



The National Audit of Cardiac Rehabilitation

Quality and Outcomes Report 2019



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Strategic mission

The National Audit of Cardiac Rehabilitation (NACR) is a British Heart Foundation (BHF) strategic project supporting cardiovascular prevention and rehabilitation services to achieve the best possible outcomes for people with heart and circulatory diseases irrespective of where they live.

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Executive summary

Cardiac rehabilitation (CR) quality has increased across the UK this year. Sixty-six programmes have now achieved Green status, an increase of 20 programmes compared with last year.

Green status means programmes are meeting all seven key performance indicators (KPIs) required for certification by the National Certification Programme for CR (NCP_CR). A further 79 programmes are classed as Amber status (meeting 4-6 KPIs) and 61 are classed as Red status (meeting 1-3 KPIs). The improvement in quality is UK wide, with 25.7%, 53.8% and 47% of programmes meeting full certification across England, Northern Ireland and Wales, respectively. A total of 22 programmes across the three nations failed to meet any NCP_CR KPIs.

On average, across the three nations 50% of eligible patients are taking up the offer of CR, which is the same proportion as last year. However, there has also been an overall increase in the number of patients who are eligible for CR, which means the absolute number of patients receiving CR is higher than in previous years. Compared to the 2014 report (2012/13 data), where 77,590 patients were seen by CR teams, there were 11,983 extra patients taking up the service in 2017/18 (total 89,573).

Across all three nations there is a worrying trend of lower uptake among patients who have had a Myocardial Infarction (MI) and are medically managed, even though there is an increasing number of eligible patients being treated via this clinical pathway. We will investigate trends and report further next year.

We also continue to see considerable variation in the proportion of female CR attendance between nations, ranging from 15% to 38%.

Group-based supervised CR is still the most common mode of CR delivery, with 75.4% of patients receiving this compared with 8.8% taking up home-based CR, with an associated comorbidity of 53.7% and 51.3% respectively. However, the low uptake of CR for people with Heart Failure (HF) continues to be a major challenge and requires innovation to develop alternatives to group-based interventions.

Pre- and post-assessment of patients taking part in CR shows that it leads to generally positive outcomes as measured by changes in physical, psychosocial and cardiovascular disease (CVD) risk factors. Unique to this report is an analysis of comorbidity and outcome, concluding that patient comorbidity at the start of CR is influential both on likelihood of completing CR and on the extent to which patients benefit.

Executive Summary

Key recommendations from the 2019 Quality and Outcomes report

1. Optimise recruitment of post-MI patients to CR.
2. Ensure patient comorbidity is taken into account as part of CR recruitment, assessment and tailoring of interventions.
3. Offer greater innovation in recruiting and managing patients with HF.
4. Recruit more female patients across all condition/treatment groups.
5. Pursue quality CR delivery evidenced by achieving 'certified' programme status.

Through the collective efforts of NACR, the British Association for Cardiovascular Prevention and Rehabilitation (BACPR) and the BHF, aligned with the desire and willingness of 230 clinical teams to improve services, UK CR quality has improved by over 30% since 2014. This is a world-leading achievement that all stakeholders, including patients, should be proud of, as it demonstrates that the NHS continues to lead the way in CR delivery.



Professor Patrick Doherty,
Director, National Audit of Cardiac Rehabilitation



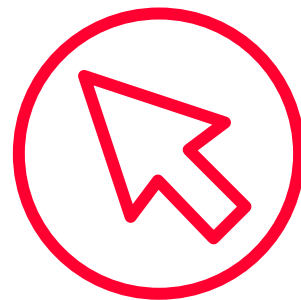
Professor Susan Dawkes,
President, British Association for Cardiovascular Prevention and Rehabilitation



Jacob West,
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Part one

Introduction and methods



82% of programmes
are registered for
electronic NACR
data

Introduction and methods

Introduction

CR is an evidence-based intervention, delivered by a multidisciplinary team (MDT), that is proven to be clinically and cost effective for improving physical and health-related quality of life outcomes after a cardiac event (Shields et al 2018, Rauch et al 2016, Anderson et al 2016, Taylor et al 2014).

The National Institute for Health and Care Excellence (NICE) Clinical Guidance (CG172, CG94 and NG106) and leading British and European cardiovascular professional associations including the BACPR and the Scottish Intercollegiate Guidelines Network (SIGN) recommend that CR should be offered to all eligible patients in a timely and appropriate manner (BACPR 2017, Piepoli et al 2012, SIGN 2017). CR can take the form of group-, home- or web-based sessions and it is recommended that a CR intervention lasts for a minimum duration of eight weeks (BACPR 2017).

A clinical review of CR published in the British Medical Journal (Dalal et al 2015) and several trials, reviews and editorials (West et al 2011, Anderson et al 2016, Wood 2012, Doherty & Lewin 2012) agree that CR is highly effective but warn that not all programmes are achieving the minimum standards set by the BACPR.

NACR is a clinical registry embedded within routine practice through NHS Digital. Registration with and submission of data into NACR is one of the core components of the BACPR (BACPR 2017). The BHF and NACR, working in collaboration with the BACPR, local health authorities and providers in England, Northern Ireland, Scotland and Wales, are committed to quality improvement so that all patients receive the highest standard of CR and gain the expected benefits no matter where they live.

In modern CR there is no longer a 'typical journey for patients' after MI, Percutaneous Coronary Intervention (PCI), Coronary Artery Bypass Graft (CABG), or following a diagnosis of HF. Fortunately, NACR data is entered by local hospital- and community-based clinical teams allowing them to capture and input data on the patient's specific journey. Programmes are able to generate their own local reports about patient progress. Through this process, NACR – working with the BACPR – monitors CR quality and outcomes and supports the improvement of CR services across the UK via the NCP_CR.

For more information visit:

www.cardiacrehabilitation.org.uk/NCP-CR.htm

www.bacpr.com/pages/page_box_contents.asp?PageID=911

Part one: Introduction and methods

Methods for collecting data for NACR Quality and Outcomes Report 2019

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 Health Regions in England, Northern Ireland and Wales we have aligned data collection with KPIs such as timing and duration of CR, and across regional health boundaries. The NACR 2019 report uses data from 2017/18 and reports CR uptake for patients following MI, MI + PCI, PCI and CABG across England, Northern Ireland and Wales. We continue to move forward with the inclusion of Scotland in NACR, which will allow us not only to capture the good work that is happening, but also help evaluate its new integrated approach to CR.

BACPR Standards and NCP_CR KPIs both require CR programmes to register with, and enter data through, NACR as an essential part of quality assurance in CR delivery and to drive service improvement (BACPR 2017, Furze et al 2016).

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 annual email survey. Where programmes did not provide data, the number of patients receiving CR was estimated using either the previous year's figures for that programme (if they confirmed that the service had not changed), or 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. To avoid double counting, patients with an MI and CABG in the same year were counted in the CABG group. As a result of national coding variations in reporting of HF patient numbers, the audit was unable to derive valid numerator and denominator values for individual nations within the UK for this diagnosis. Based on data from the national HF audit (NICOR 2019), around 15% of patients are referred to CR.

England

NHS Digital provided anonymised individual 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.

Part one: Introduction and methods

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 in England and Wales without explicit consent from individual patients. NACR is GDPR compliant and has a Privacy Notice available on the website:

www.cardiacrehabilitation.org.uk/patient-privacy-notice.htm

NACR and NHS Digital have Data Access Agreements (DAAs) with the five Health and Social Care Trusts in Northern Ireland. Information Sharing Agreements (ISAs) are in place for the Health Boards in Scotland that will be involved in the NACR pilot.

Gaining the consent of patients to use their data for national audit purposes is extremely difficult 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. Section 251 approval and the data agreements cover the roles of the BHF, NHS Digital and NACR and ensure the highest quality procedures for collecting, sharing and using only the agreed data about a patient's CR experience. NACR's approval and the purpose of the national audit are reviewed each year by CAG and DAAs/ISAs are reviewed regularly.

For more information about NACR please visit our web pages:

www.york.ac.uk/healthsciences/research/cardiac

www.cardiacrehabilitation.org.uk

Part two

Uptake to cardiac rehabilitation by country



50% of eligible
patients in the UK
attend CR

Part two: Uptake to cardiac rehabilitation by country

Number and type of patients starting CR by country

The number of patients recruited to UK CR programmes has increased again this year, with a total of 89,573 patients taking up CR (Table 1). This represents an increase of 11,983 patients taking up the service this year compared with a total of 77,590 in the 2014 NACR report.

The increase in numbers of people starting CR is in proportion to each country's population with 80,867 people starting CR in England, 3,216 in Northern Ireland and 5,230 in Wales.

A broader population of patients with CVD is also being recruited to CR (Table 1). This is especially the case in HF, where numbers have almost trebled from 2,346 in the 2014 NACR report to 6,502 this year. Given the development and rollout of the REACH-HF facilitated home-based CR approach and its inclusion as a new mode of rehabilitation delivery by NHS Digital, we hope to see HF numbers increase substantially in the next few years (Dalal et al 2019, Taylor et al 2019). Recent BHF-supported research using routine practice national data shows that home-based programmes achieve equivalent outcomes to centre-based programmes (Harrison and Doherty 2018b).

Table 1

Number and type of patients starting CR

	Number of patients			
	England	Northern Ireland	Wales	Other
MI	10,902	280	688	14
MI+PCI	24,763	1,195	1,788	82
MI+CABG	2,541	77	135	18
CABG	9,649	311	526	30
PCI	13,572	747	574	36
Arrhythmia/Cardiac Arrest	393	<10	36	<10
Angina	2,725	73	336	10
Valve Disease/Surgery	5,854	201	463	38
MI with HF	308	35	21	<10
HF or Cardiomyopathy	5,568	220	341	<10
CVD Device	1,833	27	126	12
Peripheral Arterial Disease (PAD)	234	<10	<10	-
High CVD Risk	357	16	39	-
Other CVD No Treatment	2,168	30	154	<10
Total	80,867	3,216	5,230	260

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

Part two: Uptake to cardiac rehabilitation by country

Uptake to CR services

The overall mean uptake to CR in the UK remains at 50% with uptake highest in patients treated with CABG, followed by MI+PCI, PCI and post-MI medical management (Table 2). Although more patients were seen in this year compared with the 2018 NACR report, there was a corresponding increase in the overall number of people presenting with CVD and related cardiac events/treatments. There were 135,861 eligible patients across the four main treatment groups, of whom 68,074 took up CR.

Across all three nations we see a worrying negative trend of lower uptake year-on-year in patients who are medically managed following MI. This trend persists even taking into account an increasing number of eligible patients being treated via this clinical pathway. Of increased importance is that analysis has shown that females make up a greater proportion of this medically managed group than those of the PCI and CABG treated patients.

Seven in 10 people in the UK will survive an MI, and it accounts for more than 100,000 hospital admissions each year. This is an excellent improvement in survival, but it also places an increasing burden on already stretched CR services. The NHS England Long Term Plan sets an ambitious target of 85% uptake to CR in the next ten years (NHS England 2019). Northern Ireland (NICSF 2009), Scotland (SIGN 2017) and Wales (All Wales Cardiac Rehabilitation Review 2010) all support CR for all eligible patients. Current trends indicate that without significant innovation and funding UK CR programmes will not only struggle to meet existing demands but will clearly fail to achieve the ambitious national targets. As a result, tens of thousands of patients will not have the support to make the most of their lives following treatment and the NHS will be unable to achieve optimal outcomes from expensive CVD interventions.

England

An extra 2,126 patients took up CR in England compared with last year. The proportion of patients starting CR remains at 50% because of the overall increase in eligible patients (Table 2). England follows the trend of other national figures with fewer patients from the post-MI group taking up CR (28% of those eligible) compared to 75% of eligible patients from the CABG population.

Northern Ireland

Uptake of CR has increased considerably in Northern Ireland from 39% to 49%. There was a positive but smaller increase seen in the CABG treatment group (6%) with the highest increase seen in MI+PCI and PCI patient groups, where uptake improved by 12% and 13%, respectively. Unfortunately, Northern Ireland lags behind other countries in terms of recruitment of post-MI patients, which stands at 19%.

Part two: Uptake to cardiac rehabilitation by country

Wales

Wales continues its positive trend in CR recruitment with an overall 2% increase in CR uptake, which now stands at 61% overall. Data for individual treatment groups reveals an impressive 100% recruitment rate for CABG, but only 28% of post-MI patients started CR, a drop of 2% on last year. Significant improvements in uptake occurred for patients after MI + PCI (5% increase) and PCI (6% increase).

Table 2

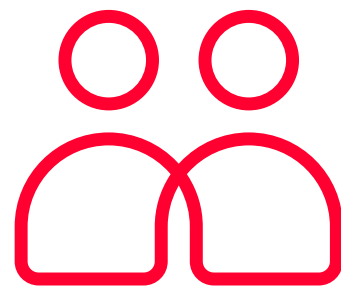
CR uptake split by country and main diagnosis/treatment group

Country		N	Receiving CR	Uptake %
UK	MI	42,982	12,234	28
	MI+PCI	46,346	27,746	60
	PCI	28,799	14,893	52
	CABG	17,734	13,239	75
Total		135,861	68,074	50
England	MI	38,775	11,210	29
	MI+PCI	42,888	24,763	58
	PCI	26,078	13,572	52
	CABG	16,662	12,190	73
Total		124,403	61,735	50
Northern Ireland	MI	1,632	315	19
	MI+PCI	1,553	1,195	77
	PCI	1,723	747	43
	CABG	449	388	86
Total		5,357	2,645	49
Wales	MI	2,575	709	28
	MI+PCI	1,905	1,788	94
	PCI	998	574	58
	CABG	623	623*	100
Total		6,101	3,694	61

*Figures adjusted to eligible in-year only where 100% is the maximum possible reportable value.

