be hindered by their own success in smoking cessation. Evidence suggests that patients trying to quit smoking are more likely to put on between three and five kilograms in the first three months to a year (Aubin et al 2012). This substantial effect may inhibit reporting of some successful weight loss programmes but, at a national level, patients losing weight and moving to BMI <30 is evidence that CR is positively associated with weight management. With regards to smoking and weight interactions, NACR data analysis concludes that the extent of weight gain associated with smoking cessation in patients attending CR is much less than previous studies suggest.

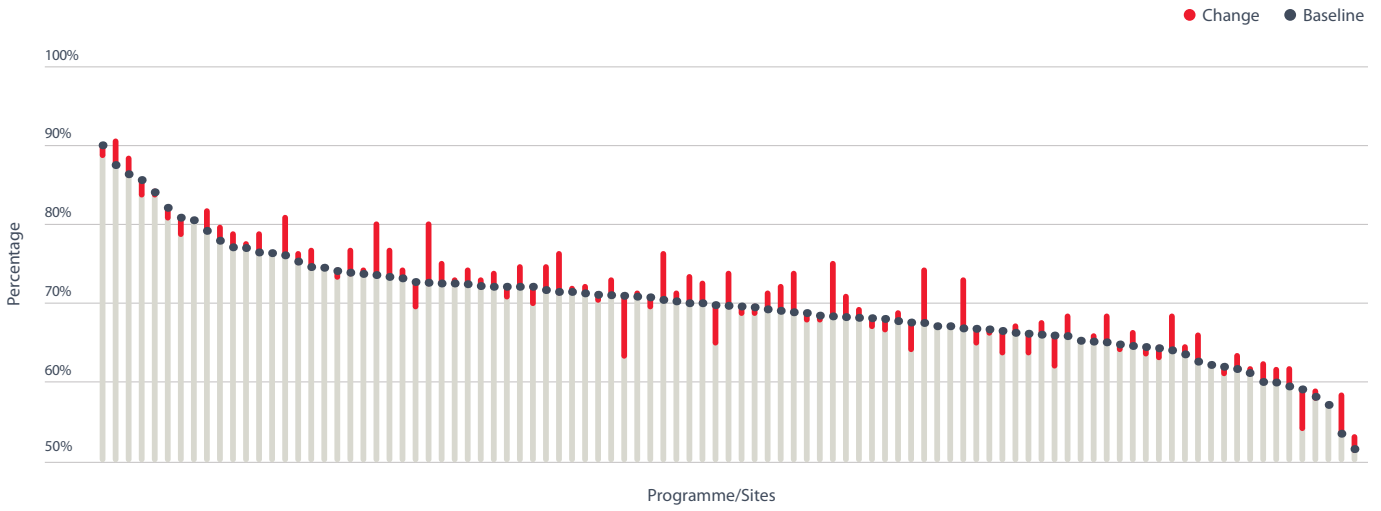
**TABLE 20:**  
**PERCENTAGE OF PATIENTS WITH BMI <30 PRE- AND POST-CR**

COUNTRY	HEALTH REGION	PRE %	POST %	POINT CHANGE %
England	C & M	67.2	66.8	-0.4
	EM	65.1	64.6	-0.4
	E o E	68.8	69.3	0.5
	GM, L & SC	70.1	71.4	1.3
	L	71.5	71.1	-0.4
	SEC	73.9	75.6	1.7
	SW	72.3	74.9	2.6
	TV	66.8	68.3	1.4
	W	72.5	74.3	1.8
	WM	67.1	67.2	0.1
	Y & TH	67.8	69.5	1.8
<b>Total</b>		<b>69.8</b>	<b>70.7</b>	<b>0.8</b>
Northern Ireland	BHSCT	61.7	61.9	0.2
	NHSCT	64.0	64.8	0.8
	SEHSCT	68.9	70.3	1.5
	SHSCT	70.4	70.4	0.0
<b>Total</b>		<b>64.9</b>	<b>65.6</b>	<b>0.7</b>
Wales	ABM	67.0	66.5	-0.4
	AB	60.1	61.5	1.4
	BC	67.8	70.3	2.5
	C & V	66.2	65.5	-0.6
	CT	68.0	68.0	0.0
	HD	70.6	71.3	0.7
	<b>Total</b>		<b>65.5</b>	<b>65.8</b>
Other	Other	74.4	73.3	-1.2
<b>TOTAL</b>		<b>69.3</b>	<b>70.1</b>	<b>0.8</b>

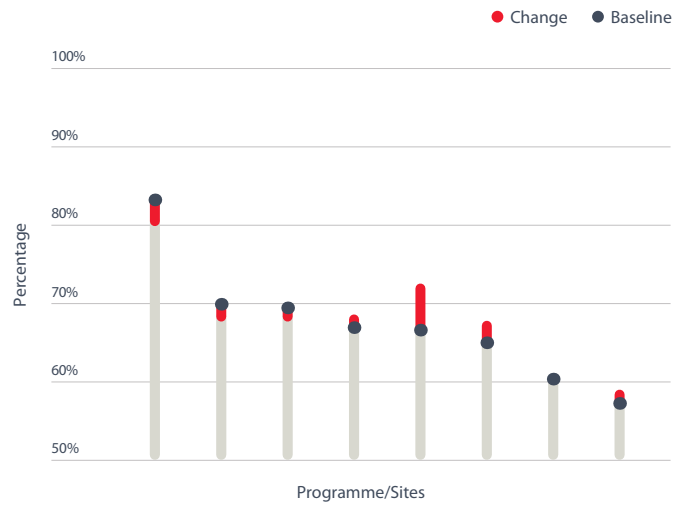
England N=17,058, Northern Ireland N=1,003, Wales N=1,439, Total N=19,593 (includes Other)  
WHST has been removed due to insufficient NACR data

