National Audit of Cardiac Rehabilitation

Quality and Outcomes Report 2022

Executive Summary

Nearly three years on from when Covid-19 had a significant impact on the NHS most cardiac rehabilitation (CR) programmes are up and running, albeit many are running services with less than optimal staffing compared to the preCovid-19 era. The nature of the staffing challenge is complex relating to continued CR staff redeployment, large numbers of staff retiring, delays in recruitment or non-replacement of posts and fundamental service changes. NACR survey data from programmes in England, Northern Ireland and Wales reveals that 57.6% of all services were interrupted and that 54.8% of CR services reported that staff were redeployed during 2021. The movement and loss of staff this year highlights how the NHS CR workforce provision has yet to recover to pre Covid-19 levels.

The CR service staff issue outlined above has prevented us from reporting uptake against the total eligible population as the validation criteria requires senior CR staff to verify the actual numbers seen. However, NACR is able to report that in total, CR services in the last 12 months have seen 50,473 patients which equates to 73.6% of the number seen in 2019 (pre Covid-19 data).

The large-scale shift in CR mode of delivery seen in last year's report, resulting in a 57% increase in home-based, has continued with 70.3% of patients taking part in home-based, 15.7% in group-based and 14.0% having a hybrid (group+facilitated home-based) version of CR. Patient participation rates by ethnicity, gender, areas of deprivation and rurality continue to show inequalities in service access across all modes of CR delivery.

A low level of exercise testing (functional capacity - FCT), on average 78.8% without an exercise test, was most notable in home-based CR which now has the largest patient population receiving CR. Approximately 19,600 patients did not have an exercise test (FCT) measured/recorded in 2021 prior to starting exercise-based CR - a worrying trend as research and clinical registry studies show that not having a tailored exercise prescription is associated with higher risk of life-threatening adverse events.

Data from the National Certification Programme for CR (NCP_CR) shows that, of the 205 programmes included, 82 (40.0%) met all seven standards (Green certified) in the 2021 data year (certification period 2022-23). This represents an increase of 18 programmes (10.7%) being Green certified compared to last year. At the same time there has been an increase in Amber status (meeting 4-6 of the seven KPIs) with 69 programmes (up from 62 last year). However, the number of programmes in the Fail category (meeting no KPIs) has increased by nine programmes.

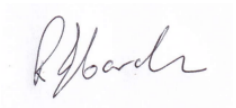
The NACR team, in collaboration with NHS England, the British Association of Cardiovascular Prevention and Rehabilitation (BACPR), and the British Heart Foundation (BHF), will work with clinical teams and associated Cardiac Networks, Health and Social Care Trusts and Health Boards to help implement the recommendations based on this year's audit.

Key recommendations	Recommended actions
Implement service change to reduce known inequalities in CR provision	a) Ensure services are offering, promoting and supporting delivery of all three primary modes of CR (group-based; home-based; hybrid) to all eligible patient groups b) Take proactive steps to recruit more patients from underrepresented ethnic groups, patients from areas of higher deprivation and rural areas
Ensure that all CR delivered across different modes (e.g. home-based, group-based and hybrid versions) aligns with BACPR standards	For each patient check that the core components of CR are incorporated and supported by an appropriate multidisciplinary staff team
Make sure that CR is tailored to patient needs through a comprehensive baseline assessment	Review patient assessment protocols and routine practice assessment to ensure they are implemented thoroughly at the start of CR and ensure that the findings are documented in a format that can be audited
Reduce excess risk associated with exercise training as part of CR	Ensure that all patients taking part in CR exercise have a baseline exercise test (FCT)
Ensure CR staffing levels are appropriate to support a quality CR service for all eligible patients	Work with service managers, Cardiac Networks, Health and Social Care Trusts and Health Boards to develop a robust staffing business case

Professor Patrick Doherty, Director - National Audit of Cardiac Rehabilitation

Dr Kathryn Carver, President - British Association for Cardiovascular Prevention and Rehabilitation

Diane Saunders, CVD Programme Lead - NHS England



Richard Corder, President, Cardiovascular Care Partnership UK

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SECTION 1

Patient participation and access by mode of delivery

UK cardiac rehabilitation (CR) remains in a stage of recovery following large scale service change and staffing challenges during the Covid-19 pandemic.

In the 2021 data period 50,473 patients received CR across England, Northern Ireland and Wales (216 programmes) which represents 73.6% of the number seen in 2019 (pre Covid-19 period) where 68,591 patients received CR (Table 1).

Table 1. Numbers and proportion of patients across the five Acute Coronary Syndrome patient groups starting cardiac rehabilitation by year

	Pre Covid-19 comparison*	2021 Data Year (Jan-Dec)	Patients receiving CR as a percentage of pre Covid-19 comparison
MI	12234	9110	74.5%
MI+PCI	27746	25380	91.5%
PCI	14893	9091	61.0%
CABG	13239	6616	50.0%
Unstable Angina	479	276	57.6%
Total	68591	50473	73.6%

**Pre Covid-19 comparison – Data from the 2019 Annual report which included data from April 2017 to March 2018*

Data for acute coronary syndrome patients from 2021 shows a three percent increase in the numbers receiving CR compared to 2020 which is a positive trend when viewed in the context of historical annual increases in the number receiving CR which averaged one percent every year for the four previous years. Pre-pandemic, numbers for Heart Failure were 6,594 patients starting CR and in 2020 this dropped to 4,814 (27.0% reduction). In 2021, the numbers have increased to 5,227 - an increase of over 400 patients compared to 2020, but still below pre-pandemic levels (20.7% reduction).

The ability of CR programmes' service provision to recover, and also meet the aspirational targets set by the NHS Long Term Plan (LTP) will be strongly influenced by future national and local staffing, recruitment and retention strategies.

The huge increase in home-based CR seen in 2020 data (57%) continues in 2021 as evidenced by 68.5% of all patients starting CR receiving a purely home-based mode of delivery (Table 2).