Part three

CR delivery at country, Health Region and local programme level



75% of patients
receive group-
based CR

Part three: CR delivery at country, Health Region and local programme level

NACR statistics by country, Health Region and local programme level

CR programme data by country and Health Region

This year 82% of programmes are registered for electronic NACR data enabling greater audit coverage and reporting of national trends. Fourteen of the 24 Health Regions achieved 100% registration of their programmes to NACR (Table 3). The average number of patients starting CR per programme in the UK was 389 ($89,573 \div 230$).

Part three: CR delivery at country, Health Region and local programme level

Table 3
CR programme data by country and Health Region

Country	Health Region	Total Programmes	Electronic NACR Registration	% Registered
England*	Cheshire and Merseyside (C&M)	11	11	100
	East Midlands (EM)	16	11	69
	East of England (EoE)	22	18	82
	Greater Manchester, Lancashire and South Cumbria (GM, L & SC)	19	15	79
	London (L)	33	26	79
	Northern England (NE)	12	4	33
	South East Coast (SEC)	16	14	88
	South West (SW)	17	16	94
	Thames Valley (TV)	4	4	100
	Wessex (W)	7	7	100
	West Midlands (WM)	19	17	89
	Yorkshire and The Humber (Y&TH)	21	16	76
Northern Ireland	Belfast Health and Social Care Trust (BHSCT)	1	1	100
	Northern Health and Social Care Trust (NHSCT)	4	4	100
	South Eastern Health and Social Care Trust (SEHSCT)	3	3	100
	Southern Health and Social Care Trust (SHSCT)	3	3	100
	Western Health and Social Care Trust (WHSCT)	2	2	100
Wales	Aneurin Bevan University Health Board (ABUHB)	4	4	100
	Betsi Cadwaladr University Health Board (BCUHB)	3	3	100
	Cardiff and Vale University Health Board (CVUHB)	1	1	100
	Cwm Taf Morgannwg University Health Board (CTMUHB)***	2	2	100
	Hywel Dda University Health Board (HDUHB)	3	3	100
	Powys Teaching Health Board (PTHB)**	2	1	50
	Swansea Bay University Health Board (SBUHB)***	2	2	100
Other	-	3	1	33
Total		230	189	82

* Nine programmes in England have been omitted as they provided Early CR data and from this point this audit only refers to Core Delivery. Four of these programmes are registered with, and enter data through, NACR.

** PTHB (Powys Teaching Health Board) has been removed from subsequent tables due to insufficient NACR data.

*** Health boards changed in April 2019

Part three: CR delivery at country, Health Region and local programme level

The number of programmes that submitted data via NACR and were subsequently included in the NCP_CR is shown below (Table 4). This will differ from numbers elsewhere in the report because of the criteria for NCP_CR.

Table 4

Total number of programmes, programmes included in NCP_CR, programmes registered via NACR by country

Number of programmes surveyed	
Total number of programmes	239
Total number of core programmes*	230
Number of programmes included in NCP_CR**	
(Core programmes surveyed)	
England***	198
Northern Ireland	13
Wales	17
Total	228
Number of programmes registered via NACR	
England***	160
Northern Ireland	13
Wales	16
Total	189

* Nine of the total programmes were Early CR only.

** Two programmes (Jersey and Guernsey) were removed due to data entry issues beyond their control.

*** England includes Isle of Man.

Part three: CR delivery at country, Health Region and local programme level

Age and gender profile at country and programme level

There is considerable variation in the proportion of female CR attendance between programmes in each country, ranging from 15% to 38% in England, with less variability in Northern Ireland and Wales (Figure 1a-c). Overall, the average proportion of female patients attending CR in England dropped by 1% compared with last year but remained the same for Northern Ireland and Wales (Figure 1a-c). Given repeated calls for CR programmes to recruit more women these national figures remain worrying. Some local programmes have achieved higher recruitment of women compared to national averages and these provide an opportunity for the BHF, BACPR and NACR to learn from and share good practice.

More than 30% of patients registered with NACR are over 75 years of age. This is markedly different to randomised controlled trials of CR in CHD where virtually no patients older than 71 years are recruited and the average age is 56 years (Anderson et al 2016). UK CR programmes should be commended for successfully recruiting patients with a mean age of 67 years (range from 18 to 105), which is more representative of the diverse range of patients with CHD who are eligible and likely to benefit from CR.

Part three: CR delivery at country, Health Region and local programme level

Figure 1a/b/c: Proportion of male and female patients by age and country/programme

Fig. 1a England

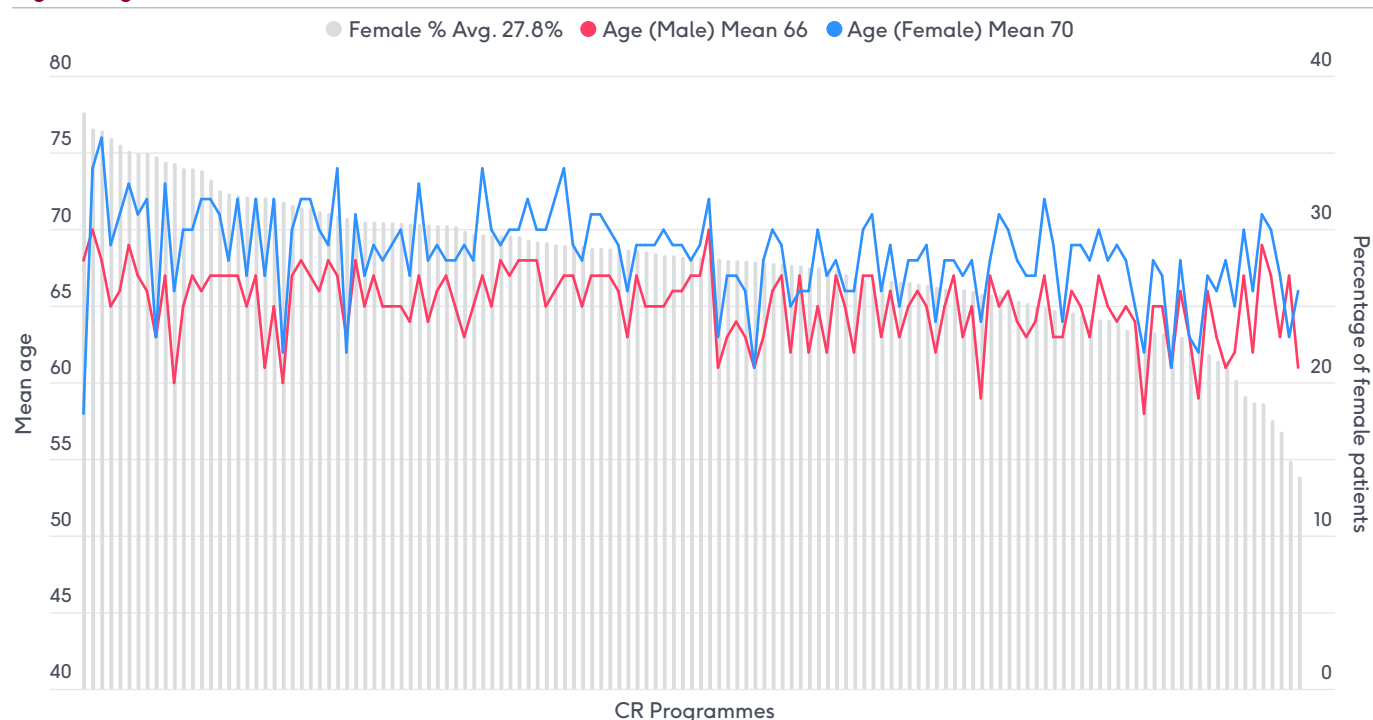


Fig. 1b Northern Ireland

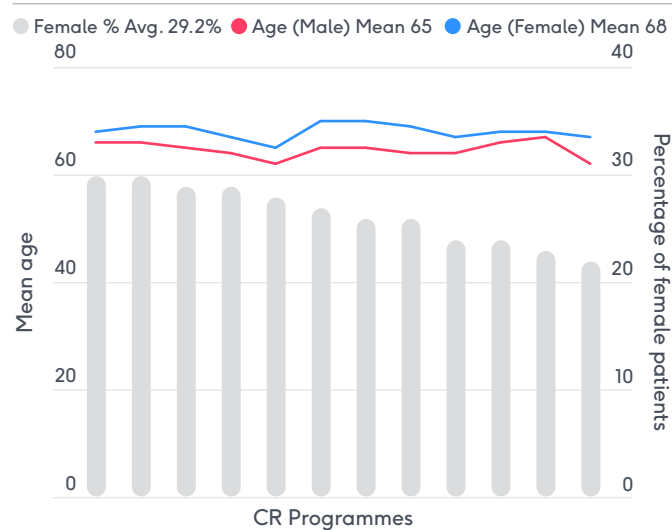
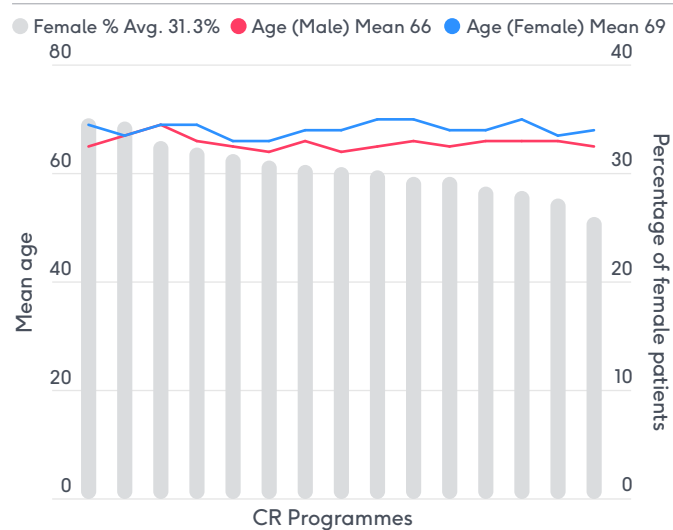


Fig. 1c Wales



Part three: CR delivery at country, Health Region and local programme level

Ethnicity and gender by comorbidity

The ethnicity of patients attending CR remains predominantly White-British (79%), of whom 70.6% are male. Yet, the burden of comorbidity in this group (Table 5) is relatively low at 50.4% compared with patients of Irish (60.8%), White and Black African (61.5%) or Caribbean (58.3%) ethnicity. NACR has produced an online supplement showing local level variation in CR by ethnicity available from:

www.cardiacrehabilitation.org.uk/current-annual-report.htm

Table 5

Ethnic groups by gender and comorbidities

Ethnicity		%	Male %	Female %	% w/ two or more comorbidities
White	British	79.0	70.6	29.4	50.4
	Irish	1.7	69.0	31.0	60.8
	Any other White background	3.1	70.6	29.4	36.8
Mixed/Multiple ethnic groups	White and Black Caribbean	0.1	66.1	33.9	35.2
	White and Black African	0.1	57.7	42.3	61.5
	White and Asian	0.1	74.1	25.9	45.7
	Any other mixed background	0.5	71.6	28.4	25.7
Asian/Asian British	Chinese	0.1	77.0	23.0	37.7
	Indian	2.5	75.5	24.5	51.5
	Pakistani	2.1	75.2	24.8	45.7
	Bangladeshi	0.6	83.1	16.9	57.1
	Any other Asian background	1.2	80.9	19.1	52.8
Black/African/Caribbean/Black British	Caribbean	0.6	58.9	41.1	58.3
	African	0.3	67.8	32.2	49.1
	Any other Black background	0.2	65.1	34.9	46.6
Other	Any other ethnic group	0.9	76.1	23.9	43.4
	Not stated	7.0	70.5	29.5	45.5

N=85,738

Part three: CR delivery at country, Health Region and local programme level

Reasons for not taking part in CR

The most common reasons for not taking part in early CR were related to the service (66% and 61%, respectively) (Table 6). At core CR, the reasons for not taking part were more likely to be personal to the individual patient for both men and women (56% and 58%, respectively). Previous research tells us that patient preference matters and is important in defining uptake and outcomes of CR (Dalal et al 2007). Analysis by comorbidity shows that there is a high proportion of patients with two or more comorbidities among those who do not take up CR (Table 6). Female patients with two or more comorbidities were most likely to cite 'Patient' level (52%) and 'Work/Social' level (54%) reasons for not taking part in core CR. A full list of Reasons for Not Taking Part is provided in Appendix 1. As recommended by the BACPR (BACPR 2017) and discussed at previous BACPR/NACR conference workshops, offering different modes of delivery is a natural step in better aligning services with patient needs and preferences.

Table 6

Reasons for not taking part in CR by age, gender and comorbidity

Gender	Reason for not taking part grouped	Reason %	Mean age	% w/ two or more comorbidities	Early		% w/ two or more comorbidities
					Reason %	Mean age	
Male	Patient	26.1	72	44.5	56.2	69	47.3
	Service	66.1	65	33.2	35.0	65	40.2
	Work/social	7.8	65	45.4	8.8	63	48.1
Female	Patient	30.6	77	45.7	58.4	74	52.0
	Service	61.4	70	38.1	34.1	70	43.3
	Work/social	8.0	70	48.8	7.5	70	54.2
Total	Patient	27.5	74	44.9	56.9	71	48.9
	Service	64.6	67	34.6	34.7	67	41.2
	Work/social	7.9	67	46.5	8.4	65	49.9

Early CR N=8,247 (male 5,671 + female 2,576), Core CR N=20,613 (male 13,855 + female 6,758)

Part three: CR delivery at country, Health Region and local programme level

Reasons for not completing CR

The proportion of patients completing CR is 77%, an increase of 1% compared with last year.