**FIGURE 7 a-c: CHANGE IN BMI POST-CR (<30 BMI) BY PROGRAMME**

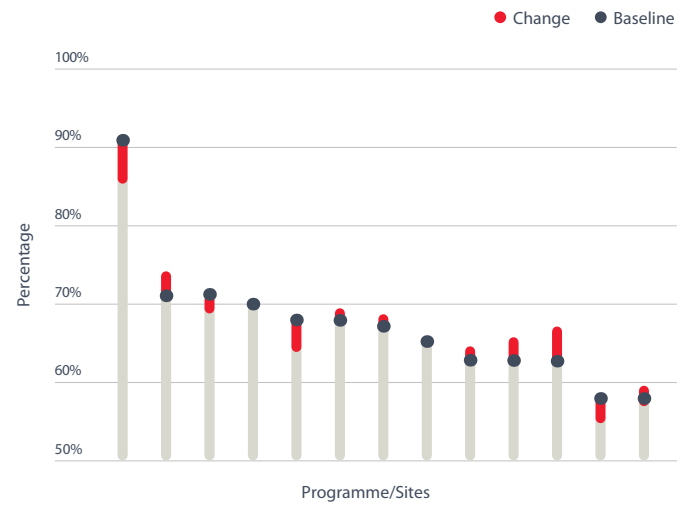
**Fig 7a. ENGLAND**



**Fig 7b. NORTHERN IRELAND**



**Fig 7c. WALES**



## Analysis of CR contribution to HADS anxiety levels

At baseline around 72.5% of patients present within the normal HADS anxiety category, with 27.6% residing in the clinical and borderline categories at the point they enter CR (Table 21). Variation in the burden of anxiety is evident across countries and Health Regions, with averages of 14.7%, 13.1% and 11.8% for clinical levels of anxiety in Wales, Northern Ireland and England, respectively. Change in patient status from clinically anxious to borderline and normal categories is well distributed and for the most part positive across Health Regions (Table 21 and 22). Overall there was a 6.3 percentage point shift from clinically/borderline anxious to the normal anxiety category (Table 22). National and regional values suggest that most patients benefit from CR, however, there is large variation in the extent of this improvement at a local level from -9.0% to 28.7% (Figure 8 a-c). Around 65% of programmes met or exceeded the 6.3 percentage point national average change in anxiety which is encouraging, however, further work is required to ensure that more patients are supported to achieve close to the average change following CR.

**TABLE 21:**  
PERCENTAGE OF PATIENTS BY HADS ANXIETY CATEGORIES PRE- AND POST-CR

COUNTRY	HEALTH REGION	PRE			POST		
		NORMAL %	BORDERLINE %	CLINICALLY ANXIOUS %	NORMAL %	BORDERLINE %	CLINICALLY ANXIOUS %
England	C & M	72.6	15.0	12.4	78.1	12.4	9.5
	EM	71.5	15.5	13.0	75.3	15.0	9.7
	E o E	73.2	15.1	11.8	81.0	11.9	7.1
	GM, L & SC	70.4	17.1	12.5	77.5	13.4	9.0
	L	69.3	16.7	14.1	75.0	14.9	10.1
	SEC	75.2	14.0	10.8	81.1	11.1	7.9
	SW	74.9	16.7	8.4	84.3	11.6	4.1
	TV	74.7	15.1	10.2	83.4	10.2	6.3
	W	76.0	15.9	8.1	82.4	11.7	5.9
	WM	74.3	13.7	12.0	79.0	13.9	7.1
	Y & TH	71.3	16.0	12.8	79.3	12.3	8.3
<b>Total</b>		<b>72.6</b>	<b>15.6</b>	<b>11.8</b>	<b>79.0</b>	<b>12.8</b>	<b>8.2</b>
Northern Ireland	BHSCT	65.4	17.1	17.4	74.8	13.8	11.4
	NHSCT	78.3	11.5	10.2	82.3	11.5	6.2
	SEHSCT	81.0	8.5	10.4	80.6	12.3	7.1
<b>Total</b>		<b>74.2</b>	<b>12.7</b>	<b>13.1</b>	<b>78.0</b>	<b>13.5</b>	<b>8.5</b>
Wales	ABM	69.0	16.6	14.4	76.6	14.1	9.2
	AB	65.8	15.4	18.8	75.7	12.9	11.4
	BC	72.3	13.9	13.9	79.2	13.9	6.9
	C & V	70.7	16.3	13.0	75.9	15.2	8.9
	HD	72.8	16.2	11.0	72.3	17.8	9.9
<b>Total</b>		<b>69.4</b>	<b>15.9</b>	<b>14.7</b>	<b>75.8</b>	<b>14.6</b>	<b>9.6</b>
Other	Other	83.5	9.4	7.1	85.9	8.2	5.9
<b>TOTAL</b>		<b>72.5</b>	<b>15.5</b>	<b>12.1</b>	<b>78.7</b>	<b>12.9</b>	<b>8.3</b>

England N=14,183, Northern Ireland N=810, Wales N=1,255, Total N=16,356 (includes Other)  
SHSCT, WHSCT & CT has been removed due to insufficient NACR data