Table 2. Participation rates by mode of delivery and patient ethnicity

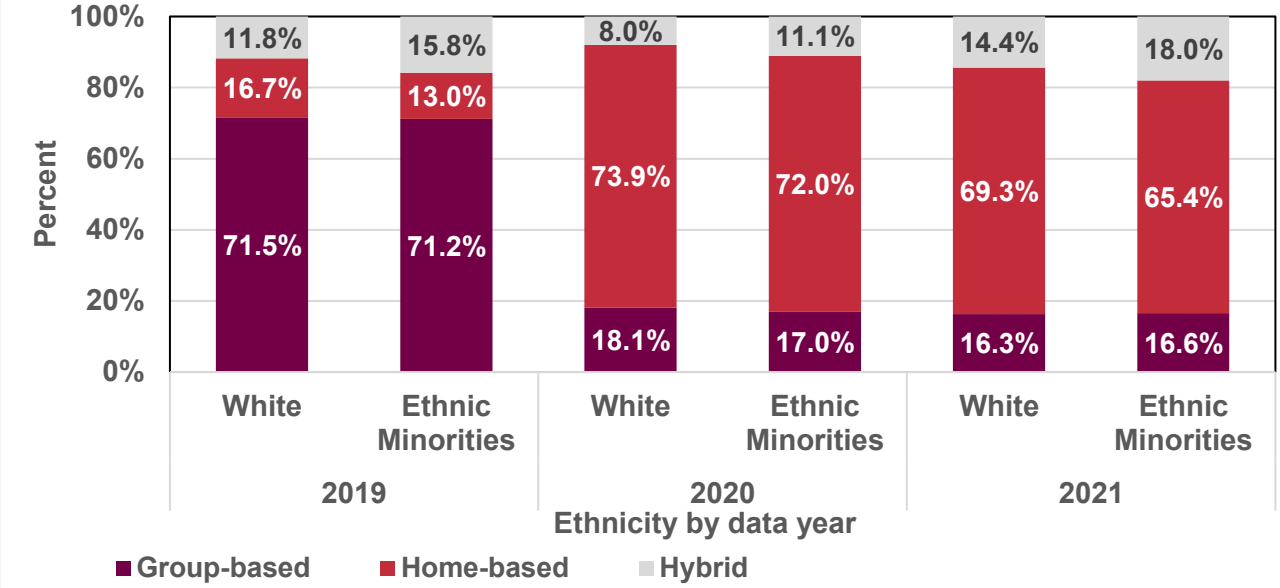
Data Year (Jan-Dec)	Ethnicity	Mode of Delivery					
		Group-based		Home-based		Hybrid**	
		Count (%)	Mode %	Count (%)	Mode %	Count (%)	Mode %
2019	White	22104 (82.4)	71.5	5158 (85.7)	16.7	3649 (77.7)	11.8
	Ethnic Minorities*	4716 (17.6)	71.2	859 (14.3)	13.0	1047 (22.3)	15.8
	Total	26820	71.5	6017	16.0	4696	12.5
2020	White	4558 (82.3)	18.1	18590 (81.7)	73.9	2000 (75.8)	8.0
	Ethnic Minorities*	979 (17.7)	17.0	4157 (18.3)	72.0	639 (24.2)	11.1
	Total	5537	17.9	22747	73.6	2639	8.5
2021	White	3816 (80.6)	16.3	16205 (81.7)	69.3	3369 (77.1)	14.4
	Ethnic Minorities*	921 (19.4)	16.6	3640 (18.3)	65.4	1002 (22.9)	18.0
	Total	4737	16.4	19845	68.5	4371	15.1

**Ethnic minorities – Includes Mixed, Asian/Asian British, Black/Black British or other ethnic groups*
***Hybrid – Patients having received group-based CR in addition to a version of facilitated home-based*

Stand alone group-based CR remains static at 16.4% with hybrid mode of delivery (group + facilitated home-based) increasing to 15.1% which is just one percent below group-based CR. Details around patient participation rates by ethnicity across mode of CR delivery is shown in Table 2 with a graphical summary displayed in Figure 1.

Collectively this data (Table 2 and Figure 1) shows a small increase in patients from ethnic minorities receiving group-based CR (17.7% to 19.4%) with no change in home-based CR and a small drop (1.3%) in the proportion of patients from ethnic minorities taking up hybrid CR between 2020 and 2021.

Figure 1. Proportion of patients receiving cardiac rehabilitation by ethnicity and mode of delivery



n=97,409

Proportional distribution by gender and mode of CR between 2019 and 2021 (Table 3) found that 3.3% fewer females, by proportion (31.5% - 28.2%), were taking up home-based CR and a small drop (1.5%) taking up hybrid CR compared to 2019 (pre Covid-19 period). Within those receiving group-based CR, the gender split remained similar across all three years (25.6%-25.9%).

Of the female patients that received CR in 2020 a total of 7,702 (76.7%) had home-based CR. This proportion fell to 7,004 (72.3%) in 2021 with a shift towards hybrid (Table 3).

Table 3. Cardiac rehabilitation participation rates by mode of delivery and gender

Data Year (Jan-Dec)	Gender	Mode of delivery					
		Group-based		Home-based		Hybrid	
		Count (%)	Mode %	Count (%)	Mode %	Count (%)	Mode %
2019	Male	22855 (74.4)	73.2	4630 (68.5)	14.8	3745 (73.3)	12.0
	Female	7845 (25.6)	69.2	2128 (31.5)	18.8	1367 (26.7)	12.1
	Total	30700	72.1	6758	15.9	5112	12.0
2020	Male	4618 (74.4)	17.2	19925 (72.1)	74.4	2245 (75.0)	8.4
	Female	1585 (25.6)	15.8	7702 (27.9)	76.7	750 (25.0)	7.5
	Total	6203	16.8	27627	75.0	2995	8.1
2021	Male	4114 (74.1)	16.0	17845 (71.8)	69.5	3713 (74.9)	14.5
	Female	1441 (25.9)	14.9	7004 (28.2)	72.3	1241 (25.1)	12.8
	Total	5555	15.7	24849	70.3	4954	14.0

The Index of Multiple Deprivation (IMD) is a measure of relative levels of deprivation in 32,844 small areas or neighbourhoods in England.

Referring to Table 4, from 2019 through to 2021 for patients from least deprived areas (fifth quintile) group-based CR participation was dominant with approximately double the patient numbers compared to the most deprived areas (lowest quintile). The same analysis looking at patients from areas of greatest deprivation (lowest quintile) finds that the dominant mode of CR is home-based in 2020 and 2021. Hybrid CR in 2020 and 2021 was also greater for patients from areas of least deprivation.

Table 4. Cardiac rehabilitation participation rates by mode delivery and Index of Multiple Deprivation (IMD)

Data Year (Jan-Dec)	Index of Multiple Deprivation	Mode of delivery					
		Group-based		Home-based		Hybrid	
		Count (%)	Mode %	Count (%)	Mode %	Count (%)	Mode %
2019	Lowest quintile *most deprived*	3575 (13.4)	64.6	1061 (20.0)	19.2	896 (20.6)	16.2
	Fifth quintile *least deprived*	6725 (25.2)	82.5	692 (13.1)	8.5	739 (17.0)	9.1
	Total	26671	73.4	5292	14.6	4354	12.0
2020	Lowest quintile *most deprived*	684 (12.1)	13.3	4095 (16.9)	79.7	360 (13.8)	7.0
	Fifth quintile *least deprived*	1570 (27.8)	21.9	4945 (20.4)	68.8	670 (25.7)	9.3
	Total	5656	17.4	24263	74.6	2609	8.0
2021	Lowest quintile *most deprived*	634 (12.5)	11.9	4171 (19.2)	78.2	532 (12.2)	10.0
	Fifth quintile *least deprived*	1345 (26.6)	20.3	4101 (18.9)	62.0	1172 (27.0)	17.7
	Total	5053	16.2	21705	69.8	4345	14.0

Independent of IMD the location of where patients live is increasingly influential in determining uptake to CR. NACR can allocate patients based on rural/urban status and has reported them for the first time by mode of CR and year (Table 5).

The data shows that, by proportion, the majority of patients are from urban areas with, on average, only 20% of the population from rural areas. However, in 2019, the data suggests a disproportionate offering of home-based CR to rural patients with almost double receiving this mode (13.8% vs. 22.5%). The service provision in 2020 drastically increased the overall offering of home-based, however, in 2021 the trend remains that patients from urban areas are receiving group-based or hybrid modes in a larger proportion than rural patients.