Analysis by comorbidity showed that a high proportion of patients who did not complete CR had two or more conditions (Table 7). Unfortunately, the most common reason given for not completing CR was 'unknown reason' (35.7%), which provides little insight into the factors underlying non-completion. High proportions of patients who cited 'Planned/Emergency Intervention' or being 'Too Ill' as reasons for not completing had two or more comorbidities (58.9% and 64%, respectively).

Future analyses of non-completion of CR will use a refined list of reasons determined by the emerging BACPR/NACR definition of completion.

Part three: CR delivery at country, Health Region and local programme level

Table 7
Reasons for not completing CR by age, gender and comorbidity

Gender	Reason for not completing	%	Mean age	% w/ two or more comorbidities
Male	DNA (unknown reason)	36.7	60	52.8
	Returned to work	9.7	55	47.3
	Left this area	1.0	63	50.0
	Planned/emergency intervention	2.4	64	58.6
	Too ill	12.5	69	62.6
	Died	1.5	73	43.8
	Other	29.4	67	55.4
	Hospital re-admission	1.8	69	56.9
	Unknown	4.8	61	54.0
Female	DNA (unknown reason)	33.1	61	58.9
	Returned to work	4.2	54	52.0
	Left this area	1.0	67	62.2
	Planned/emergency intervention	2.0	62	60.0
	Too ill	15.8	70	66.5
	Died	1.7	76	53.8
	Other	35.5	69	58.2
	Hospital re-admission	1.9	68	68.4
	Unknown	4.8	64	62.3
Total	DNA (unknown reason)	35.7	60	54.5
	Returned to work	8.1	55	47.9
	Left this area	1.0	64	53.8
	Planned/emergency intervention	2.2	64	58.9
	Too ill	13.4	69	64.0
	Died	1.6	74	46.8
	Other	31.2	68	56.3
	Hospital re-admission	1.9	69	60.4
	Unknown	4.8	62	56.6

N= 10,153 (male 7,157 and female 2,996)

Part three: CR delivery at country, Health Region and local programme level

Mode of delivery in UK CR

Evidence from clinical trials continues to show that CR can be delivered successfully through group- or home-based modes of delivery (Anderson et al 2017, Dalal et al 2019). Recent observational studies have shown facilitated self-managed programmes (home-based) to be comparable in terms of psychosocial outcomes, walking ability and CVD outcomes (Harrison and Doherty 2018a, Harrison et al 2018, Harrison and Doherty 2018b).

This year's report shows that across the three nations a majority of patients (75.4%) chose group-based supervised CR rather than home- or web-based (Table 8). The proportion of patients with comorbidity by mode of delivery was 53.7%, 51.3% and 45.5% for group-based, home-based and web-based, respectively. Multimodal rehabilitation was delivered in 85.6% of programmes, and on average 42.2% of patients had two or more modes of delivery recorded. Only ten programmes reported using web-based CR, and this was delivered to 1.5% of the total population seen by these programmes.

Low uptake of CR for people with HF remains an issue. However, alternatives to group-based CR such as the successful trials of the REACH-HF intervention (Taylor et al 2015, Dalal et al 2019), now offers a valid HF-specific home-based CR option for patients and service providers. The NHS Digital NACR data fields now include a new mode of 'rehabilitation delivery' data choice which includes REACH-HF. This will enable NACR to assess: (1) uptake and (2) quality of delivery and outcomes from REACH-HF.

Table 8

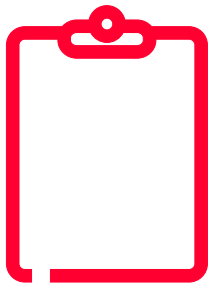
Mode of delivery split by age, gender and comorbidity

		All diagnosis/treatment groups		
		%	Mean age	% w/ two or more comorbidities
Male	Group-based	76.6	64	52.7
	Home-based	8.4	66	49.3
	Web-based	0.2	56	41.9
Female	Group-based	72.2	66	56.3
	Home-based	9.9	70	55.9
	Web-based	0.1	60	64.3
Total	Group-based	75.4	65	53.7
	Home-based	8.8	67	51.3
	Web-based	0.2	57	45.5

All diagnosis N=45,956 (male 33,726 + female 12,230), HF N=3,442 (male 2,369 + female 1,073).

Part four

Analysis of national clinical standards



75% of patients are
assessed at the
start of CR

Part four: Analysis of national clinical standards

Is CR delivered early enough to meet national guidance?

Research tells us that the longer patients wait to start CR the less they benefit compared with those who have timely CR (Marzolini et al 2015, Fell et al 2016, Sumner et al 2017). The NICE, SIGN and BACPR guidelines, and KPIs for the NCP_CR programme (Furze 2016), all recommend that CR is started early. In 2014, NACR reported average wait times of 54 days for patients treated with surgery (CABG) and 40 days for non-surgical patients. This means that no Health Regions met the national wait time targets of 42 and 28 days for CABG and non-surgical patients, respectively. By contrast, in 2019, median wait times across the UK were 35 and 24 days for surgical and non-surgical patients, respectively (Table 9). This means a reduction in waiting time of 19 days for patients who had CABG and of 16 days for non-surgical patients compared with 2014. Overall, the national wait times for CR have decreased by 18.5 days since 2014. This is significant progress considering that wait times decreased by only 2.5 days between 2011 and 2013.

Part four: Analysis of national clinical standards

Table 9

Time (days) from post-discharge referral to start of core CR

Country	Health Region	MI and/or PCI (24 Days)	CABG (35 Days)
England	C&M	29-	36+
	EM	26+	36+
	EoE	19+	35+
	GM, L & SC	29-	41-
	L	31-	39-
	SEC	28-	34+
	SW	40-	45-
	TV	37-	45-
	W	18+	29+
	WM	28-	36+
	Y&TH	11+	13+
Total		26	36
Northern Ireland	BHSCT	21-	39-
	NHSCT	10+	10+
	SEHSCT	33-	43-
	SHSCT	14+	13+
	WHSCT	7+	10+
Total		14	17
Wales	ABUHB	24-	26-
	BCUHB*	6+	6+
	CVUHB	21-	21-
	CTMUHB	13+	11+
	HDUHB	31-	18-
	SBUHB	33-	35-
Total		16	16
Other		50-	50-
Total		24	35

N= 42,754, - or + nation-specific referral time criteria: - = not met, + = met, * figures confirmed by clinical team lead.

NE has been removed due to insufficient NACR data

Part four: Analysis of national clinical standards

Figure 2a/b/c: Time from referral to start of CR by programme and country

Fig. 2a England

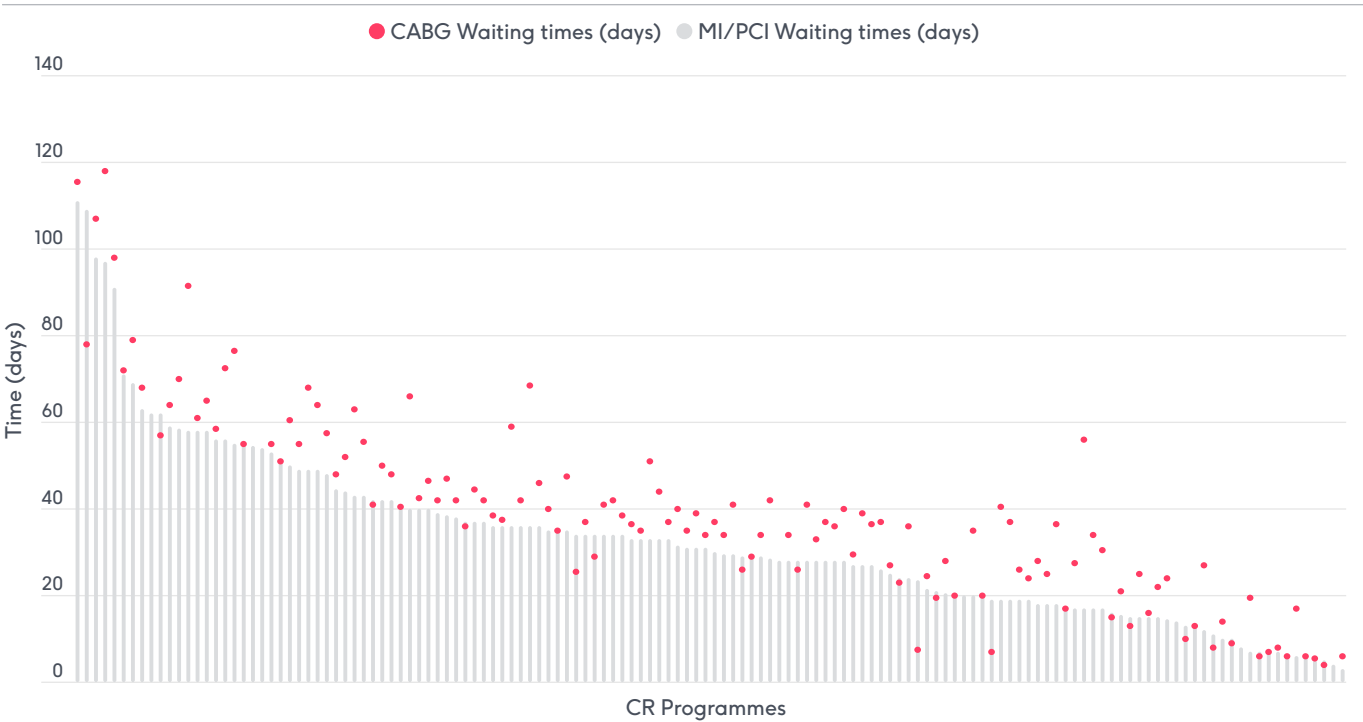


Fig. 2b Northern Ireland

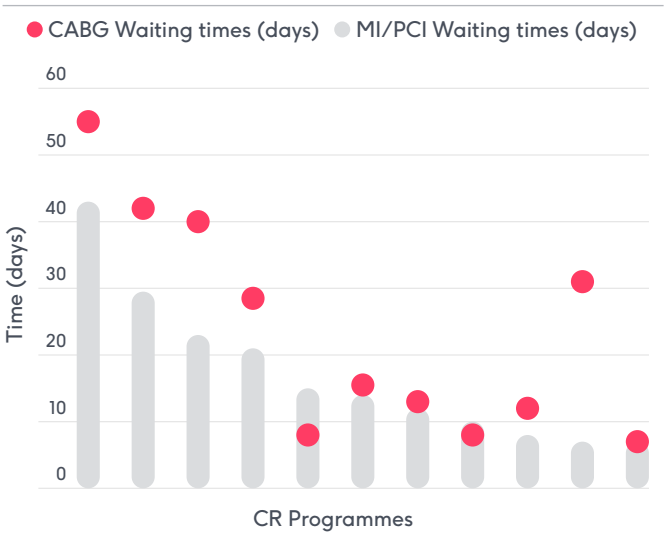
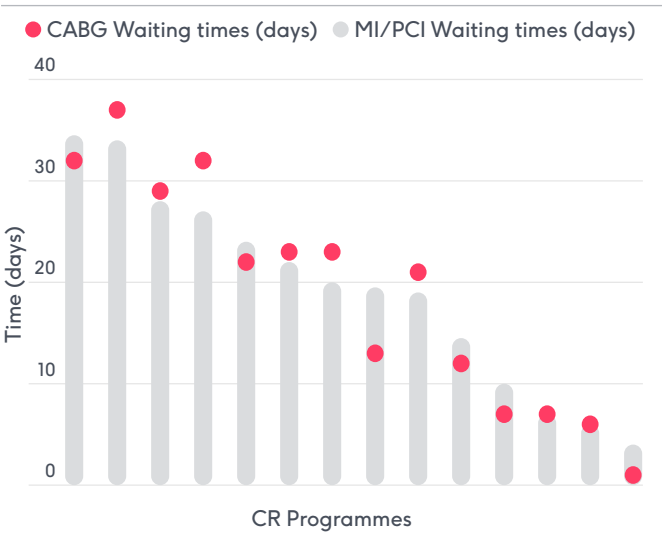


Fig. 2c Wales



Part four: Analysis of national clinical standards

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

All major CR guidelines recommend carrying out a comprehensive assessment with patients at the start and end of CR which is deemed as fundamental to achieving a tailored CR intervention (BACPR, NICE, SIGN). Between 2014 and 2019, the percentage of patients assessed at the start of CR increased by 38%, from 51% to 89%. An even greater increase was achieved in the number and percentage of patients assessed at the end of CR: from 24% in 2014 to nearly 69% in 2019, an increase of nearly 45%.

Country-level data also shows that variation in assessment practices has improved, with 94.4%, 89% and 86.7% people receiving a pre-CR assessment in Northern Ireland, England and Wales, respectively (Table 10). The proportion of patients receiving a post-CR assessment is lowest for Wales (58.6%) followed by Northern Ireland at 67.3% and England at 70%.