**TABLE 22:**  
**PERCENTAGE POINT CHANGE IN HADS ANXIETY CATEGORIES FOLLOWING CR**

COUNTRY	HEALTH REGION	POINT CHANGE		
		NORMAL %	BORDERLINE %	CLINICALLY ANXIOUS %
England	C & M	5.5	-2.5	-2.9
	EM	3.7	-0.5	-3.2
	E o E	7.8	-3.2	-4.6
	GM, L & SC	7.1	-3.6	-3.5
	L	5.7	-1.7	-4.0
	SEC	5.9	-3.0	-2.9
	SW	9.4	-5.2	-4.3
	TV	8.8	-4.9	-3.9
	W	6.4	-4.2	-2.1
	WM	4.7	0.2	-4.9
	Y & TH	8.1	-3.6	-4.4
<b>Total</b>		<b>6.4</b>	<b>-2.8</b>	<b>-3.6</b>
Northern Ireland	BHSCT	9.4	-3.4	-6.0
	NHSCT	4.0	0.0	-4.0
	SEHSCT	-0.5	3.8	-3.3
<b>Total</b>		<b>3.8</b>	<b>0.7</b>	<b>-4.6</b>
Wales	ABM	7.6	-2.4	-5.2
	AB	9.8	-2.5	-7.4
	BC	6.9	0.0	-6.9
	C & V	5.2	-1.1	-4.1
	HD	-0.5	1.6	-1.0
<b>Total</b>		<b>6.4</b>	<b>-1.4</b>	<b>-5.0</b>
Other	Other	2.4	-1.2	-1.2
<b>TOTAL</b>		<b>6.3</b>	<b>-2.5</b>	<b>-3.7</b>

England N=14,183, Northern Ireland N=810, Wales N=1,255, Total N=16,356 (includes other)  
SHSCT, WHSCT & CT has been removed due to insufficient NACR data



# Analysis of CR contribution to HADS anxiety levels (continued)

FIGURE 8 a-c: CHANGE IN ANXIETY POST-CR BY PROGRAMME (% NORMAL)

Fig 8a.  
ENGLAND

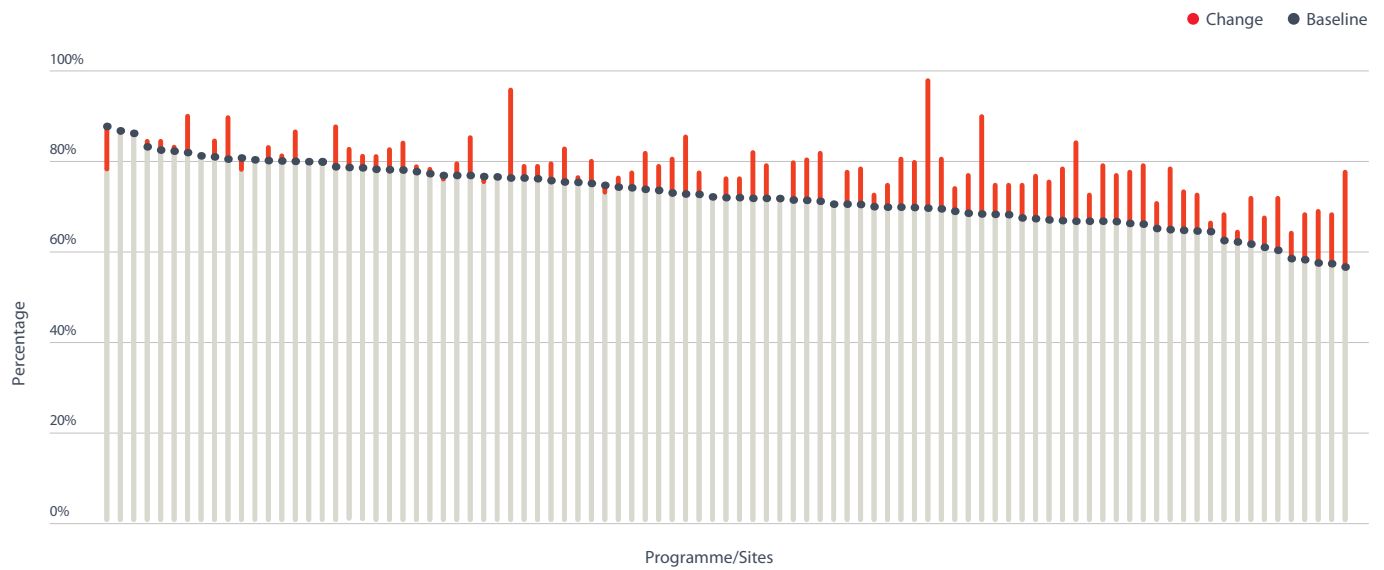


Fig 8b. NORTHERN IRELAND

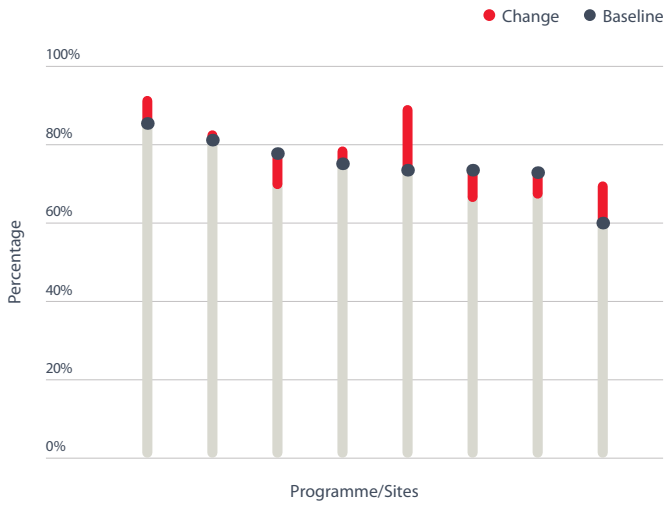
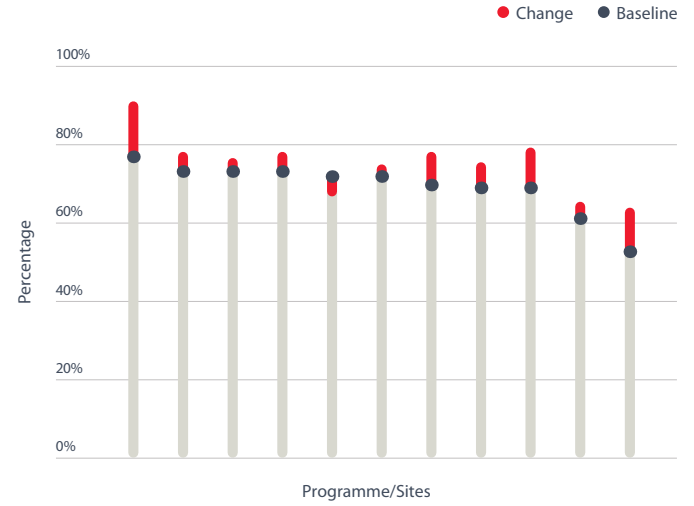