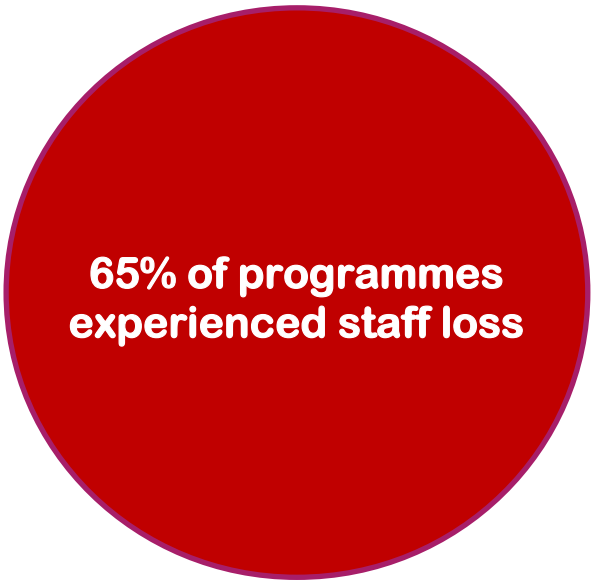
Table 5. Cardiac rehabilitation participation by mode of delivery and rural/urban status

Data Year (Jan-Dec)	Rural/ Urban Status	Mode of Delivery					
		Group-based		Home-based		Hybrid	
		Count (%)	Mode %	Count (%)	Mode %	Count (%)	Mode %
2019	Urban	23006 (80.1)	73.8	4287 (68.5)	13.8	3866 (78.3)	12.4
	Rural	5723 (19.9)	65.3	1974 (31.5)	22.5	1072 (21.7)	12.2
	Total	28729	72.0	6261	15.7	4938	12.4
2020	Urban	4796 (81.7)	17.2	20878 (78.4)	74.9	2207 (80.3)	7.9
	Rural	1072 (18.3)	14.5	5755 (21.6)	78.1	542 (19.7)	7.4
	Total	5868	16.6	26633	75.6	2749	7.8
2021	Urban	4308 (80.3)	16.1	18549 (78.8)	69.3	3896 (82.8)	14.6
	Rural	1058 (19.7)	15.4	4987 (21.2)	72.7	812 (17.2)	11.8
	Total	5366	16.0	23536	70.0	4708	14.0

The findings for both deprivation (IMD) and rural/urban status (Table 4 & 5) suggests that home-based CR is often the default option for patients from areas of high deprivation and those from rural settings. Although, in some instances, allocation of CR by urban/rural location may appear logical and pragmatic it does raise questions about the extent to which such approaches are tailored to patient needs and preference (Dalal et al 2007). If CR delivery is to be patient centred then both location and patient preference around mode of CR should be considered.

SECTION 2

Staffing

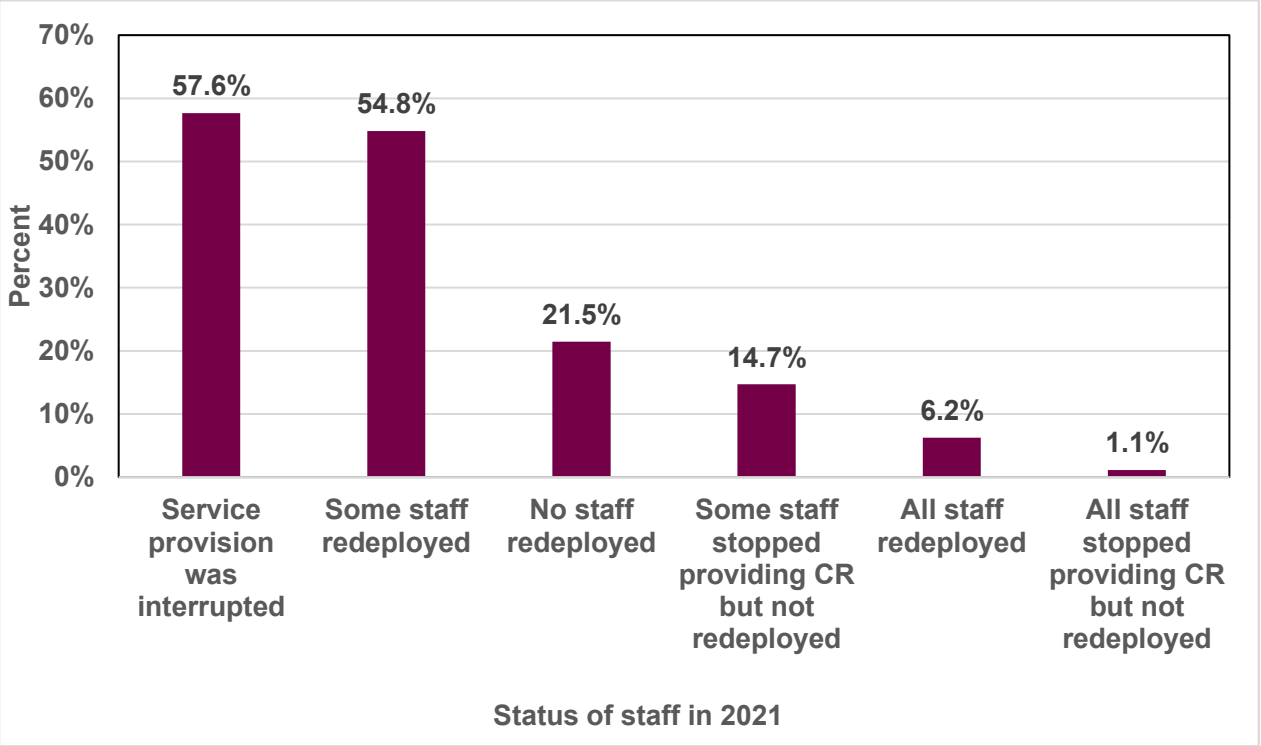


In addition to the NACR annual staffing survey of CR clinicians - used to collect information on staff type, grade and hours - the NACR Steering Group felt it was also important, in the post Covid-19 service era, to collect information on redeployment, returning rates of staff and also whether there were increasing levels of staff leaving the service. The analysis below focuses on the impact of NHS service change on staffing alongside the questions asked on the survey.

Question one: **Thinking about the 2021 Calendar year (Jan-Dec), due to the Covid-19 pandemic were any of your staff redeployed/stopped providing CR?**

Based on NACR survey data from programmes in England, Northern Ireland and Wales 57.6% of all programmes reported that their service was interrupted and 54.8% that some staff were redeployed to other NHS related work (Figure 2).