Part four: Analysis of national clinical standards

Table 10
Percentage starting CR with a record of pre- and post-assessment by Health Region

Country	Health Region	Ass1 %	Ass2 %
England	C&M	88.2	68.9
	EM	95.0	62.4
	EoE	93.2	70.2
	GM, L & SC	81.1	62.9
	L	95.1	70.9
	SEC	94.7	74.4
	SW	75.7	73.2
	TV	98.7	79.5
	W	79.7	64.7
	WM	88.3	66.1
	Y&TH	95.3	79.7
Total		89.0	70.0
Northern Ireland	BHSCT	99.2	78.1
	NHSCT	99.8	78.1
	SEHSCT	99.5	71.7
	SHSCT	74.3	34.2
	WHSCT	97.7	69.0
Total		94.4	67.3
Wales	ABUHB	98.0	68.7
	BCUHB	71.7	40.3
	CVUHB	97.5	78.4
	CTMUHB	96.0	60.6
	HDUHB	81.2	58.7
	SBUHB	98.3	81.9
Total		86.7	58.6
Other		100.0	96.7
Total		89.1	68.6

England N=41,854, Northern Ireland N=3,035, Wales N=4,362, Total N=49,922 (includes Other).

NE has been removed due to insufficient NACR data.

Part four: Analysis of national clinical standards

Is the duration of Core CR meeting national guidance?

In the 2014 NACR report the average programme duration was 56 days (eight weeks) as per BACPR standards. In this year's report a comparable analysis shows that CR duration has improved across all three nations with an overall average of 76 days (11 weeks), which represents an improvement of three weeks compared with 2014 data (Table 11). Wales and Northern Ireland lead the way with longer CR duration of 13 and 12.7 weeks, respectively, with England programmes reporting an average duration of 10.3 weeks. Variation across Health Regions ranged from eight to 16 weeks (Table 11).

The BHF and NACR teams working with the BACPR have, through improved audit quality, research data, education and training, supported CR programmes across England, Northern Ireland and Wales to achieve a substantial improvement in the duration of CR. We know that health behaviour change, facilitated through comprehensive CR, requires time to achieve the desired clinical and patient goals. This improvement in routine CR duration should be celebrated by clinical teams as it has led to a system-level change across the NHS allowing patients more time to be supported to achieve their goals.

Part four: Analysis of national clinical standards

Table 11
Total programme duration of CR in days and weeks (median)

Country	Health Region	Duration (days)	Duration (weeks)
England	C&M	75	10.7
	EM	63	9.0
	EoE	65	9.3
	GM, L & SC	70	10.0
	L	75	10.6
	SEC	70	10.0
	SW	60	8.6
	TV	76	10.9
	W	77	11.0
	WM	91	13.0
	Y&TH	92	13.1
Total		72	10.3
Northern Ireland	BHSCT	106	15.1
	NHSCT	81	11.6
	SEHSCT	96	13.7
	SHSCT	58	8.3
	WHSCT	63	9.0
Total		89	12.7
Wales	ABUHB	88	12.6
	BCUHB	113	16.1
	CVUHB	79	11.3
	CTMUHB	87	12.4
	HDUHB	110	15.7
	SBUHB	70	10.0
Total		91	13.0
Other		38	5.4
Total		76	10.9

N=40,627

NE has been removed due to insufficient NACR data.

Part four: Analysis of national clinical standards

Figure 3a/b/c: Duration of CR by programme

Fig. 3a England

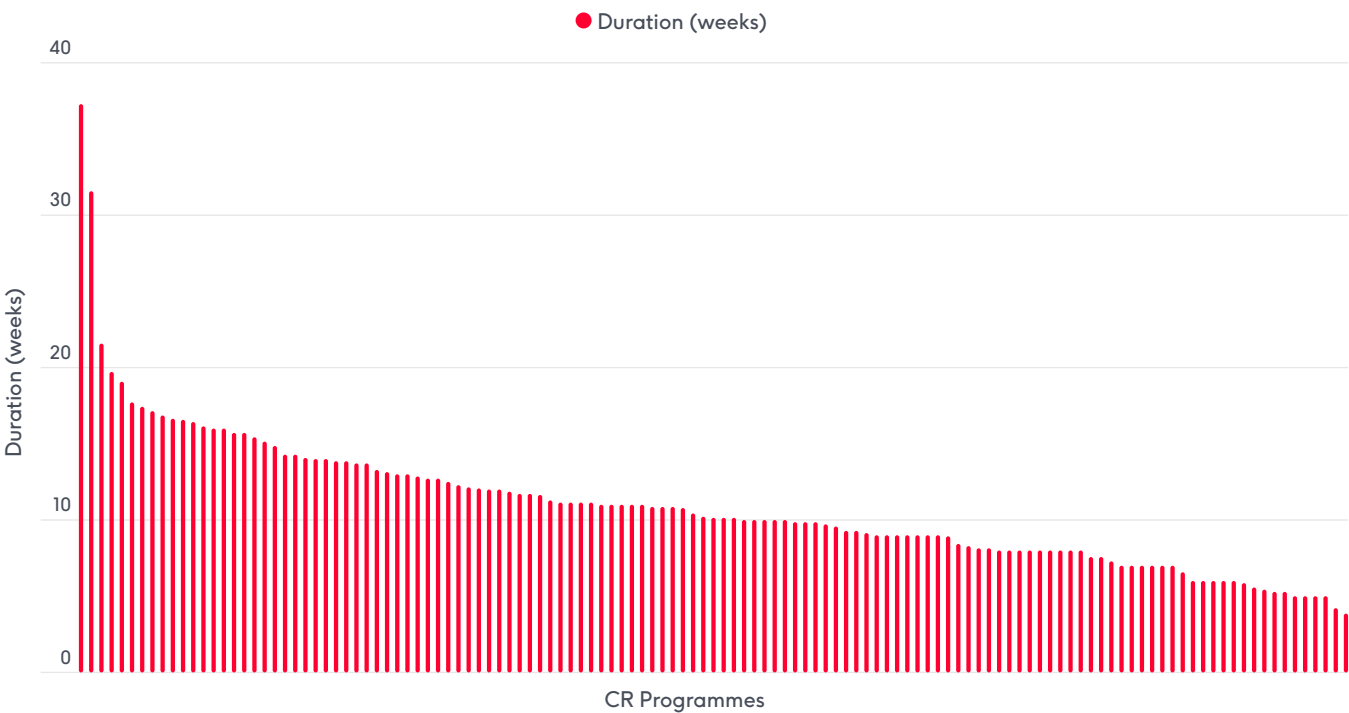


Fig. 3b Northern Ireland

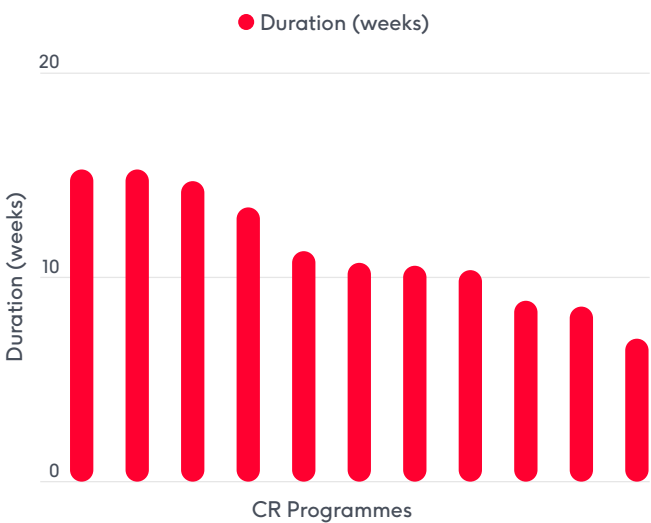
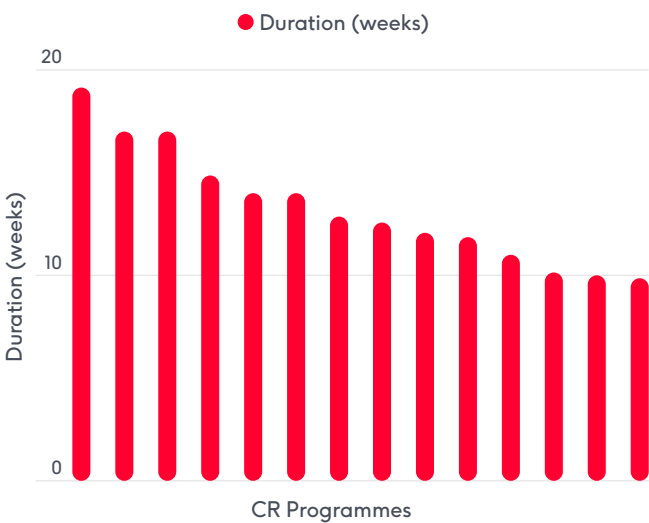


Fig. 3c Wales



Part four: Analysis of national clinical standards

Is CR delivered by a multidisciplinary team (MDT) as recommended by national guidance?

BACPR standards recommend that CR, which is increasingly offered to a multi-morbid patient population, is best delivered by an MDT of skilled and experienced healthcare professionals (BACPR 2017). In the UK, nurses represent the largest professional group involved in delivering CR (almost 97%) followed by physiotherapists at 64%, and an increasingly good spread across other health professionals (Table 12). Some variation in the make-up of MDTs exists between different countries (Table 12).

Staffing analysis is also part of the NCP_CR which is covered further in the next section. A more detailed breakdown of CR staffing by programme is available on the NACR webpage:

www.cardiacrehabilitation.org.uk/current-annual-report.htm

Table 12

National overall staffing profile for CR programmes

	England		Northern Ireland		Wales		UK total	
	N	%	N	%	N	%	N	%
Counsellor	16	8.3	0	0.0	4	23.5	20	9.0
Dietitian	89	46.1	7	58.3	10	58.8	107	48.0
Doctor	18	9.3	2	16.7	0	0.0	20	9.0
Exercise Specialist	108	56.0	3	25.0	10	58.8	121	54.3
Healthcare Assistant	27	14.0	4	33.3	2	11.8	33	14.8
Nurse	186	96.4	12	100.0	17	100.0	216	96.9
Occupational Therapist	40	20.7	4	33.3	10	58.8	55	24.7
Pharmacist	58	30.1	8	66.7	9	52.9	76	34.1
Physiotherapist	118	61.1	10	83.3	14	82.4	143	64.1
Physiotherapy Assistant	53	27.5	3	25.0	6	35.3	62	27.8
Psychologist	44	22.8	3	25.0	3	17.6	50	22.4
Secretarial/Clerical Administrator	131	67.9	5	41.7	13	76.5	149	66.8

Numbers differ from other tables as staffing data is derived from email survey carried out each year.

England N=193, Northern Ireland N=12, Wales N=17.

Part four: Analysis of national clinical standards

Monitoring national standards for CR

BACPR Standards and Core Components recommend that all CR programmes offer a tailored cardiovascular prevention and rehabilitation intervention to all eligible patients (BACPR 2017). To support programmes in delivering the best quality of care and to ensure patients gain the expected benefits the BACPR and NACR launched the NCP_CR in 2016 (Doherty et al 2016 and Furze et al 2016). The NCP_CR is a joint programme from the BACPR and NACR which uses KPIs to certify the quality of CR service delivery (Table 13). The NCP_CR is managed by a national Steering Group composed of the BACPR, NACR, clinical staff and patient representatives.

National guidance (BACPR 2017; NICE CG172; NG106; and SIGN 2017) recommends that CR programmes should be offered early after a cardiovascular event or treatment and are underpinned by a pre- and post-CR assessment. The minimum recommended duration and frequency of CR is eight weeks with two sessions per week (BACPR 2017, standard 4). Given the range of CVD risk factors and the multimorbid profile of patients attending CR, a further recommendation is that it is delivered by a team of multidisciplinary staff, with the skills and competencies to support patients in achieving desired health behaviour change (BACPR 2017).

Table 13

NCP_CR KPIs

Minimum standard 1: MDT	At least three health professions in the CR team who formally and regularly support the CR programme
Minimum standard 2: Patient group	Cardiovascular rehabilitation is offered to all these priority groups: MI, MI+PCI, PCI, CABG, HF
Minimum standard 3: Duration	Duration of Core CR programme: ≥ national median of 56 days (8 weeks)
Standard 4: National average for assessment 1	Percentage of patients with recorded assessment 1: England ≥80%; Northern Ireland ≥88%; Wales ≥68%
Standard 5: National average for CABG wait time	Time from post-discharge referral to start of Core CR programme for CABG national median of: England ≥46 days; Northern Ireland ≥52 days; Wales ≥42 days
Standard 6: National average for MI/PCI wait time	Time from post-discharge referral to start of Core CR programme for MI/PCI national median of: England ≤33 days; Northern Ireland ≤40 days; Wales ≤26 days
Standard 7: National average for assessment 2	Percentage of patients with recorded assessment 2 (end of CR): England ≥57%; Northern Ireland ≥61%; Wales ≥43%

Information on staffing profile and MDT, which forms one of the NCP_CR KPIs, is taken from the NACR annual email survey. This information is not collected on the electronic NACR database. In order for certification to be validated each CR team must return the NACR annual email survey form with staffing completed.

Part four: Analysis of national clinical standards

Measuring KPI metrics as part of NCP_CR

The NCP_CR is encouraged to see an improvement in the quality of CR against KPIs building on last year (Table 14). Certification of programmes is judged using four status categories (Table 15) where Green status represents full certification when all seven KPIs have been achieved.