Fig 8c. WALES



## Analysis of CR contribution to HADS depression levels

Around 19% of patients present within the clinical and borderline categories of depression at the point they enter CR (Table 23). Variation in the burden of depression is evident across countries and Health Regions, with averages of 6.6%, 6.8% and 9.6% for clinical levels of depression in England, Northern Ireland and Wales respectively. Changes in patient status from clinically depressed to borderline and normal categories are evenly distributed and mostly positive across all Health Regions (Table 23 and 24). There was a decrease in the percentage of patients in the clinically depressed and borderline groups, 2.4 and 3.8 percentage points, respectively, across all countries, and a 6.2 percentage point positive movement to the normal group (Table 24). Performance at national and regional level suggests that most patients benefit from reduced levels of depression after CR. However, there is large variation in the extent of this improvement at a local level from -8.1 to 24.3 percentage points (Figure 9 a-c). At a regional and local level 60% of programmes met or exceeded the 6.2 percentage point national average change in depression which is encouraging, however further work is required to ensure that more patients are supported to achieve close to the nation-specific average change following CR.

This year, along with the local reporting of physical activity status, we are publishing the HADS categories for pre-CR, post-CR and the change in each category at a named local programme level. This will be produced for both anxiety and depression which are indicators for psychosocial health, a key aim for programmes to address with patients. This is the direction the audit is continuing to adopt across different patient outcome measures and we appreciate feedback on its methodology and impact.

The report is available from: <http://www.cardiacrehabilitation.org.uk/current-annual-report.htm>

**TABLE 23:**  
PERCENTAGE OF PATIENTS BY HADS DEPRESSION CATEGORIES PRE- AND POST-CR

COUNTRY	HEALTH REGION	NORMAL %	BORDERLINE %	PRE	NORMAL %	BORDERLINE %	POST
				CLINICALLY DEPRESSED %			CLINICALLY DEPRESSED %
England	C & M	79.7	12.1	8.2	86.8	8.5	4.7
	EM	81.8	11.2	7.0	85.4	9.4	5.2
	E o E	84.5	10.3	5.2	90.9	5.3	3.8
	GM, L & SC	80.3	11.8	7.8	87.0	8.2	4.8
	L	77.1	14.2	8.8	84.0	10.1	5.9
	SEC	82.1	11.5	6.4	89.0	6.7	4.3
	SW	85.6	10.9	3.4	92.1	4.7	3.2
	TV	79.6	14.4	5.9	88.5	7.7	3.8
	W	87.1	9.7	3.2	92.1	6.5	1.4
	WM	85.9	8.8	5.3	87.4	8.5	4.1
	Y & TH	79.2	13.7	7.1	86.6	8.3	5.1
<b>Total</b>		<b>81.6</b>	<b>11.8</b>	<b>6.6</b>	<b>87.8</b>	<b>7.8</b>	<b>4.4</b>
Northern Ireland	BHSCT	79.5	12.1	8.4	87.9	7.4	4.7
	NHSCT	86.7	8.0	5.3	88.9	8.8	2.2
	SEHSCT	85.8	9.0	5.2	89.1	7.6	3.3
	SHSCT	84.0	6.7	9.3	88.0	5.3	6.7
<b>Total</b>		<b>83.6</b>	<b>9.6</b>	<b>6.8</b>	<b>88.5</b>	<b>7.7</b>	<b>3.8</b>
Wales	ABM	75.5	15.0	9.5	84.2	10.9	4.9
	AB	75.7	12.6	11.7	84.0	9.5	6.5
	BC	82.2	7.9	9.9	85.1	11.9	3.0
	C & V	83.0	9.2	7.7	88.6	7.7	3.7
	HD	75.3	15.8	8.9	77.4	13.2	9.5
<b>Total</b>		<b>77.7</b>	<b>12.7</b>	<b>9.6</b>	<b>84.1</b>	<b>10.3</b>	<b>5.6</b>
Other	Other	89.4	8.2	2.4	96.5	1.2	2.4
<b>TOTAL</b>		<b>81.4</b>	<b>11.8</b>	<b>6.8</b>	<b>87.6</b>	<b>8.0</b>	<b>4.4</b>

England N=14,165, Northern Ireland N=810, Wales N=1,254, Total N=16,337 (includes Other)  
WHST & CT has been removed due to insufficient NACR data

**TABLE 24:**  
**PERCENTAGE POINT CHANGE IN HADS DEPRESSION FOLLOWING CR**

COUNTRY	HEALTH REGION	NORMAL %	BORDERLINE %	POST
				CLINICALLY DEPRESSED %
England	C & M	7.1	-3.6	-3.5
	EM	3.6	-1.8	-1.8
	E o E	6.4	-5.0	-1.4
	GM, L & SC	6.7	-3.6	-3.1
	L	6.9	-4.0	-2.9
	SEC	6.9	-4.8	-2.1
	SW	6.4	-6.2	-0.2
	TV	8.9	-6.7	-2.2
	W	5.0	-3.2	-1.8
	WM	1.5	-0.2	-1.3
	Y & TH	7.4	-5.4	-2.1
<b>Total</b>		<b>6.2</b>	<b>-4.0</b>	<b>-2.2</b>
Northern Ireland	BHSCT	8.4	-4.7	-3.7
	NHSCT	2.2	0.9	-3.1
	SEHSCT	3.3	-1.4	-1.9
	SHSCT	4.0	-1.3	-2.7
<b>Total</b>		<b>4.9</b>	<b>-2.0</b>	<b>-3.0</b>
Wales	ABM	8.7	-4.1	-4.6
	AB	8.3	-3.1	-5.2
	BC	3.0	4.0	-6.9
	C & V	5.5	-1.5	-4.1
	HD	2.1	-2.6	0.5
<b>Total</b>		<b>6.5</b>	<b>-2.4</b>	<b>-4.1</b>
Other	Other	7.1	-7.1	0.0
<b>TOTAL</b>		<b>6.2</b>	<b>-3.8</b>	<b>-2.4</b>