Figure 2. Extent of redeployment in 2021



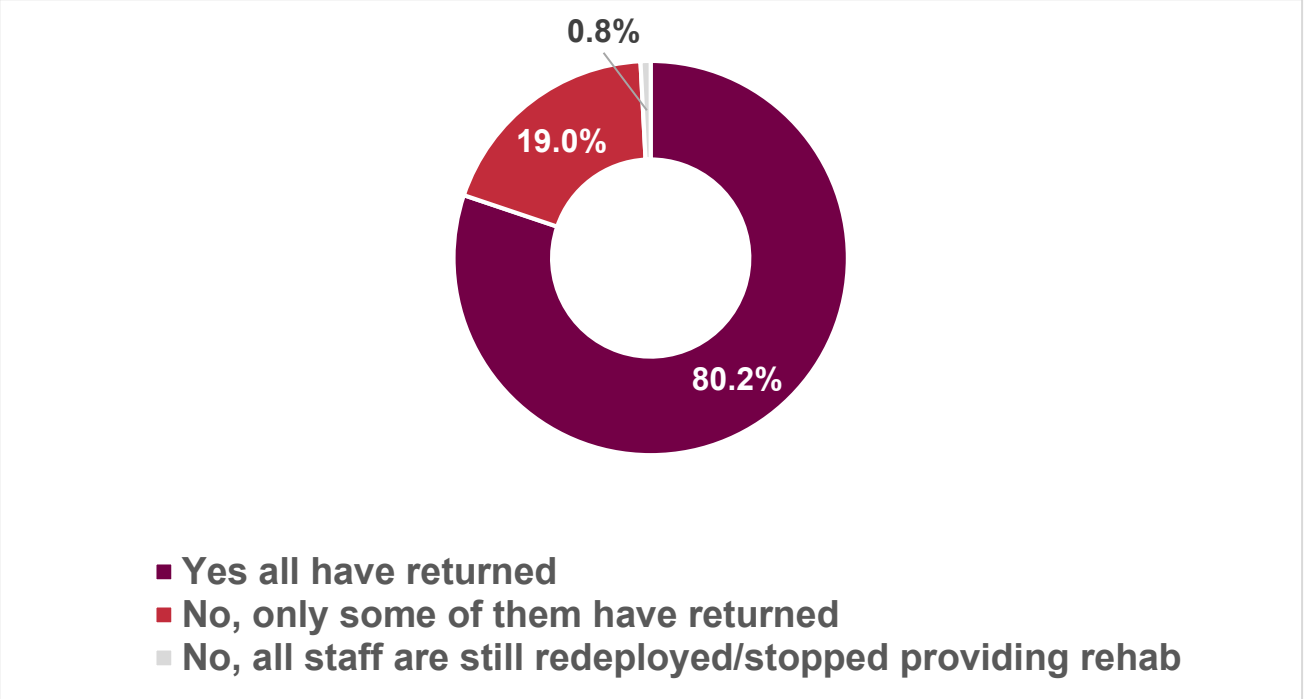
n=150

Question two: **If staff were redeployed/stopped providing CR is your staff team back to pre Covid-19/March 2020 levels?**

Of those services that responded to redeployment 80.2% reported that their staff had returned with 0.8% stating 'No, all staff are still redeployed/stopped providing rehab' (Figure 3).

Programme specific CR staffing data is presented in the October 2022 Quarterly report. This can be found at: Quarterly Reports

Figure 3. Extent of services that were redeployed/stopped providing cardiac rehabilitation in 2021

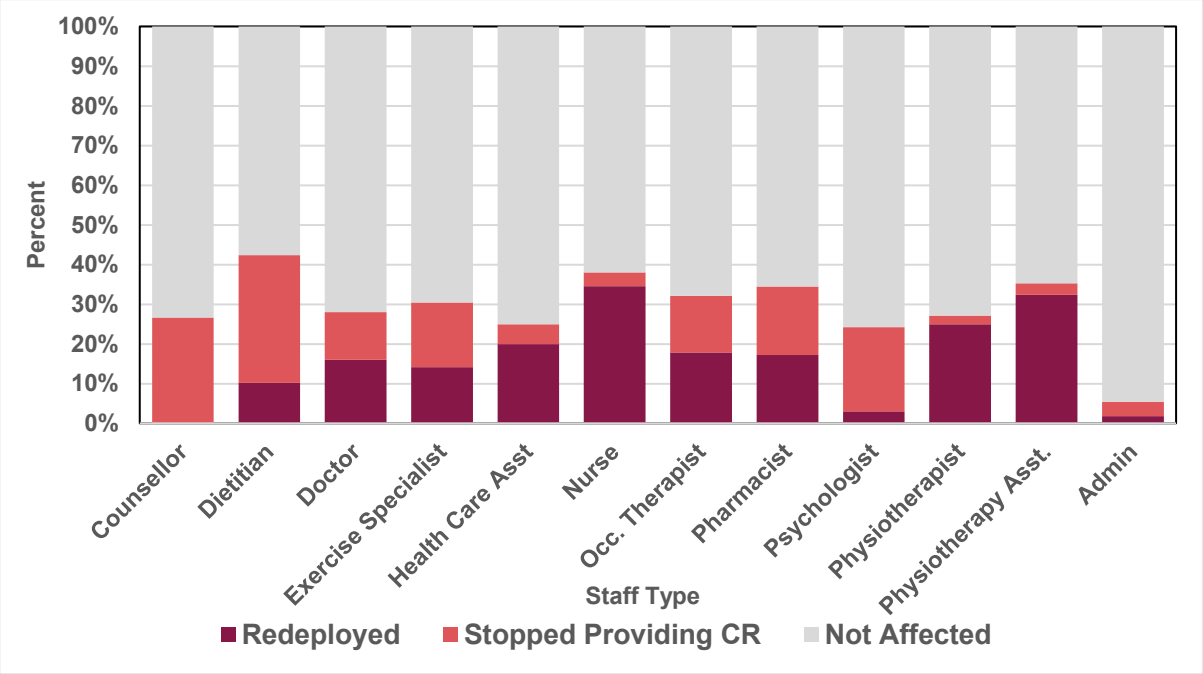


n=103

Question three: Which staff types were redeployed or stopped providing CR?

This question was completed by all programmes and shows the level of redeployment/ stopped providing CR by each staff type. There is variation across staff types in both the level of impact and the cause. Administrative staff were least affected, whereas dietitians were most impacted. Nurses showed the highest levels of redeployment.

Figure 4. Staff type who were redeployed/stopped providing cardiac rehabilitation in 2021



n=103

Question four: **Since the start of the Covid-19 pandemic, have any of your staff left the CR team e.g. retired, moved to another job outside the NHS, moved to another job within the NHS, on long term sick?**

Two thirds of programmes had some staff loss with only 35.5% stating none (Table 6). The most common reasons were staff movement within the NHS (32.6%) or staff retirement (31.4%).

Table 6. Staff loss

	Programme count	%
No	59	35.5
Moved jobs within NHS	57	32.6
Moved jobs outside the NHS	24	14.0
Retired	55	31.4
Currently on long term sick	32	17.4
Other (eg. maternity leave)	30	16.9
Total	166	

Question five: **If there were staff leaving were these posts replaced?**

The most concerning statistic is that of 110 services reporting that staff had left the team, 50.9% stated that not all positions had been replaced (21.8% - some positions replaced and 27.3% - no positions replaced) (Table 7).