Table 14

Number of programmes achieving CR KPIs as part of NCP_CR

NCP_CR KPIs	Standard	CR programmes meeting standards		
		England N=159	N. Ireland N=13	Wales N=16
Agreed minimum standards				
Multidisciplinary team	>=3 different staff types	138	11	15
Receiving all patient priority groups	Each group >0	130	12	15
Duration	>=56 (8 weeks)	115	11	15
Standards based on 2016 national averages				
Assessment 1	England 80%	113	10	14
	N. Ireland 88%			
	Wales 68%			
Referral to CR start (CABG)	England 46 days	94	11	12
	N. Ireland 52 days			
	Wales 42 days			
Referral to CR start (MI/PCI)	England 33 days	88	11	11
	N. Ireland 40 days			
	Wales 26 days			
Assessment 2	England 57%	103	7	14
	N. Ireland 61%			
	Wales 43%			

Table 15

NCP_CR classification scale

NCP_CR Status	KPIs
 Green (certified)	Meeting all seven KPIs
 Amber	Meeting four to six KPIs
 Red	Meeting one to three KPIs
 Fail	Meeting no KPIs

Part four: Analysis of national clinical standards

Analysis of quality of CR delivery by country

Across all CR programmes (N=228) in England, Northern Ireland and Wales, 66 programmes (Table 16) met all KPIs and received certification (Green status). This represents an increase of 20 programmes from last year. This year, 79 programmes were classified as Amber (meeting 4-6 KPIs), 61 programmes were classified as Red (meeting 1-3 KPIs) and 22 programmes failed to meet any NCP_CR KPIs (classified as fail). There is a positive national trend in the number of programmes shifting from fail/low to higher quality CR. This improvement is seen across England, Northern Ireland and Wales with 25.7%, 53.8% and 47% of programmes, respectively, achieving full certification (Green status). Since the first publication of CR KPIs in 2014 (Doherty et al 2016), there has been 31.7% increase in the quality of delivery compared to 2019 NCP_CR.

Table 16

NCP_CR certification status for all CR programmes across England, Northern Ireland and Wales

	England N=198	Northern Ireland N=13	Wales N=17	UK N=228
 Green (certified)	51	7	8	66
 Amber	69	4	6	79
 Red	59	1	1	61
 Fail	19	1	2	22

To support programmes in learning from each other and innovating CR service provision, the BHF Health Services Engagement Teams are working with NACR and the BACPR to support innovation and sharing of best practice. See:

www.bhf.org.uk/for-professionals/healthcare-professionals/innovation-in-care

The rating scale for the NCP_CR criteria (Tables 14 & 15) is used in the next part of this report to summarise the quality of CR service delivery at a national and Health Region level across the UK.

Quality of CR across Health Regions in England

Twelve of the 13 Health Regions have a certified CR programme (Green status) with one region (London: L) having ten certified programmes (Figure 4a) and 12 regions achieving Amber status (meeting 4-6 KPIs). Five of the 13 regions have no programmes failing certification.

Quality of CR across Health and Social Care Trusts in Northern Ireland

Certification is heading in a positive direction with two of the five Health and Social Care Trusts (BHSCT and NHSCT) having all programmes certified in their region (Green status).

Part four: Analysis of national clinical standards

Of the remaining trusts, two have some programmes achieving full certification and only one region has a failing programme (Figure 4b).

Quality of CR across Health Boards in Wales

Five of the seven Health Boards in Wales have certified programmes with two regions achieving certification of all CR programmes within their region (Figure 4c) and a further four regions showing encouraging signs with amber status. One Health Board (PTHB) with two CR programmes in their region failed to meet any KPIs.

Figure 4a/b/c: NCP_CR KPIs and Certification categories by country/Health Region

Fig. 4a England

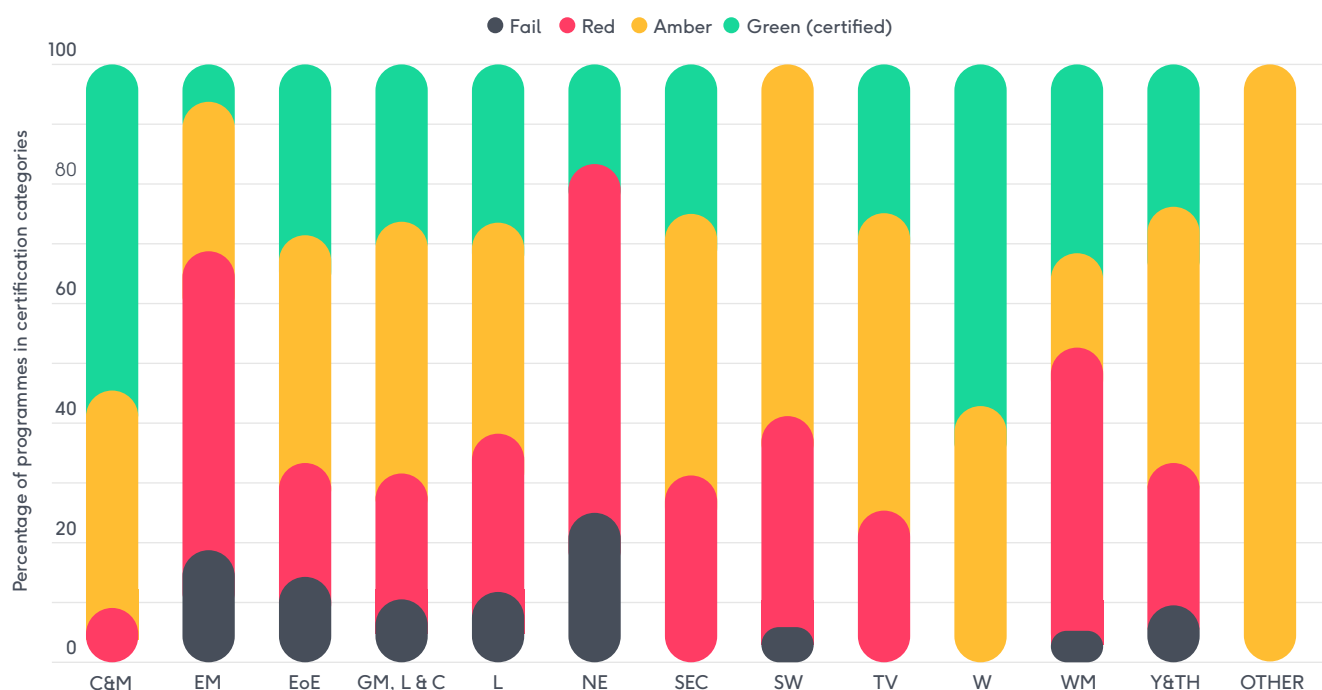


Fig. 4b Northern Ireland

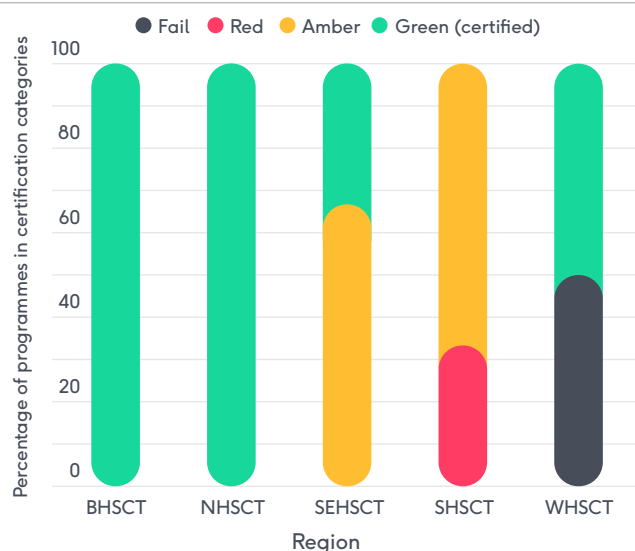
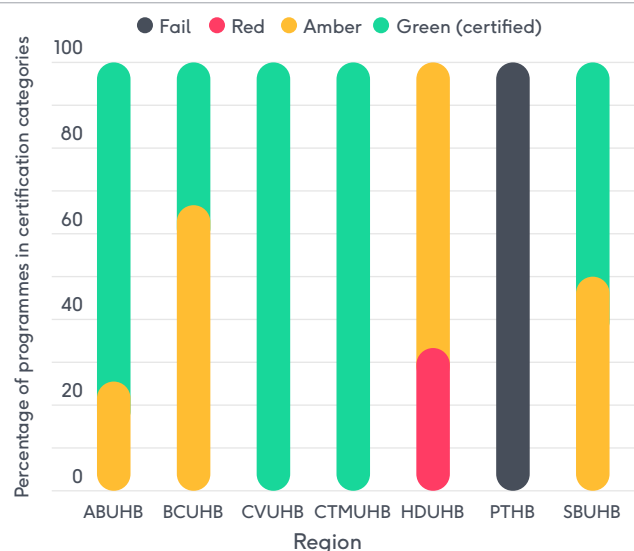


Fig. 4c Wales



Part five

Evaluation of patient outcomes following CR



77% of patients meet recommended activity levels at the end of CR

Part five: Evaluation of patient outcomes following CR

Analysis of CR contribution to smoking cessation

Research shows that stopping smoking reduces premature death, prevents CVD and manages excess CVD risk in patients following a cardiac event (Mons et al 2015). A systematic review of 12 studies following 5,878 patients after an MI found quitting smoking reduced the relative risk of premature death by between 15% and 61% (Wilson et al 2000). These studies show the benefit of quitting smoking in the over 60s age group, which is highly relevant to UK patients receiving CR whose mean age is 67 years.

On average, 94% of UK patients who start CR are non-smokers and CR is associated with an average increase in smoking cessation of one percentage point (Table 17). However, considerable variation exists when you look at the proportion of non-smokers entering CR programmes in individual nations (Figure 5a-c) with a range of 66% to 100%. With this year's NACR report focusing on comorbidity, we also present smoking cessation data as an outcome of CR for patients with zero, one, and two or more comorbidities (Table 17). Regression analysis of this data found that 27% of patients with two or more comorbidities were more likely to be smoking post-CR than the patients with no additional comorbidities.

Table 17

Percentage of non-smokers pre- and post-CR by comorbidity

Comorbidity number	Pre-CR %	Post-CR %	% point change
0	93.7	95.2	1.5
1	93.2	94.7	1.5
2+	94.4	95.3	0.8
Total	94.0	95.1	1.1