England N=14,165, Northern Ireland N=810, Wales N=1,254, Total N=16,337 (includes Other)  
 WHSCT & CT has been removed due to insufficient NACR data

# Analysis of CR contribution to HADS depression levels (continued)

FIGURE 9 a-c: CHANGE IN DEPRESSION POST-CR BY PROGRAMME (% NORMAL)

Fig 9a.  
ENGLAND

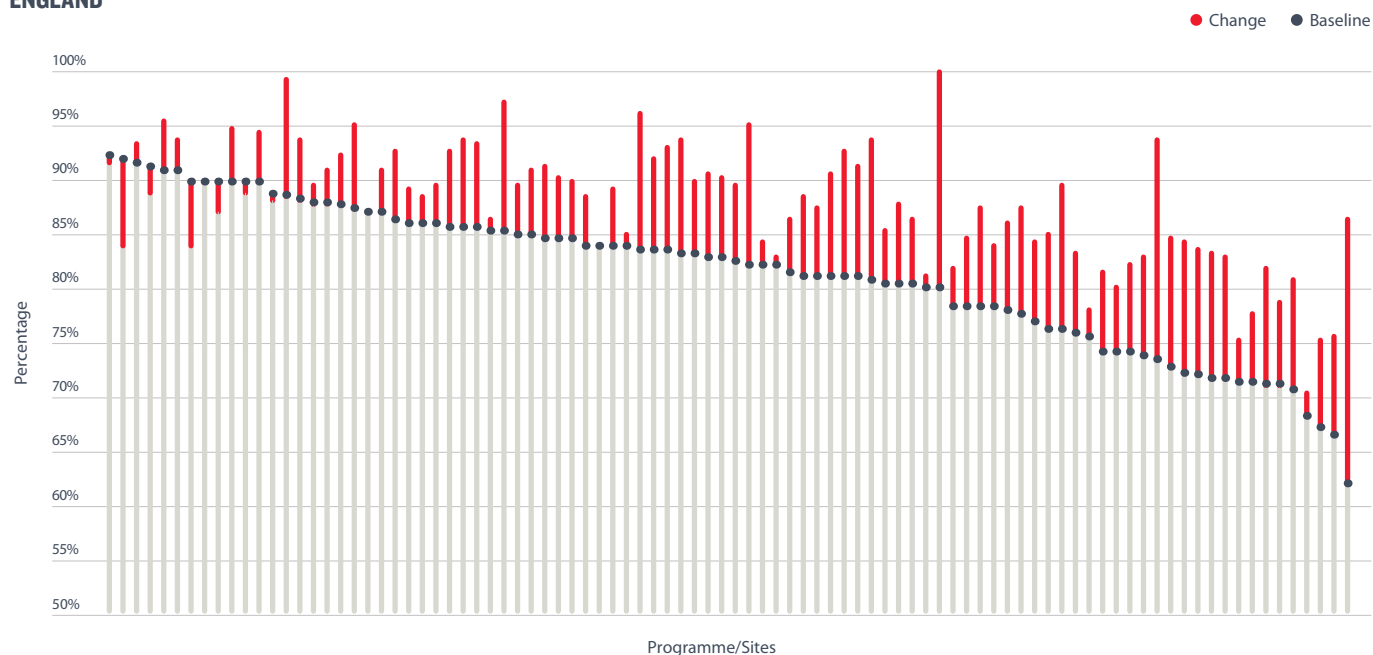


Fig 9b.  
NORTHERN IRELAND

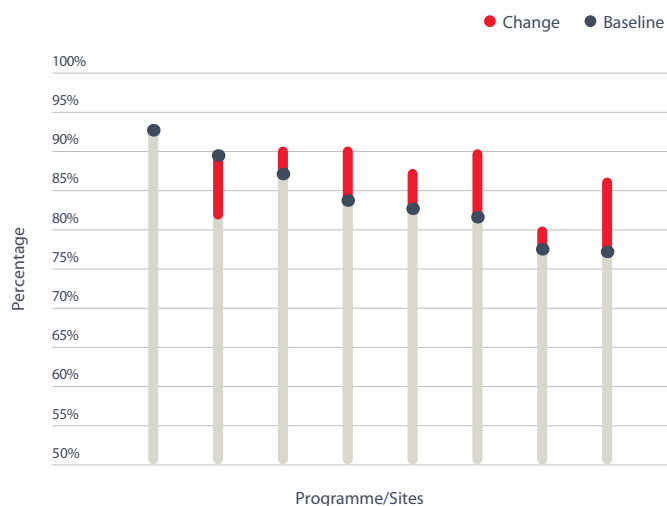
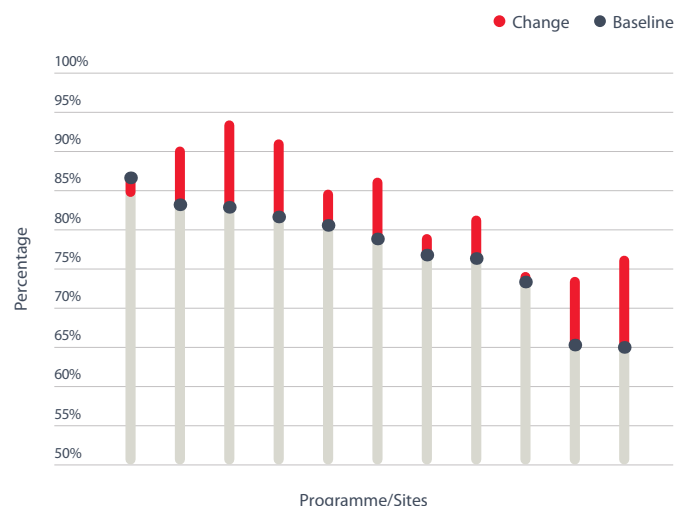


Fig 9c.  
WALES



# Analysis of CR contribution to additional cardiovascular risk factors and physical fitness

The following outcome variables have yet to achieve sufficient sample size to allow analysis by region or at programme level. However, combining all three nations provides sufficient data to report nationally.