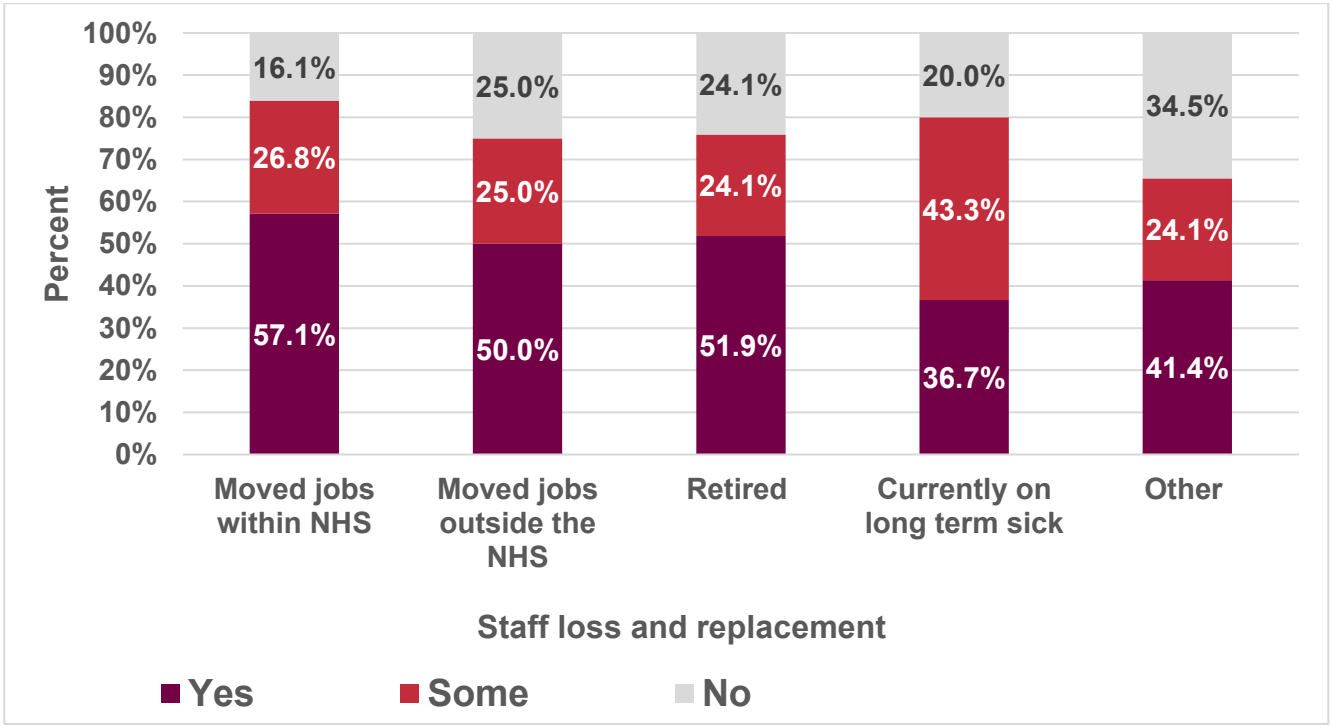
Table 7. Were staff posts replaced

	Programme count	%
Yes	56	50.9
No	30	27.3
Some	24	21.8
Total	110	

Figure 5 summarises the responses regarding staff movement, retirement and replacement highlighting that CR staffing provision has yet to recover to pre Covid-19 levels. Across the different reasons for staff loss, 16.1%-34.5% of staff were not replaced in 2021. These findings reiterate the need to highlight the risk of a future large-scale staff shortage if the NHS is to meet its 85% uptake target by 2028.

Recent NHS England funding across Clinical Networks and ongoing work on present and future workforce is expected to yield benefits in terms of staffing over the next 12 months. NACR will also work with the Health and Social Care Trusts in Northern Ireland and Health Boards in Wales to identify areas where improvements can be made and support the building of business cases to promote a multidisciplinary and optimal long-term CR team.

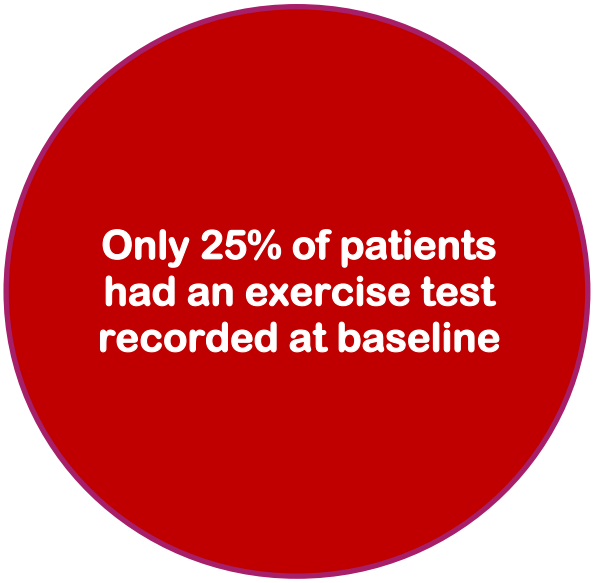
Figure 5. Staff loss and replacement in 2021



n=110

SECTION 3

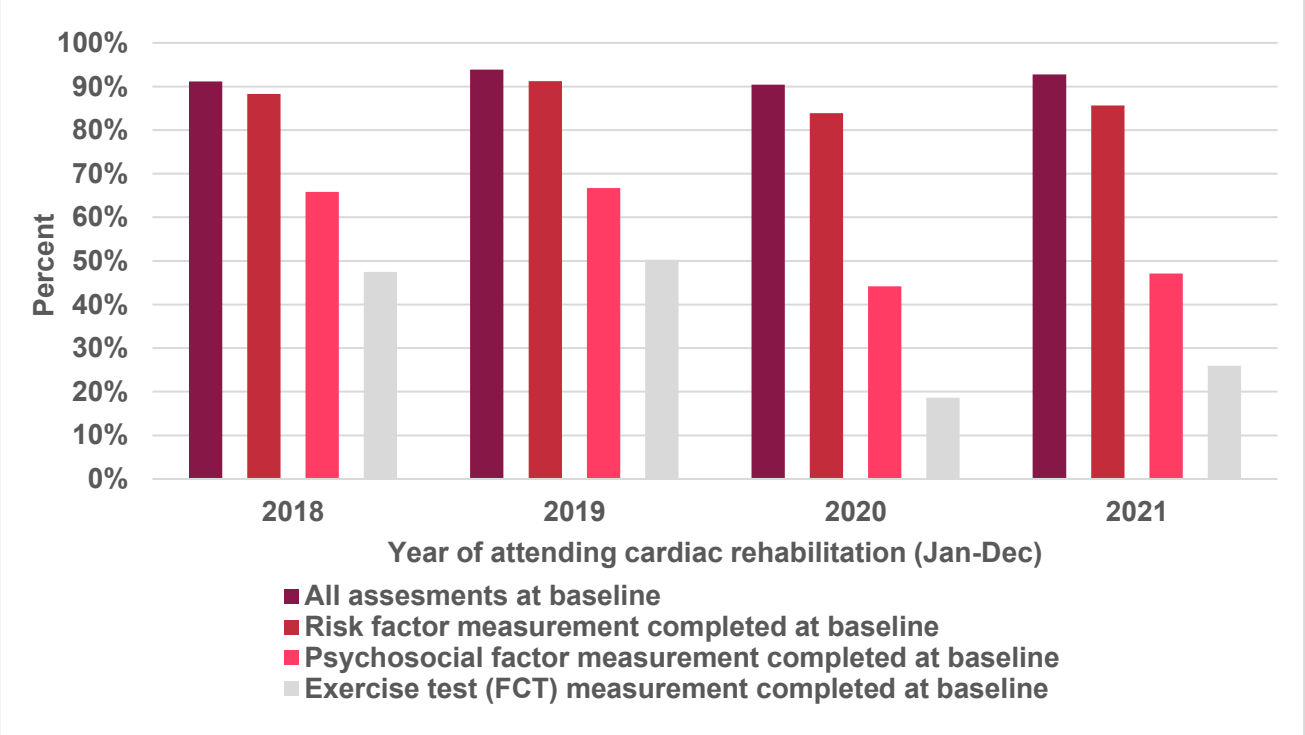
Baseline assessment at the start of cardiac rehabilitation



Within the NACR data set, there are over 30 different tools and measures that can be entered into the assessment record. BACPR Standard 3 states that all patients should receive 'early initial assessment of individual patient needs, which informs the agreed personalised goals that are reviewed regularly' (BACPR 2017). In addition, the specific components of the assessments are grouped into categories such as risk factor assessment, exercise testing (FCT) and psychosocial wellbeing.