N=22,119

Part five: Evaluation of patient outcomes following CR

Figure 5a/b/c: Percentage change in non-smokers post-CR by programme

Fig. 5a England

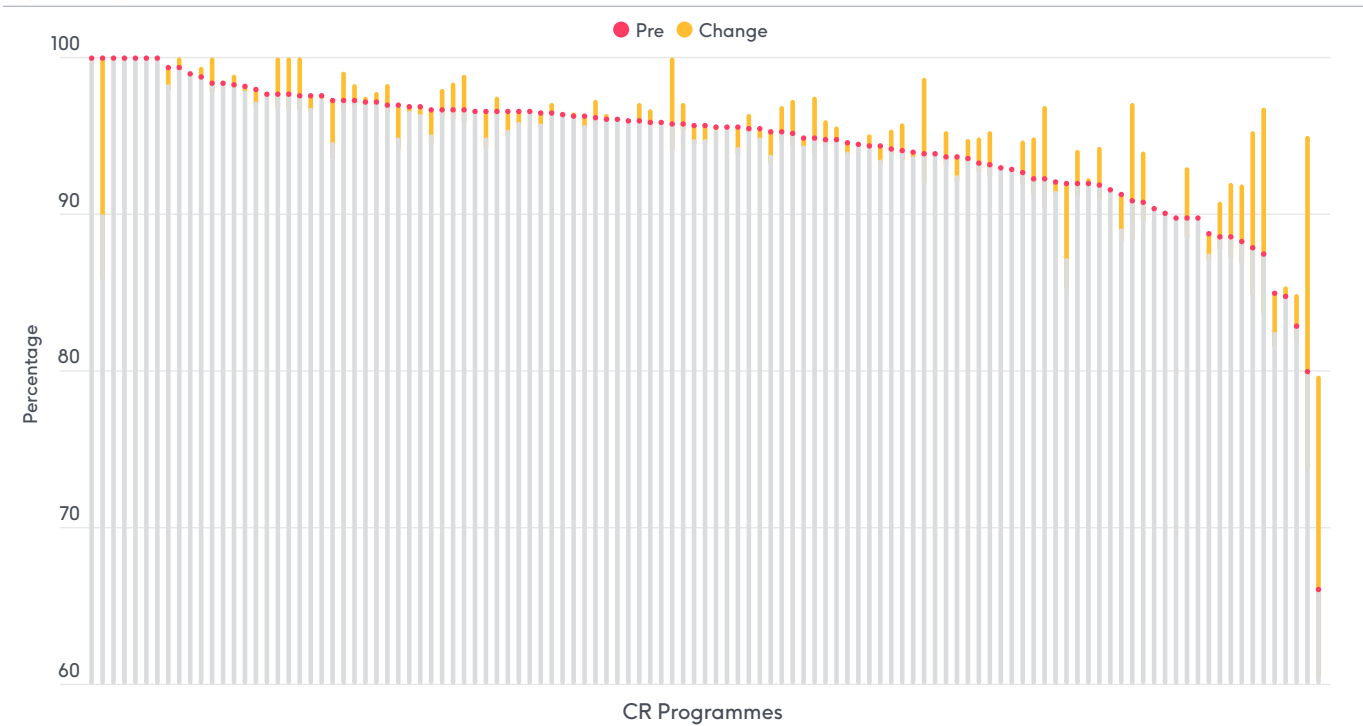


Fig. 5b Northern Ireland

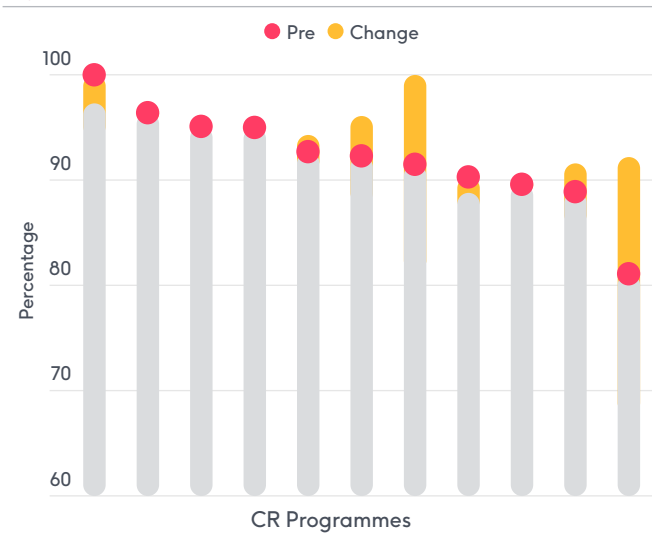
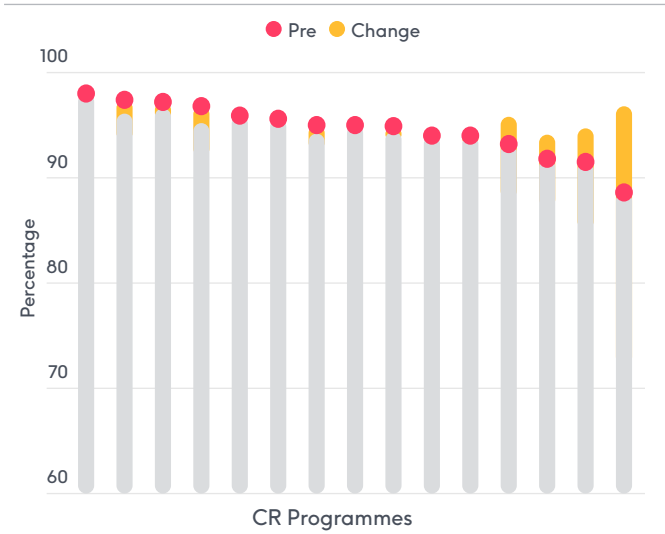


Fig. 5c Wales



Part five: Evaluation of patient outcomes following CR

Analysis of CR contribution to physical activity status

Increasing or maintaining physical activity is an important part of long-term management of CVD risk factors and psychosocial wellbeing. However, improvements in physical fitness, through CR-based exercise training, do not necessarily lead to an increase in physical activity (Alotaibi & Doherty 2017). This means that CR programmes should have clearly defined strategies, independent of recommended fitness exercise training, to increase overall physical activity.

The public health recommendation that people should take part in at least 150 minutes of moderate intensity physical activity per week is also a requirement of CR, according to the BACPR (2017) and SIGN (2017). At the start of CR fewer than 50% of patients are currently meeting the 150 minutes target (Table 18), ranging from 3% to 82% across different programmes (Figure 6a-c). At the end of CR 77% were meeting the recommended activity levels. It is encouraging that the extent of patient benefit (a 29% mean increase in patients reaching activity level targets) was not significantly influenced by the amount of comorbidity (Table 18). Additional analysis found that 12% of patients with two or more comorbidities were less likely to be physically active post-CR than the patients with no additional comorbidities.

Table 18**Percentage of patients physically active pre- and post-CR by comorbidity**

Comorbidity number	Pre-CR %	Post-CR %	% point change
0	52.0	79.6	27.6
1	51.2	79.8	28.6
2+	46.8	75.8	28.9
Total	48.8	77.4	28.6

N=27,990

Part five: Evaluation of patient outcomes following CR

Figure 6a/b/c: Change in physical activity status (150 minutes per week) following CR by programme

Fig. 6a England

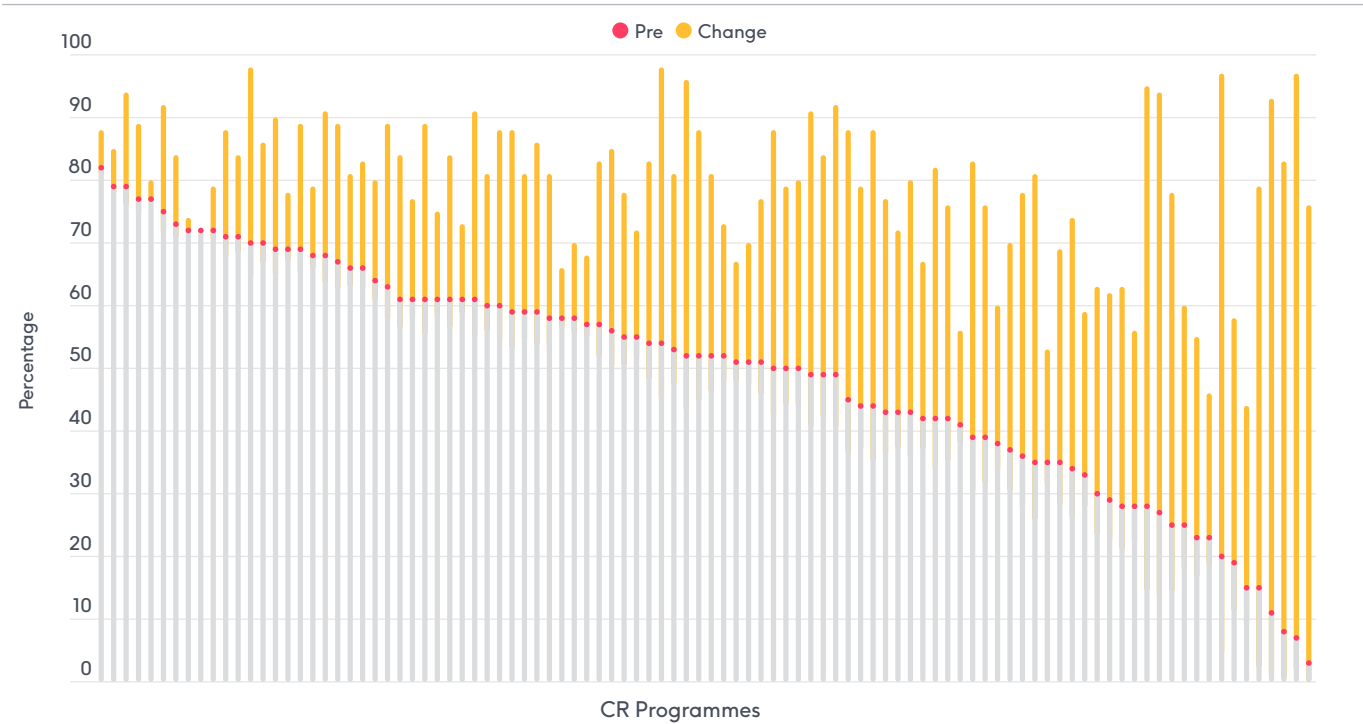


Fig. 6b Northern Ireland

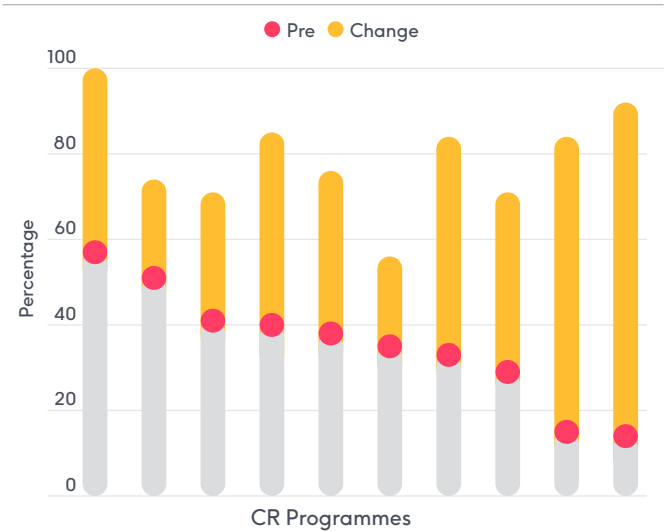
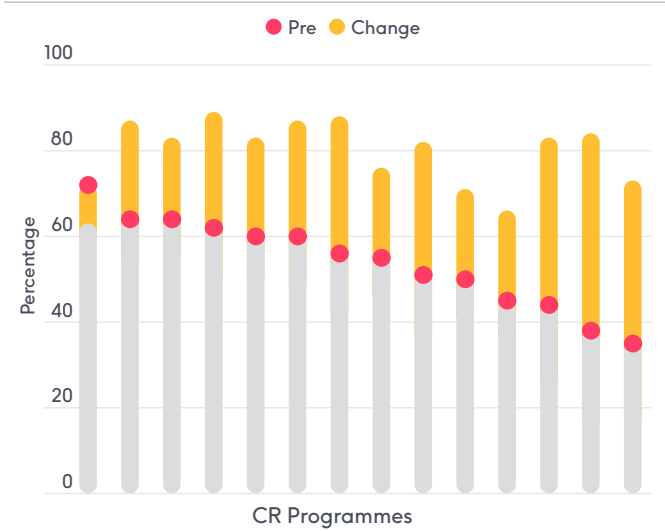


Fig. 6c Wales



Part five: Evaluation of patient outcomes following CR

Analysis of CR contribution to Body Mass Index (BMI)

The mean BMI of patients starting CR is 28 (SD 5) meaning that on average patients are overweight and a small proportion are classed as obese. On average across the three nations, 70% started CR with a BMI <30 (Table 19). Patients with higher levels of comorbidity tended to remain in the obese BMI category following CR.

Figure 7a-c shows that the range of BMI improvement was highly variable across programmes. The ability of a CR programme to achieve change in BMI is influenced by multiple factors such as diet, smoking cessation, physical activity status, level of depression and social deprivation. In addition, patients trying to quit smoking are more likely to put on weight (Aubin et al 2012, Tian et al 2015, Snaterse et al 2018). Additional NACR analysis found that 26% of patients with two or more comorbidities were more likely to have a BMI >30 post-CR than the patients with no additional comorbidities.

Table 19

Percentage of patients with BMI <30 pre- and post-CR by comorbidity

Comorbidity number	Pre-CR %	Post-CR %	% point change
0	73.4	73.5	0.1
1	73.0	73.6	0.6
2+	66.9	67.1	0.2
Total	69.7	69.9	0.2