Table 25 shows that, after CR, there is a 27 percentage point improvement in meeting the total cholesterol target (<4.0), and a 25 percentage point change meeting the LDL target (<2.0). Smaller positive changes were also seen for waist circumference (three percentage points), blood pressure (two percentage points) and alcohol consumption (one percentage point).

**TABLE 25:**  
**CHANGE IN RISK FACTOR OUTCOMES**

		PRE %	POST %	POINT CHANGE %
Cholesterol (Total) N=3,391	<4.0	34	61	27
Cholesterol (LDL) N=3,391	<2.0	31	56	25
Blood Pressure N=19,815	Systolic <140 and Diastolic <90	69	71	2
Waist N=9,534	<102 cm Male <88cm Female	57	60	3
Alcohol N=13,897	<14 units of alcohol per week	84	85	1

The Incremental Shuttle Walk Test, which is a valid field test of fitness in CR patients, was recorded for 4,363 patients as the primary measure of fitness as part of this report. Following CR, 60% of patients achieved the minimum clinical difference of >70m (Table 26). An even stronger benefit was seen in the Six Minute Walk Test of walking endurance (aimed at patients with HF) which showed that 75% of patients achieved a minimum clinical difference of >25m (Table 26). Uncertainty remains about the extent of minimum clinical difference for different patient populations. NACR will aim to clarify elements of this in future publications.

Despite BACPR recommendations for the assessment of fitness to classify patients risk and inform the exercise prescription prior to CR, less than a third of patients are receiving a functional capacity measurement at baseline. This is a requirement of the BACPR minimum standards (BACPR 2017) as it aids risk stratification and enables the intervention to be tailored to patient need.

**TABLE 26:**  
**MEASURES OF WALKING FITNESS AND LEVEL OF ACHIEVEMENT AGAINST CLINICALLY MEANINGFUL DIFFERENCES**

		NO %	YES %
Incremental Shuttle Walk Test N=4,363	Clinical difference of >70m	40	60
	(Houchen-Wollof 2015)		
Six Minute Walk Test N=2,333	Clinical difference of >25m	25	75
	(Gremeaux 2011)		

**PART FIVE: EVALUATION OF PATIENT OUTCOMES FOLLOWING CR  
BY COUNTRY, HEALTH REGION AND LOCAL PROGRAMME**

# Analysis of CR contribution to normal health-related Quality of Life

There was a 2.7, 2.8 and 2.1 percentage point improvement of QoL post-CR in England, Northern Ireland and Wales measured by each patient's positive response to the question (Table 27b). There continues to be large improvements in other questions such as a total 32.4 percentage point increase in physical fitness and a 5.3 percentage point increase in self-perceived pain (Table 27a-b). Variation in the amount of QoL change following CR is considerable across Health Regions.

**TABLE 27a:**  
**PERCENTAGE OF PATIENTS WITH NORMAL HEALTH RELATED QOL (DARTMOUTH COOP) SCORE PRE- AND POST-CR**

COUNTRY	HEALTH REGION	PHYSICAL FITNESS		FEELINGS		DAILY ACTIVITIES		SOCIAL ACTIVITIES	
		PRE%	POST%	PRE%	POST%	PRE%	POST%	PRE%	POST%
England	C & M	40.9	75.6	85.1	90.5	85.7	95.2	83.5	93.9
	EM	44.7	62.6	86.3	89.3	86.0	89.8	86.3	90.4
	E o E	45.6	80.0	86.2	90.4	87.5	96.3	85.9	95.6
	GM, L & SC	41.3	74.5	85.6	89.6	84.6	96.6	80.2	93.8
	L	44.5	76.7	83.7	88.4	84.9	95.3	82.9	93.8
	SEC	42.3	80.5	84.7	91.1	82.7	96.1	81.0	95.3
	SW	53.3	80.7	85.7	94.8	87.3	97.7	90.0	96.8
	TV	55.3	84.5	86.9	89.8	88.4	96.7	84.9	96.5
	W	51.2	81.8	89.0	91.8	88.7	96.9	89.1	97.3
	WM	27.9	75.5	89.6	92.0	80.1	96.3	79.8	95.2
	Y & TH	26.8	62.2	84.4	89.8	82.3	93.0	82.3	93.7
<b>Total</b>		<b>43.1</b>	<b>75.9</b>	<b>85.6</b>	<b>90.3</b>	<b>85.2</b>	<b>95.4</b>	<b>83.7</b>	<b>94.6</b>
Northern Ireland	BHSCT	39.4	73.9	81.1	89.4	88.3	94.3	84.8	94.3
	NHSCT	29.3	69.0	91.4	94.8	89.7	96.6	89.7	94.8
	SEHSCT	47.8	82.9	87.8	95.1	90.2	98.5	87.3	97.1
	SHSCT	20.0	58.8	85.0	91.3	82.5	97.5	81.3	96.3
<b>Total</b>		<b>38.7</b>	<b>74.5</b>	<b>84.9</b>	<b>92.1</b>	<b>88.3</b>	<b>96.4</b>	<b>85.7</b>	<b>95.6</b>
Wales	ABM	38.7	71.0	83.3	90.5	84.4	95.5	79.7	95.0
	AB	46.9	72.7	82.2	88.7	85.8	94.2	85.5	91.6
	BC	38.1	77.1	82.9	87.6	78.1	94.3	80.0	94.3
	C & V	44.1	71.3	83.8	91.9	88.3	94.3	88.3	96.0
	CT	27.8	50.0	83.3	88.9	72.2	100.0	66.7	77.8
	HD	38.9	57.4	86.8	88.9	78.9	87.4	81.1	87.9
<b>Total</b>		<b>41.5</b>	<b>69.5</b>	<b>83.7</b>	<b>89.9</b>	<b>83.9</b>	<b>93.6</b>	<b>82.8</b>	<b>93.0</b>
Other	Other	66.3	96.5	81.4	93.0	89.5	100.0	91.9	98.8
<b>TOTAL</b>		<b>43.0</b>	<b>75.4</b>	<b>85.4</b>	<b>90.3</b>	<b>85.3</b>	<b>95.3</b>	<b>83.8</b>	<b>94.5</b>