Figure 6 shows data from 2018 to 2021, with the percent of patients that started core CR with a baseline assessment recorded and within that a breakdown of risk factor, psychosocial wellbeing and exercise testing (FCT) (ISWT, 6MWT or other MET score) measured at baseline.

Figure 6. Cardiac rehabilitation baseline assessment rates by core component



n=222,605

The trend throughout 2018 to 2021 shows that 90% or more patients had baseline assessment of at least one measure (Figure 6). When we analysed across the three assessment categories nearly all patients had risk factors recorded. In 2018 to 2019 two thirds of patients had psychosocial wellbeing recorded, and there was also an increase in the percent of patients with a recorded exercise test (FCT) from 47.5% in 2018 to 50.3% in 2019.

However, in 2020 there was a substantial drop in the components being recorded for patients, especially for exercise testing (FCT), with an absolute drop of 31.6% percentage points from 2019 to 2020. This decline seems to have improved slightly in 2021 with a movement back towards pre-pandemic levels, however, this is still only one quarter of all starters having an objective exercise test (FCT) measured/recorded.

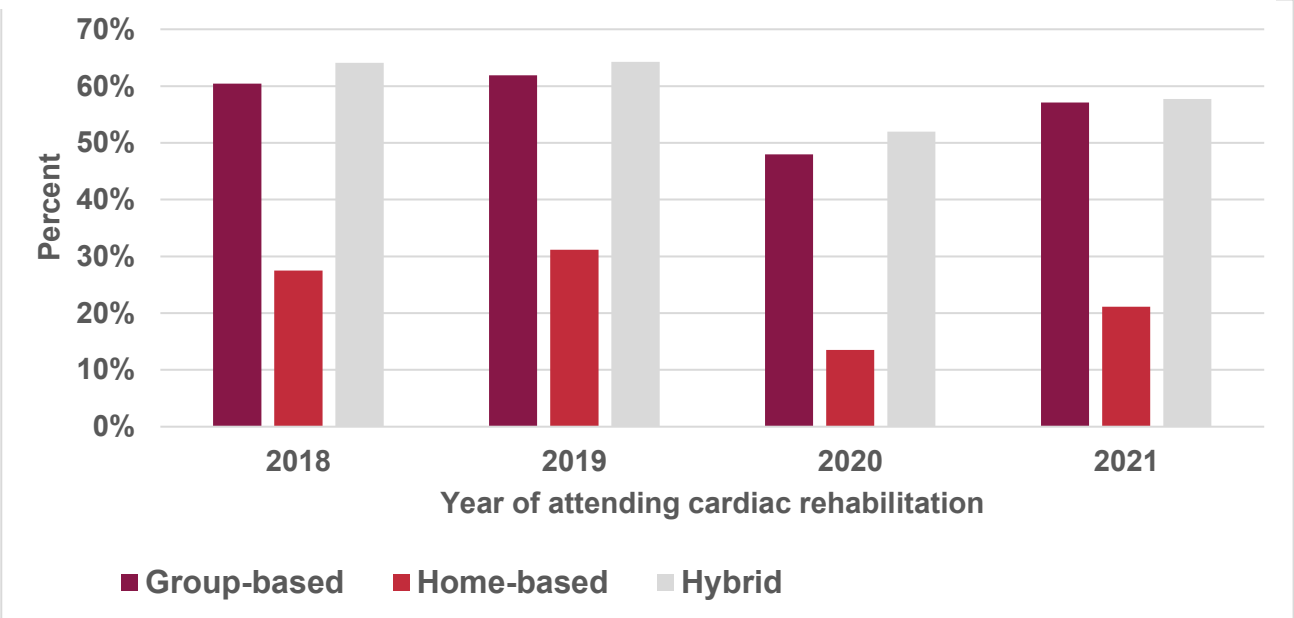
Furthermore, the psychosocial wellbeing measure declined in 2020 by 22.6% percentage points. This has not yet recovered to the 66.7% pre-pandemic levels and should be a focus for clinicians, due to the significant burden and link between cardiovascular disease, psychosocial wellbeing and long-term successful lifestyle change.

This year the audit has also investigated the extent to which assessment components are completed by mode of delivery. As discussed in Section 1, the extent to which rehabilitation has become dominated by home-based in the last two years is extensive and this is likely to be a trend that continues.

Figure 7 shows the percent of patients in the three modes that had a direct (objective) exercise test (FCT) recorded over four years and indicates a reduction in the rate of these assessments in 2020 and 2021. However, what is important to highlight is the consistently lower rates of exercise test (FCT) assessment in home-based CR compared to group based – in 2018 and 2019, around 30% fewer patients had an exercise test (FCT) when receiving home-based CR.

In the period impacted by Covid-19, the difference was even greater, with only one third of patients who received an exercise test (FCT) assessment in group-based CR having an equivalent assessment as part of home-based provision. The difference in 2021 is still stark with 35.9% lower in the home-based population.

Figure 7. Comparison of cardiac rehabilitation baseline exercise testing (FCT) assessments by mode of delivery



n=116,606

Despite exercise testing (FCT) being a core BACPR component it remains sub-optimal generally with on average of only 42% of patients being assessed prior to starting CR. In 2021, as seen in Figure 7, the lowest level of exercise testing (FCT) was home-based with an average of 21.2% of patients being assessed. Assessment rates for group-based and hybrid CR were two to three times higher than for home-based CR (Table 8). Across all three modes of CR delivery, patients from ethnic minorities had fewer exercise test (FCT) assessments compared to patients from white ethnicity. This was most evident in hybrid CR where the difference was 14.9% (53.5% – 38.6%) fewer patients from ethnic minorities having an exercise test (FCT). The low rate of assessment prior to commencing exercise training not only falls short of meeting national and international guidelines (ACSM 2021, BACPR 2017, ESC 2020) but is also associated with an increased likelihood of life-threatening adverse events (LAEs).

Table 8. Exercise testing (FCT) assessments by mode of cardiac rehabilitation and ethnicity in 2021

Mode of Delivery	Ethnicity	No exercise testing (FCT) recorded		Exercise testing (FCT) recorded	
		Count (%)	Assessment %	Count (%)	Assessment %
Group-based	White	1647 (76.5)	43.2	2169 (84.0)	56.8
	Ethnic minorities*	507 (23.5)	55.0	414 (16.0)	45.0
Home-based	White	12711 (81.4)	78.4	3494 (82.5)	21.6
	Ethnic minorities*	2899 (18.6)	79.6	741 (17.5)	20.4
Hybrid	White	1302 (70.8)	38.6	2067 (81.6)	61.4
	Ethnic minorities*	536 (29.2)	53.5	466 (18.4)	46.5

**Ethnic minorities – Includes Mixed, Asian/Asian British, Black/Black British or other ethnic groups*

The safety of exercise for patients with cardiovascular disease or those following a cardiac event is strongly related to having an exercise prescription based on an actual exercise test (FCT) (ACSM 2021, BACPR 2017, ESC 2020). A recent international audit of CR in patients with acute coronary syndrome found that the incidence of LAEs was zero in 277,721 patient-hours of CR exercise when based on a formal exercise test (FCT) prescription, whereas two LAEs occurred during 105,375 patient-hours when exercise training was not based on an exercise test (FCT) (Saito M, et al 2014). The likelihood of major adverse cardiac events is also high in patients with Heart Failure taking part in home-based CR exercise, which led these authors from the Mayo Clinic, to recommend an individualised prescription of exercise (Jallow H, et al 2022).