N=25,096

Part five: Evaluation of patient outcomes following CR

Figure 7a/b/c: Change in BMI post-CR (<30 BMI) by programme

Fig. 7a England

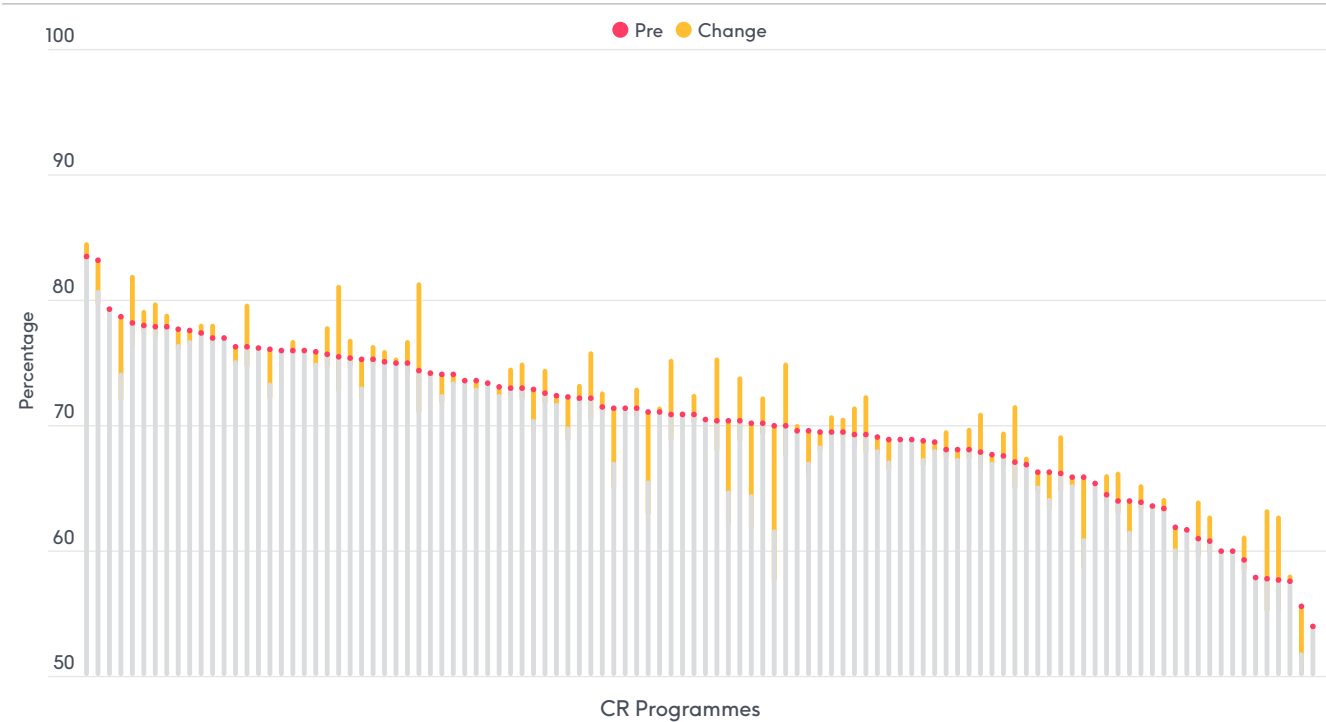


Fig. 7b Northern Ireland

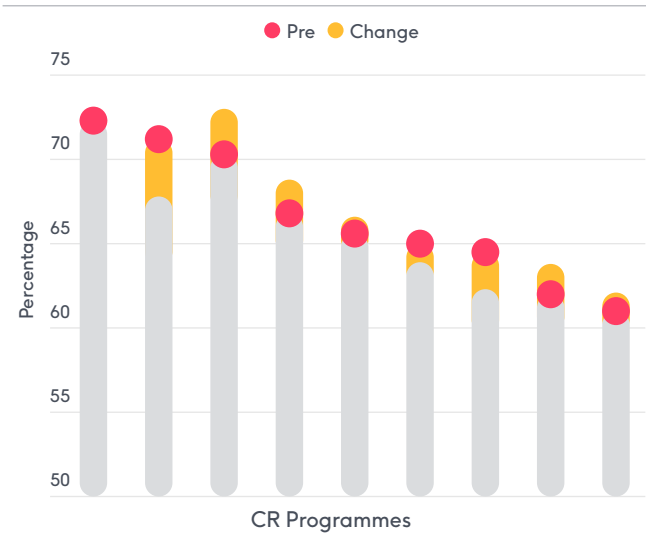
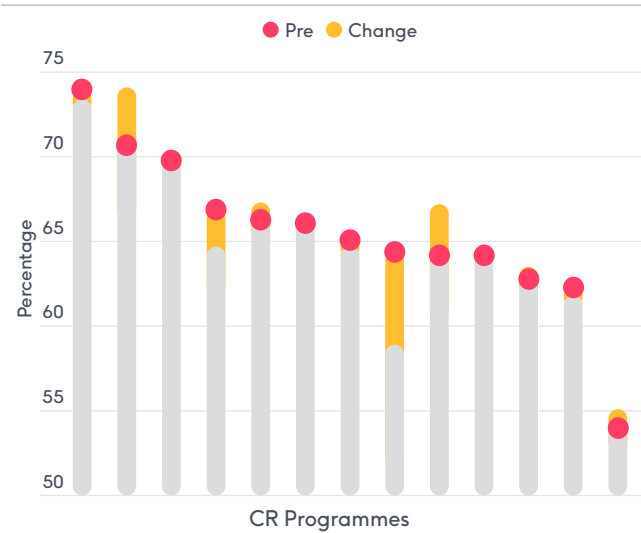


Fig. 7c Wales



Part five: Evaluation of patient outcomes following CR

Analysis of CR contribution to HADS anxiety levels

On average across the three nations, 72% of patients start CR with anxiety levels within the 'normal' category on the Hospital Anxiety and Depression Scale (HADS), with the remaining 28% classed as having borderline or clinical anxiety (Table 20). Variation in the burden of anxiety is evident at a programme level across all three nations (Figure 8a-c). At the national level, CR resulted in an average six percentage point shift from a score of borderline or clinical anxiety to normal anxiety. Patients with no comorbidities benefitted more (eight percentage point improvement) compared with patients with two or more comorbidities (five percentage point improvement). Regression analysis of this data found that 39% of patients with two or more comorbidities were more likely to be borderline/clinically anxious after completing CR than the patients with no additional comorbidities.

Table 20

Percentage of patients by HADS anxiety categories pre-CR and percentage change by comorbidity

Comorbidity Number	Pre-CR			Change		
	Normal Anxiety %	Borderline Anxiety %	Clinical Anxiety %	Normal Anxiety %	Borderline Anxiety %	Clinical Anxiety %
0	73.4	16.1	10.5	7.6	-3.7	-3.9
1	75.1	14.8	10.1	6.1	-2.9	-3.2
2+	70.9	16.5	12.6	5.5	-2.4	-3.1
Total	72.3	16.0	11.7	6.1	-2.8	-3.3

N=19,016

Part five: Evaluation of patient outcomes following CR

Figure 8a/b/c: Change in anxiety post-CR by programme (% normal)

Fig. 8a England

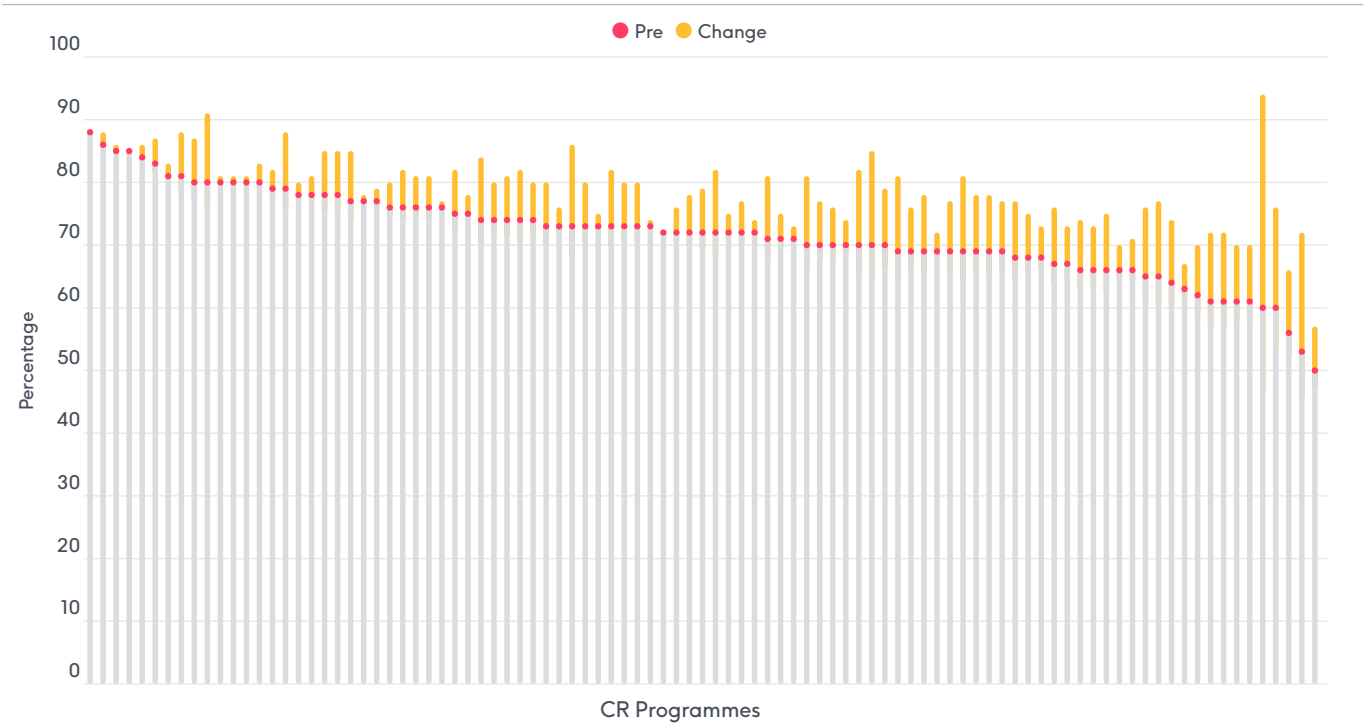
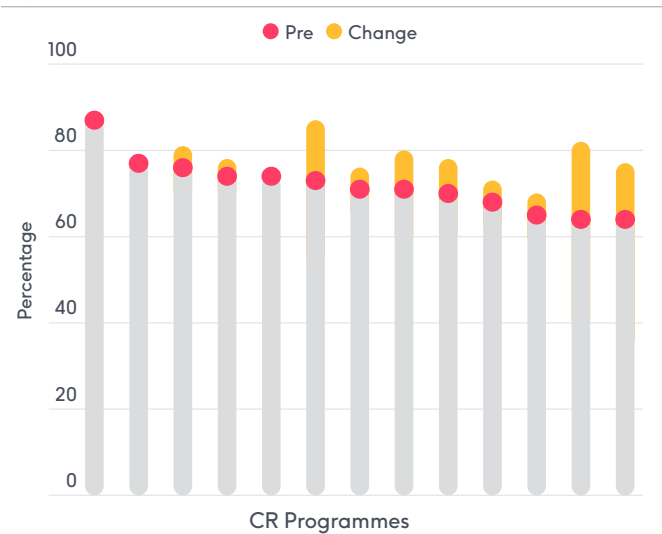


Fig. 8b Northern Ireland



Fig. 8c Wales



Part five: Evaluation of patient outcomes following CR

Analysis of CR contribution to HADS depression levels

On average across the three nations, 81% of patients start CR with depression levels that fall within the 'normal' category on HADS. The remaining 19% were classed as having borderline or clinical depression (Table 21). Figure 9a-c shows the variation in burden of depression occurring at a programme level across all nations. At the national level there was an average six percentage point shift in the proportion of patients who moved from borderline or clinical depression categories to the normal depression category after CR. This improvement was seen regardless of the number of comorbidities. Regression analysis found that 28% of patients with two or more comorbidities were more likely to be borderline/clinically depressed post-CR than the patients with no additional comorbidities.

Table 21

Percentage of patients by HADS depression categories pre-CR and percentage change by comorbidity

Comorbidity Number	Pre-CR			Change		
	Normal Depression %	Borderline Depression %	Clinical Depression %	Normal Depression %	Borderline Depression %	Clinical Depression %
0	83.2	10.8	6.0	5.8	-3.6	-2.1
1	84.2	10.4	5.5	6.0	-3.2	-2.8
2+	79.4	12.7	7.9	6.3	-3.5	-2.8
Total	81.2	11.8	7.0	6.1	-3.4	-2.7

N=19,005

Part five: Evaluation of patient outcomes following CR

Figure 9a/b/c: Change in depression post-CR by programme (% normal)

Fig. 9a England

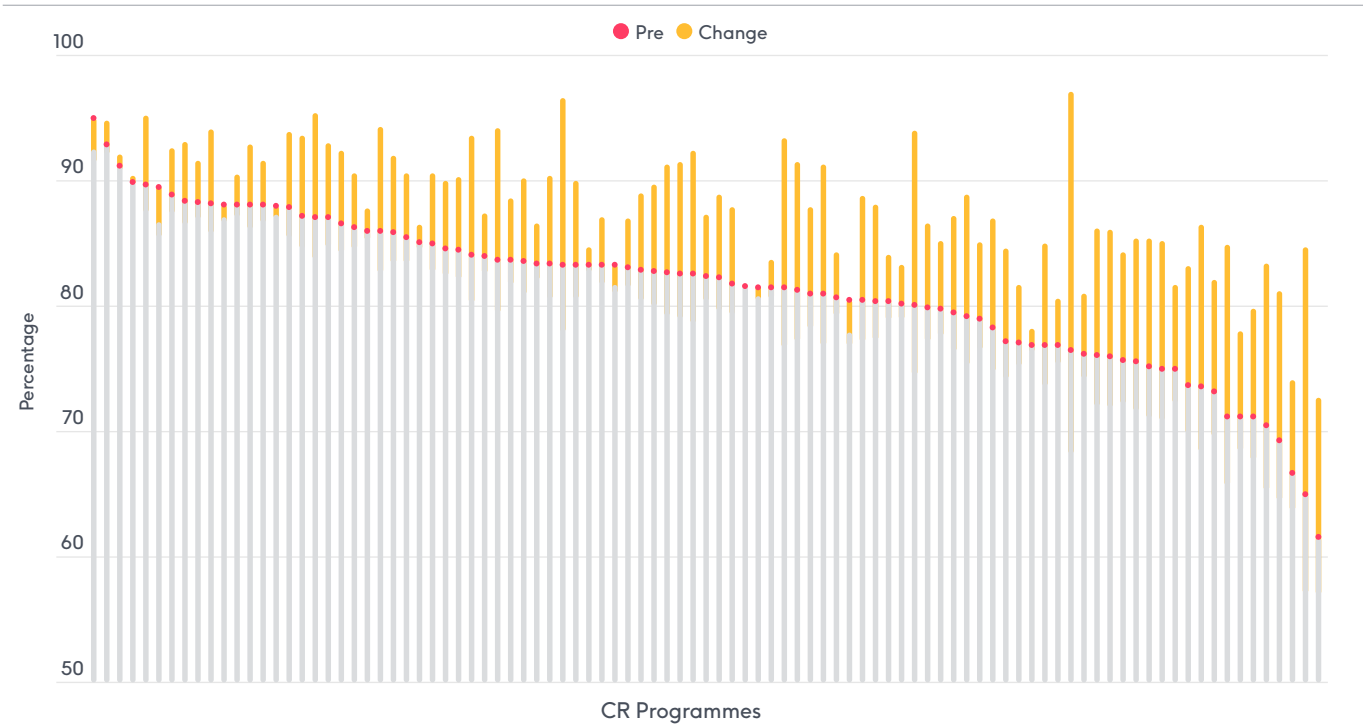


Fig. 9b Northern Ireland

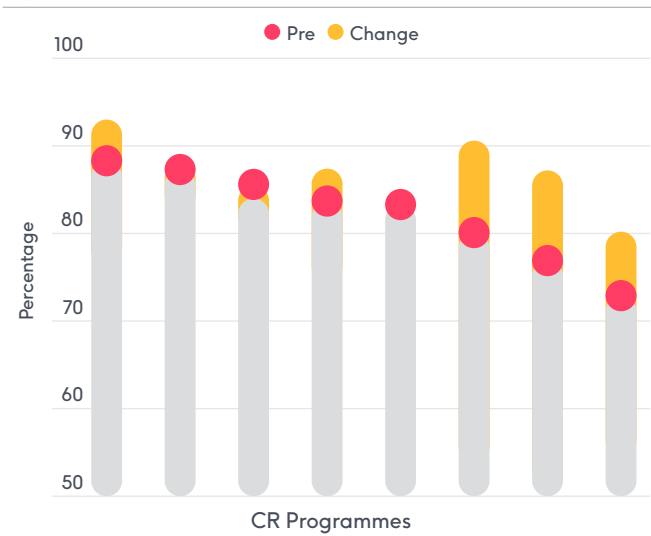
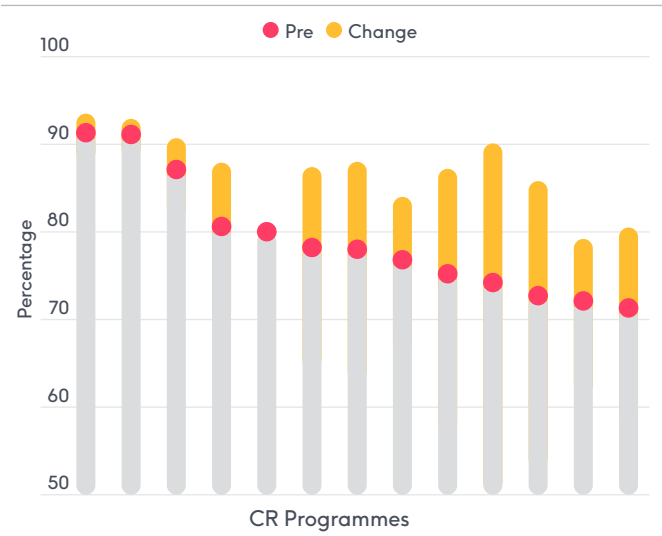