England N=11,918, Northern Ireland N=608, Wales N=1,194, Total N=13,806 (includes Other)  
WHSCT has been removed due to insufficient NACR data

**TABLE 27b:**  
**PERCENTAGE OF PATIENTS WITH NORMAL HEALTH RELATED QOL (DARTMOUTH COOP) SCORE PRE- AND POST-CR**

COUNTRY	HEALTH REGION	PAIN		OVERALL HEALTH		SOCIAL SUPPORT		QUALITY OF LIFE	
		PRE%	POST%	PRE%	POST%	PRE%	POST%	PRE%	POST%
England	C & M	76.2	80.6	60.3	78.8	89.0	85.4	95.0	98.0
	EM	79.4	81.3	64.6	71.3	87.7	85.4	96.4	97.0
	E o E	82.2	85.0	69.5	81.4	89.3	85.0	96.2	97.3
	GM, L & SC	75.5	81.6	60.7	77.8	86.4	84.3	94.6	97.8
	L	76.0	82.5	62.4	77.8	84.6	82.7	94.2	97.2
	SEC	77.7	85.0	65.2	80.3	89.3	85.3	94.3	98.0
	SW	76.6	87.3	66.0	83.7	85.5	83.0	92.5	98.6
	TV	82.2	85.5	66.3	82.9	86.7	86.7	96.5	99.2
	W	79.5	84.8	69.5	81.9	89.7	85.8	96.8	98.1
	WM	81.1	86.2	61.2	82.7	89.1	87.8	95.2	97.9
	Y & TH	73.9	77.2	59.7	72.9	91.5	88.3	93.6	97.3
<b>Total</b>		<b>77.7</b>	<b>83.0</b>	<b>64.1</b>	<b>78.7</b>	<b>87.9</b>	<b>85.0</b>	<b>95.0</b>	<b>97.7</b>
Northern Ireland	BHSCT	75.8	81.4	67.4	83.3	88.6	84.8	93.6	96.6
	NHSCT	89.7	86.2	67.2	86.2	89.7	89.7	96.6	100.0
	SEHSCT	86.8	91.7	68.3	85.4	84.9	83.9	97.1	99.5
	SHSCT	80.0	88.8	58.8	86.3	95.0	85.0	95.0	97.5
<b>Total</b>		<b>81.3</b>	<b>86.2</b>	<b>66.4</b>	<b>84.7</b>	<b>88.3</b>	<b>84.9</b>	<b>95.2</b>	<b>98.0</b>
Wales	ABM	73.8	81.1	63.5	79.7	86.4	83.6	95.8	96.9
	AB	72.7	78.5	64.4	78.2	87.3	86.9	93.8	96.0
	BC	81.0	79.0	67.6	81.9	89.5	81.0	92.4	97.1
	C & V	75.7	83.8	70.9	79.8	85.8	86.2	97.6	98.4
	CT	72.2	77.8	55.6	83.3	88.9	83.3	94.4	100.0
	HD	70.0	70.5	57.9	67.4	81.6	85.3	92.1	95.8
<b>Total</b>		<b>74.0</b>	<b>79.1</b>	<b>64.6</b>	<b>77.6</b>	<b>86.0</b>	<b>84.9</b>	<b>94.8</b>	<b>96.9</b>
Other	Other	74.4	84.9	84.9	93.0	94.2	95.3	96.5	98.8
<b>TOTAL</b>		<b>77.5</b>	<b>82.8</b>	<b>64.3</b>	<b>79.0</b>	<b>87.8</b>	<b>85.1</b>	<b>95.0</b>	<b>97.7</b>