Applying the same approach as the above international study to the UK patient data set in 2022 we estimate that across all three modes of CR approximately 19,602 patients did not have an exercise test (FCT) recorded prior to starting CR. Using BACPR and European recommendations for CR exercise training (i.e. two one-hour sessions per week for 12 weeks) this equates to an estimated 19,602 patients x 24 one-hour exercise sessions approximating to 470,448 patient hours of exercise per year without a tailored exercise prescription. Although some of the missing exercise test data could be argued is related to a lack of recording on NACR we expect this is a small number. Some CR services have reported to NACR that they have lost NHS exercise space in the post Covid-19 era which has either hindered or stopped exercise testing prior to starting CR.

It is clear that patients who start exercise without a baseline exercise assessment (FCT), irrespective of the mode of CR, carry an increased risk of LAEs. Our current data, which reflects CR in the post Covid-19 era, shows that most patients in routine clinical practice do not have an exercise test (FCT) measured/recorded prior to starting exercise training. The lowest rate of assessment is most prevalent in home-based programmes. This is an extremely important issue for UK CR requiring large scale changes in service provision to help lower the risk of LAEs associated with non-formal exercise training (i.e. without an exercise test (FCT) based prescription). Future NACR analysis will investigate and report on the level of assessment variation at national, regional and local programme levels.

SECTION 4

National Certification Programme for Cardiac Rehabilitation

This section summarises the NCP_CR report published in October 2022 (Certification Reports)

The National Certification Programme relies heavily on CR teams entering data and we are delighted to see that most are now in a position to do so, enabling the NCP_CR Steering Committee to assess the quality of CR service delivery. The increase in data entry in this period has allowed NCP_CR to revert back to the four-category certification approach (Green certified, Amber, Red, Fail) standing down the Green (not certified) status.

NCP_CR summary

A total of 205 programmes this year were eligible for the certification process, and of these 185 had NACR data entered allowing them to meet KPIs above the MDT (multidisciplinary team – taken from the Staffing Survey) standard. Nineteen programmes in England and one in Wales had no electronic data.

As shown in Table 9, 82 programmes (40.0%) met all seven standards and will be certified for the 2022-23 period (based on Jan-Dec 2021 data). This represents an increase of 18 programmes (10.7%) being Green certified compared to last year. At the same time there has been an increase in Amber status programmes (69 up from 62 last year) and a reduction in Red status which is also encouraging.

Table 9. NCP_CR certification status for the 2021 data period

	England (n=184)	N. Ireland (n=9)	Wales (n=12)	UK (n=205)
	Count (%)	Count (%)	Count (%)	Count (%)
Green Certified	73 (39.7)	2 (22.2)	7 (58.3)	82 (40.0)
Amber	60 (32.6)	5 (55.6)	4 (33.3)	69 (33.7)
Red	30 (16.3)	2 (22.2)	0	32 (15.6)
Fail	21 (11.4)	0	1 (8.3)	22 (10.7)

On the less positive side, with the exception of Northern Ireland, there has been an increase of nine programmes in the Fail category compared to last year. Some of these programmes continue to be significantly impacted by Covid-19 and associated redeployment. When this is set against staff loss due to retirement it highlights the pressures clinical teams are facing.

Nation specific certification outcomes

England, with 184 programmes, has some clear positives with big gains in Green certified programmes (an increase of 18) on last year but at the same time there were eight more programmes in the Fail category.

Northern Ireland, with nine programmes, has the same number of Green certified programmes (two) as last year but two programmes have slipped into Red status. For two years running they have zero Fail status programmes.

Wales, with 12 programmes, has the same number of Green certified programmes (seven) as last year, but now has one Fail status programme that was in the Red status in 2021.

SECTION 5

Recommendations and actions

Based on the data from this year's report the NACR Steering Committee proposes the following recommendations and actions for CR services:

Key recommendations	Recommended actions
Implement service change to reduce known inequalities in CR provision	a) Ensure services are offering, promoting and supporting delivery of all three primary modes of CR (group-based; home-based; hybrid) to all eligible patient groups b) Take proactive steps to recruit more patients from underrepresented ethnic groups, patients from areas of higher deprivation and rural areas
Ensure that all CR delivered across different modes (e.g. home-based, group-based and hybrid versions) aligns with BACPR standards	For each patient check that the core components of CR are incorporated and supported by an appropriate multidisciplinary staff team
Make sure that CR is tailored to patient needs through a comprehensive baseline assessment	Review patient assessment protocols and routine practice assessment to ensure they are implemented thoroughly at the start of CR and ensure that the findings are documented in a format that can be audited
Reduce excess risk associated with exercise training as part of CR	Ensure that all patients taking part in CR exercise have a baseline exercise test (FCT)
Ensure CR staffing levels are appropriate to support a quality CR service for all eligible patients	Work with service managers, Cardiac Networks, Health and Social Care Trusts and Health Boards to develop a robust staffing business case

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A national audit relies on good quality data which is only possible through the willingness of clinical teams to audit their service and to work with us to improve CR quality. A major aspect of their work involves entering comprehensive patient data which is done alongside completing clinical assessments and questionnaires specific to our audit reporting. We would like to thank them for their continued support.

Thanks also to NHS Digital who not only hosts NACR but also offers the highest level of support which enables NACR to report using quality assured data.

As the patient voice for CR in the UK, the Cardiovascular Care Partnership UK (CCPUK) helps 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 helping us navigate a route to reporting in this challenging year. They are:

Alison Allen (Wales User representative)
Dr Kathryn Carver (BACPR President)
Wendy Caulkin (Patient representative)
Richard Corder (CCPUK President)
Dr Hayes Dalal (NCP_CR co-chair)
Chris Dew (Information Analysis Lead Manager, NHS Digital)
Jennifer Hannay (England User representative)
Sally Hinton (Executive Director, BACPR)
Sarah Howard (Wales User representative)
Alana Laverty (Northern Ireland Representative)
Janine O'Rourke (England User representative)
Dr Lars Tang (International NACR Representative)

Writing group:

Professor Patrick Doherty, Director of NACR
Dr Alex Harrison, Health Services Researcher (Analyst)
Corinna Petre, NACR Project Manager
Nerina Onion, NACR Programme Manager
Jessica Hemingway, NACR Administrator
Dr Lars Tang, International NACR Representative
NACR Steering Committee (oversight and approval)

For further information and contact details please visit: NACR Website

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List of Supplements

In addition to the data and figures within this report, NACR provides local and regional reports online. These supplements can be used to inform services and drive improvement. The full list of available supplements is below and they can be accessed from the following web link. Annual Report Supplements

- Supplement Participation Report
- Staffing Report
- Exercise Test (FCT) Report
- Inequalities Report
- Comorbidities Report
- Early CR Report
- Certification Supplements