Fig. 9c Wales



Part five: Evaluation of patient outcomes following CR

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

Cardiovascular risk factors by proportion of comorbidity

In the last four years, clinical teams have more than doubled their data entry on patients' low-density lipoprotein levels (LDL) allowing for more extensive analysis. This has revealed a greater benefit of CR in helping patients meet their total cholesterol and LDL targets (Table 22). For patients with one or no comorbidities a 31 to 32 percentage point improvement in meeting target total cholesterol and LDL levels was seen, compared with a 23.7 to 24.2 percentage point improvement in patients with two or more comorbidities (Table 22). Blood pressure targets improved by one percentage point regardless of number of comorbidities. Waist circumference reduction was greater (by 2%) in patients with one or more comorbidity whereas the improvement in meeting alcohol consumption targets was one percentage point less for patients with two or more comorbidities than the patients with none.

Table 22

Change in CVD risk factor outcomes by proportion of comorbidity

		Comorbidity number	Pre-CR %	Post-CR %	% point change
Total cholesterol (N=4,825)	<4.0 mmol/L	0	33.8	66.2	32.4
		1	34.4	66.8	32.4
		2+	39.8	64.0	24.2
LDL cholesterol (N=4,825)	<2.0 mmol/L	0	32.7	63.4	30.7
		1	30.8	63.4	32.6
		2+	37.4	61.0	23.7
Blood pressure (N=26,181)	Systolic <140 mm Hg and Diastolic <90 mm Hg	0	73.5	74.9	1.4
		1	74.2	75.3	1.1
		2+	68.6	69.6	1.0
Waist circumference (N=12,516)	<102 cm Male <88 cm Female	0	63.6	65.1	1.5
		1	60.2	63.6	3.4
		2+	51.9	55.0	3.2
Alcohol consumption (N=19,581)	<14 units per week	0	85.6	87.9	2.4
		1	86.3	88.3	2.0
		2+	87.3	88.7	1.4

Part five: Evaluation of patient outcomes following CR

Physical fitness

The Incremental Shuttle Walk Test (ISWT) and the Six Minute Walk Test (6MWT) are both used to quantify improvement in physical fitness following CR.

Performance on the ISWT is expressed in two different ways (1) the proportion of patients achieving a minimal clinically important difference (MCID) of >70 metres and (2) the proportion of patients achieving a change of at least one stage of the ISWT. Table 23 shows that there was a significant positive change across both ISWT metrics for males and females after completing CR. A lower proportion of males achieved equivalent changes with increasing comorbidity whereas the walking fitness of female participants was not influenced by their level of comorbidity.

The analysis for the 6MWT, which is a measure of walking endurance aimed at patients with low functional capacity, revealed a significant benefit of CR independent of gender or level of comorbidity (Table 23).

Clinical guidelines for CR recommend physical fitness assessment to (1) aid risk assessment prior to starting CR (2) inform the exercise prescription and (3) evaluate the effectiveness of the intervention (change in pre- and post- scores) following CR (BACPR 2017).

NACR data shows that less than a third of patients are receiving a functional capacity measurement at baseline and a further third of patients do not have an end of CR functional capacity assessment. This remains a major concern as it could increase risk if patients start exercise without knowing their overall risk status (ACPICR 2015). As data input and data quality improves for additional Fitness Measures (recorded in METS e.g. Step Test) these will be reported.

Table 23

Proportional change in walking fitness after CR by comorbidity

			Comorbidity number		
			0	1	2+
Proportion of patients achieving:			%	%	%
Incremental Shuttle Walk Test Male N=3,845/ Female N=1,154	Clinical difference of >70m (Houchen-Wollof 2015)	Male	69.8	65.4	64.9
		Female	54.5	55.7	54.4
	Increase of one ISWT stage	Male	76.3	75.9	73.9
		Female	67.3	74.1	69.8
Six Minute Walk Test Male N=2,078 /Female N=916	Clinical difference of >25m (Gremeaux 2011)	Male	74.8	75.2	76.4
		Female	64.3	72.2	75.5

Part five: Evaluation of patient outcomes following CR

Analysis of CR contribution to health-related Quality of Life

NACR uses the Dartmouth COOP questionnaire to monitor improvement of patient health-related quality of life (HRQoL) in eight domains following CR. Table 24 shows that gains in HRQoL are less in patients with two or more comorbidities across all eight domains. Research has found that positive change in HRQoL is seen for both supervised and facilitated home-based/self-managed CR approaches when offered to patients with comorbidity (Harrison & Doherty 2018a).

Table 24

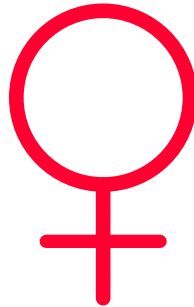
Percentage of patients with normal health-related QoL (Dartmouth COOP) score pre- and post-CR by comorbidity

	Comorbidity Number							
	0		1		2+		Total	
	Pre-CR %	Post-CR %	Pre-CR %	Post-CR %	Pre-CR %	Post-CR %	Pre-CR %	Post-CR %
Physical fitness	47.8	79.8	48.1	79.9	38.9	71.4	42.6	74.8
Feelings	87.5	92.2	88.2	92.9	84.7	89.1	85.9	90.5
Daily activities	87.2	96.6	88.2	97.1	84.5	94.8	85.8	95.6
Social activities	84.9	94.9	85.7	96.2	82.5	93.1	83.6	94.1
Pain	80.8	87.7	82.6	88.3	75.3	80.6	77.9	83.6
Overall health	68.1	82.8	68.3	83.7	61.5	76.7	64.2	79.3
Social support	88.5	85.7	88.0	86.7	87.2	84.5	87.6	85.2
Quality of life	94.4	97.2	96.6	98.2	94.6	96.8	95.0	97.2

England N=13,469, Northern Ireland N=1,038, Wales N=1,319, Total N=15,923 (includes Other).

Part six

Recommendations and actions



The range of female CR attendance is **15-38%** across the three nations

Part six: Recommendations and actions

This year's Quality and Outcomes report concludes that CR is being delivered to a higher standard than in previous years with more programmes achieving or making progress towards certification, demonstrating increased quality of CR delivery. At the same time the report highlights some unacceptable variation in delivery and outcomes within and between countries, most notably in terms of comorbidity. With the exception of post-MI and HF patients, uptake to CR for most patients is showing a positive trend. However, the extent of comorbidity at the start of CR has a significant impact on some outcomes and whether its benefits can be fully realised for patients.

Key recommendations

1. Optimise recruitment of post-MI patients to CR.
2. Ensure patient comorbidity is taken into account as part of CR recruitment, assessment and tailoring of interventions.
3. Offer greater innovation in recruiting and managing patients with HF.
4. Recruit more female patients across all condition/treatment groups.
5. Pursue quality CR delivery evidenced by achieving 'certified' programme status.

Actions

1. Review recruitment protocols and management of post-MI patients to increase uptake. NACR will report more extensively on this next year.
2. Tailor the CR intervention (mode of delivery, content and staff type) to accommodate comorbidity.
3. Ensure NACR captures innovations in HF rehabilitation via new modes of delivery, e.g. REACH-HF.
4. Ensure that CR is tailored to the needs of female patients, particularly interventions aimed at managing CVD risk factors and encouraging more physical activity.
5. Liaise with the NACR team about acquiring or maintaining 'certification' of CR delivery against clinical standards.

Please do utilise the BHF Health Services Engagement team to share good practice and keep ahead of the curve through the new BACPR online CR education courses.

Acknowledgements

NACR owes a great deal to the BHF. Special thanks go to Jacob West (Director of Healthcare Innovation), Sally Hughes (Head of Health Services Engagement) and Jenny Hargrave (Director of Patient, Public and Professional Involvement) who, through their teams, have helped improve CR for the benefit of patients.

The BACPR is committed to ensuring that all CR programmes in the UK offer quality CR that is known to benefit patients. Services benefit from BACPR's commitment to offering education and training for CR clinicians. The BACPR/NACR joint NCP_CR is a world-leading quality assurance project that owes much to the leadership of the BACPR. A big thank you to Sally Hinton (BACPR Executive Director), Vivienne Stockley (Education Co-ordinator), Professor Susan Dawkes (BACPR President), Dr Scott Murray (BACPR Former President) and Dr Hayes Dalal (NCP_CR co-chair).

NHS Digital continues to add value through its support in hosting and quality assuring our data, allowing us to utilise routine practice data to reduce inequalities and improve services.

Our collaboration with Public Health England (PHE) goes from strength to strength, extending the ability and reach of NACR.

As the patient voice for CR in the UK the Cardiovascular Care Partnership (UK) (CCPUK) makes NACR and its findings more meaningful for patients and carers. Special thanks to Ken Timmis and Trevor Fernandes (CCPUK).

NACR owes much to the willingness of clinical teams in choosing to take part and in completing the clinical assessments and questionnaires before and after their programme. Our acknowledgement extends to patients for agreeing to their data being used as part of NACR and thus helping shape the future quality of services offered by the NHS.

We would very much like to thank the NACR Steering Committee for their continued support and expertise in shaping recent developments and overseeing the NACR report. They are: Alison Allen (Wales User Representative), Elaine Allen (England User Representative), Mel Clark (Patient Representative), Dr Hayes Dalal (NCP_CR co-chair), Chris Dew (Information Analysis Lead Manager, Audit Support Unit, NHS Digital), Frances Divers (Scotland Representative, NHS Lothian), Trevor Fernandes (CCPUK), Dr Jane Flint (Cardiologist), Jenny Hargrave (Director of Patient, Public and Professional Involvement, BHF), Sally Hinton (Executive Director, BACPR), Sally Hughes (Head of Health Services Engagement, BHF), Suzanne Indge (NACR Lead for the All Wales Cardiac Rehab Group), Alana Lavery (Northern Ireland Representative), Dr Scott Murray (BACPR Former President and Cardiologist), Lorraine Oldridge (National Lead - NCVIN, Public Health England), Rachel Owen (Wales Representative), Irene Thomson (Scotland Representative, NHS Lothian), Iain Todd (Scotland Representative, NHS Lothian).

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Appendix 1: Reasons for not taking part

Patient reasons	Patient not interested/refused
	Physical incapacity
	Holidaymaker
	Mental incapacity
	Died
	Too ill
	Patient request transfer to another programme
Service reasons	Ongoing investigation
	Local exclusion criteria
	Not referred
	Rehab not needed
	Rehab not appropriate
	Staff not available
	Rapid transfer to tertiary centre
	DNA/No contact
	No service available
	Transfer for PCI/Intervention
Work/Social reasons	Transfer to DGH/Trust
	Returned to work
	Language barrier
	No transport
	Other
	Unknown

Heart transplants. Clot busting drugs. Pacemakers. Breakthroughs born from visionary medical research. Research you fund with your donations.

Heart and circulatory diseases kill 1 in 4 people in the UK. They cause heartbreak on every street. But if research can invent machines to restart hearts, fix arteries in newborn babies, build tiny devices to correct heartbeats and give someone a heart they weren't born with, imagine what's next.

We fund research into all heart and circulatory diseases and their risk factors. Heart attacks, heart failure, stroke, vascular dementia, diabetes and many more. All connected, all under our microscope. Our research is the promise of future prevention, cures and treatments.

The promise to protect the people we love. Our children. Our parents. Our brothers. Our sisters. Our grandparents. Our closest friends.

You and the British Heart Foundation. Together, we will beat heartbreak forever.

Beat heartbreak forever

Beat heartbreak from  heart diseases  stroke  vascular dementia  diabetes