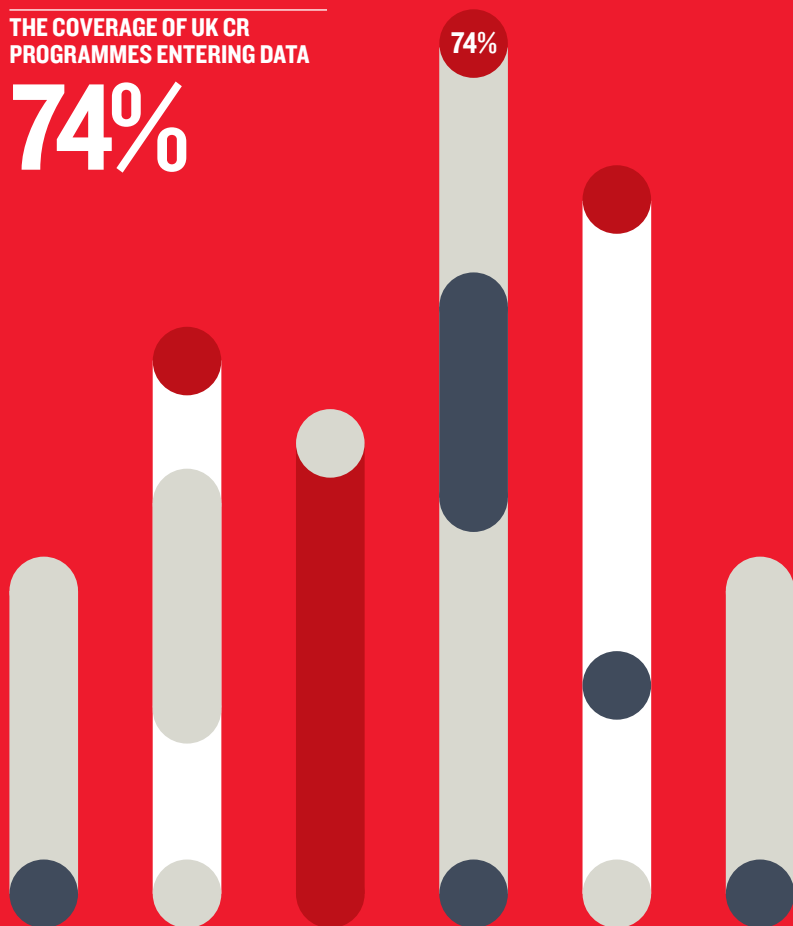
England N=11,918, Northern Ireland N=608, Wales N=1,194, Total N=13,806 (includes Other)  
 WHSCT has been removed due to insufficient NACR data



# PART SIX: RECOMMENDATIONS AND ACTIONS

THE COVERAGE OF UK CR  
PROGRAMMES ENTERING DATA

74%



COVERAGE OF REPORTING IN THIS YEAR'S REPORT

Countries

3

Health Regions

24

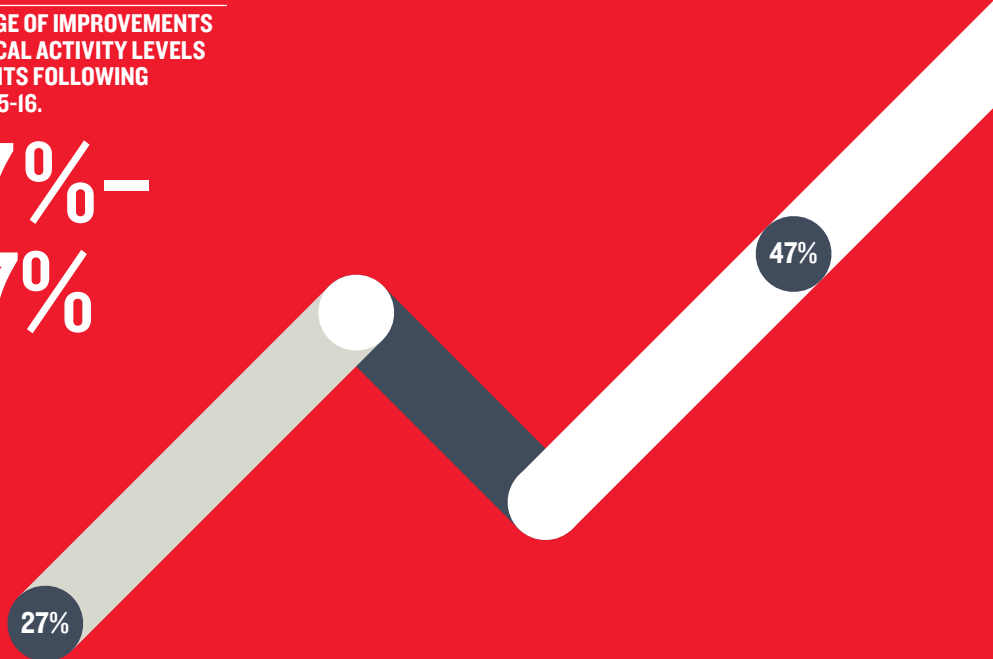
CR Programmes

224



THE RANGE OF IMPROVEMENTS IN PHYSICAL ACTIVITY LEVELS IN PATIENTS FOLLOWING CR IN 2015-16.

27%–  
47%



**PART SIX: RECOMMENDATIONS AND ACTIONS**

The NACR 2017 annual report builds on last year's by evaluating CR delivery and performance against national and nation-specific averages in service delivery for England, Northern Ireland and Wales. The report highlights some significant improvements; however, there is unacceptable variation in the quality of delivery and outcomes, which results in a mean national change in patient outcomes ranging from 1% to 31%.

Our analysis reveals that some CR services are improving against service level standards with positive patient outcomes, based on national average change, and evident across physical, risk factor and psychosocial measures. Based on the recommendations set in last year's report we have seen an increase in females attending CR, HF patient numbers increasing and shortening of wait times. However, a large proportion of eligible HF and female patients are still failing to attend CR, and the menu of CR options is still primarily group-based, not being delivered for long enough and patients are not receiving a post-CR assessment.

## KEY RECOMMENDATIONS:

1. Programmes should aim to recruit a greater proportion of eligible female patients.
2. A much bigger proportion of eligible HF patients should be referred to CR and supported to take up the offer.
3. A greater range of modes of delivery, beyond just centre-based, should be offered to patients.
4. Assessment of patients who complete CR should be at 100%.
5. The duration of CR should meet the minimum requirement of eight weeks.
6. Programmes should seek to have their service accredited as part of the National Certification Programme for CR.

## ACTIONS:

1. Greater positive action is required to recruit more female patients which is likely to require significant changes to the type and location of CR offered.
2. Referral of patients with HF should increase in line with clinical recommendations.
3. Programmes need to offer and strongly promote a wider portfolio of CR delivery options.
4. Assessment of patients as they complete their programme should be a major priority.
5. Services operating below minimum standards should strive to increase the duration and frequency of rehab sessions.
6. All programmes should contact the NACR team to assess their extent of readiness for a possible submission to the National Certification Programme for CR. This service is free to NACR users.

**PART SIX: RECOMMENDATIONS AND ACTIONS**

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