Bibliography:

- American College of Sports Medicine. ACSM's Guidelines for Exercise Testing and Prescription. 11th Edition (2021) Philadelphia Lippincott, Williams & Wilkins.
- Anderson L, Oldridge N, Thompson DR, et al. Exercise based cardiac rehabilitation for coronary heart disease: Cochrane systematic review and meta- analysis. *Journal of the American College of Cardiology* 2016; 67 (1): 1-12. https://doi.org/10.1016/j.jacc.2015.10.044
- British Association for Cardiovascular Prevention and Rehabilitation (2017). BACPR Standards and Core Components (3rd Edition). http://www.bacpr.com/resources/6A7_BACR_Standards_and_Core_ Components_2017.pdf
- Cowie A, Buckley J, Doherty P on behalf of the British Association for Cardiovascular Prevention and Rehabilitation (BACPR), et al. Standards and core components for cardiovascular disease prevention and rehabilitation. *Heart* 2019;105:510-515.
- Dalal H, Doherty P, Taylor R. Clinical Review: Cardiac Rehabilitation. *British Medical Journal* 2015; 351: h5000. https://doi.org/10.1136/bmj.h5000
- Dalal HM, Evans PH, Campbell JL, Taylor RS, Watt A, Read KL, Mourant AJ, Wingham J, Thompson DR, Pereira Gray DJ. Home-based versus hospital-based rehabilitation after myocardial infarction: A randomized trial with preference arms--Cornwall Heart Attack Rehabilitation Management Study (CHARMS). *International Journal of Cardiology*. 2007 Jul 10;119(2):202-11. doi: 10.1016/j.ijcard.2006.11.018. Epub 2006 Dec 28. PMID: 17196274.
- Doherty P and Lewin B. The RAMIT trial, a pragmatic RCT of cardiac rehabilitation versus usual care: what does it tell us? *BMJ Heart* 2012; 98: 605-6. https://doi.org/10.1136/heartjnl-2012-301728
- Fell J, Dale V, Doherty P. Does the timing of cardiac rehabilitation impact fitness outcomes? An observational analysis. *Open Heart* 2016 Feb 8; 3(1): e000369. https://doi.org/10.1136/openhrt-2015-000369
- Furze G, Doherty P, Grant-Pearce C. Development of a UK National Certification Programme for Cardiac Rehabilitation (NCP_CR). *British Journal of Cardiology* 2016; 23: (2). https://doi.org/10.5837/bjc.2016.024
- Hinde S, Harrison A, Bojke L, et al. Quantifying the impact of delayed delivery of cardiac rehabilitation on patients' health. *European Journal of Preventive Cardiology* 2020. https://doi.org/10.1177/2047487320912625
- Imran HM, Baig M, Erqou S, et al. Home-based cardiac rehabilitation alone and hybrid with center-based cardiac rehabilitation in heart failure: a systematic review and meta-analysis. *Journal of the American Heart Association*. 2019 Aug 20; 8(16): e012779. https://doi.org/10.1161/JAHA.119.012779
- Jallow H, Chacin-Suarez A, Medina-Inojosa J, et al. Major adverse cardiovascular events in heart failure patients with multimorbidity undergoing cardiac rehabilitation: a community cohort. *Journal of the American College of Cardiology*. 2022 Mar, 79 (9_Supplement) 1590.
- Mafham MM, Spata E, Goldacre R, et al 2020. COVID-19 pandemic and admission rates for and management of acute coronary syndromes in England. *Lancet* 2020; 396: (10248), 381-9. https://doi.org/10.1016/S0140-6736(20)31356-8
- NICE 2010 Unstable angina and NSTEMI: early management. NICE Clinical Guideline 94. https://www.nice.org.uk/guidance/CG94
- NICE 2013 MI-secondary prevention in primary and secondary care for patients following a myocardial infarction. NICE clinical guideline 172. https://www.nice.org.uk/Guidance/CG172
- NICE 2018 Chronic heart failure in adults: diagnosis and management. NICE guideline

106. https://www.nice.org.uk/guidance/ng106

- Pelliccia A, Sharma S, Gati S, et al. ESC Scientific Document Group, 2020 ESC Guidelines on sports cardiology and exercise in patients with cardiovascular disease: The Task Force on sports cardiology and exercise in patients with cardiovascular disease of the European Society of Cardiology (ESC), *European Heart Journal*, Volume 42, Issue 1, 1 January 2021, Pages 17–96.
- Piepoli M, Corrà U, Adamopoulos S, et al. Secondary prevention in the clinical management of patients with cardiovascular diseases. Core components, standards and outcome measures for referral and delivery. *European Journal of Preventive Cardiology* 2012; June 20. https://doi.org/10.1177/2047487312449597
- Rauch B, Davos C H, Doherty, P, et al. The prognostic effect of cardiac rehabilitation in the era of acute revascularisation and statin therapy: A systematic review and meta-analysis of randomized and non-randomized studies – The Cardiac Rehabilitation Outcome Study (CROS). *European Journal of Preventative Cardiology*. 2016; 23(18):1914-39. https://dx.doi.org/10.1177%2F2047487316671181
- Salzwedel A, Jensen K, Rauch B, et al. Effectiveness of comprehensive cardiac rehabilitation in coronary artery disease patients treated according to contemporary evidence based medicine: Update of the Cardiac Rehabilitation Outcome Study (CROS-II). *European Journal of Preventive Cardiology*. February 2020. https://doi.org/10.1177/2047487320905719
- Saito M, Ueshima K, Saito M et al. Japanese Cardiac Rehabilitation Survey Investigators. Safety of exercise-based cardiac rehabilitation and exercise testing for cardiac patients in Japan: a nationwide survey. *Circulation Journal*. 2014;78(7):1646-53. doi: 10.1253/circj.cj-13-159. Epub 2014 May 19. PMID: 24837707.
- Scottish Intercollegiate Guidelines Network SIGN. Cardiac rehabilitation: A national clinical guideline No. 150. Scottish Intercollegiate Guidelines Network; 2017. https://www.sign.ac.uk/media/1047/sign150.pdf
- Shields GE, Wells A, Doherty P, et al. Cost-effectiveness of cardiac rehabilitation: a systematic review. *Heart* 2018; 104: 1403-1410. https://doi.org/10.1136/heartjnl-2017-312809
- Sumner J, Böhnke JR, Doherty P. Does service timing matter for psychological outcomes in cardiac rehabilitation? Insights from the National Audit of Cardiac Rehabilitation. *European Journal of Preventative Cardiology* 2017; November 9. https://doi.org/10.1177%2F2047487317740951
- Taylor R, Sagar V, Davies E, Briscoe S, et al. Exercise-based rehabilitation for heart failure. *The Cochrane Library* 2014, Issue 4. Art.No.:CD003331. http://doi.org/10.1002/14651858.CD003331.pub4
- West RR, Jones DA, Henderson AH. Rehabilitation After Myocardial Infarction Trial (RAMIT): multi-centre randomised controlled trial of comprehensive cardiac rehabilitation in patients following acute myocardial infarction. *Heart* 2011; 98: 637–44. http://dx.doi.org/10.1136/heartjnl-2011-300302
- Wood D. Is cardiac rehabilitation fit for purpose in the NHS: maybe not. *Heart* 2012; 98: 607-8. http://dx.doi.org/10.1136/heartjnl-2012-301811