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Systematic screening for anxiety and depression in cardiac rehabilitation – are we there yet?☆

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ABSTRACT

Background: Anxiety and depression are prevalent in 20% of patients with acute coronary syndrome (ACS) and associated with poor outcomes. Guidelines recommend screening for these conditions in cardiac rehabilitation (CR) however, clinical practice is inconsistent. Sparse knowledge exists on determinants for screening.
Methods: This observational study used data from the National Audit of Cardiac Rehabilitation from January 2016–December 2019. A multivariate logistic regression model was performed to analyze patient- and provider level determinants for screening for anxiety and depression among patients with ACS.
Results: The population consisted of 138,018 patients, where 82,507 (59.8%) were screened and 55,511 (40.2%) were not. Younger age, non-white ethnicity, living in areas of social deprivation, current smoking, body mass index>30, and physical activity<150 min per week were negatively correlated with patients being screened. Compared to patients having a percutaneous coronary intervention, patients undergoing coronary artery bypass grafting or medical treatment were less likely to be screened. History of anxiety, depression, osteoporosis, chronic back problems, and asthma were positively correlated with screening, while chronic obstructive pulmonary disease, diabetes, hypertension, and stroke were negatively correlated with screening. Regarding provider level, certification of CR centers was positively associated with screening, while looking over time data showed an incremental negative trend in screening from 2016 to 2019.
Conclusion: We found both patient and provider level determinants of screening for anxiety and depression. Clinical practice is still inconsistent especially for high-risk groups. We recommend systematic screening to enable tailored interventions which in turn may mitigate inequity in health outcomes.

1. Introduction

In Europe alone, more than 108 million people are estimated to be living with a cardiac disease, including acute coronary syndrome (ACS) [1]. Approximately 20% of patients with ACS suffer from symptoms of comorbid anxiety and/or depression, increasing their risk of both morbidity and mortality [2,3]. Therefore, it is important to identify and treat patients for both their underlying cardiovascular disease alongside symptoms of anxiety and depression [4–6].

Cardiac rehabilitation (CR) is an evidence-based multidisciplinary intervention consisting of a range of core components, including screening for anxiety and depression [7]. Clinical guidelines have recommended screening for anxiety and depression as part of comprehensive CR for years [8,9]. Nevertheless, a small number of studies suggest clinical practice is still far from implementing systematic screening in CR [10–12]. Anxiety and depression have been shown to act as barriers to treatment adherence and life-style changes which may reduce the effect of CR [7,13]. Hence, identifying these psychosocial risk factors in patients are crucial in order to improve clinical and patient-reported outcomes. Several factors associated with anxiety and depression in patients with ACS have been investigated. Younger age, living alone, living in an area of high social deprivation, increased number of comorbidities, high body mass index (BMI), physical inactivity, and smoking are all associated with increased prevalence of anxiety and/or

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depression [14,15].

While several studies have investigated the association between anxiety and/or depression and ACS, we know little about whether subgroups of patients with ACS are less likely to be systematically screened for anxiety and/or depression in routine CR as compared to other patients. One study conducted in the general population in the United States found that calendar year, female gender, physician specialty, metropolitan location, geographical region, and time spent with the physician were significantly associated with performing screening for depression [16]. Even though the latter study is not conducted in patients with ACS, the findings raise the question if there might be similar patient or provider level characteristics, determining if ACS patients are screened for anxiety and depression as part of routine CR. Understanding what factors might be associated with a tendency to refrain from screening in patients with ACS and elevated risk of anxiety and/or depression may help to improve the quality of CR services with respect to patients' psychosocial burden. Thus, the aim of the current study was to investigate if the likelihood that patients with ACS are screened for anxiety and depression, as part of routine practice CR, is associated with patient characteristics and service quality at the provider level.

2. Methods

We used an observational study design and the STROBE guidelines (Strengthening the Reporting of Observational Studies in Epidemiology) [17] for reporting the results.

2.1. Data collection

All data were collected in routine CR in the United Kingdom (UK). The National Audit of Cardiac Rehabilitation (NACR) collects a large variety of data at both patient and provider level to maintain and improve the quality of CR [18]. Data includes sociodemographic, clinical variables and outcomes at the patient level, as well as service level variations at the provider level according to the British Association for Cardiac Prevention and Rehabilitation (BACPR) standards [19]. The NACR is hosted by NHS Digital, and data are collected and monitored under NHS data requirements. NACR has permission to use anonymized data for quality purposes without needing separate ethical approval or individual informed consent.

2.2. Participants

The study population consisted of patients from the NACR database with ACS and a pre-CR assessment in the period from 1st January 2016 to 31st December 2019 (n = 138.018). Due to the large variation in patient presentation, entry into CR as well as the service change throughout the COVID-19 pandemic, all data from 2020 was excluded [18] [20].

2.3. Variables of interest

2.3.1. Outcome measure

Screening for anxiety and depression is a core component of CR which should be executed using a validated tool [7]. Within NACR it is possible to register data with respect to screening for anxiety and depression based on three validated patient-reported questionnaires: the Hospital Anxiety and Depression Scale (HADS) [21], the Generalized Anxiety Disorder (GAD-7) [22] and the Patient Health Questionnaire (PHQ-9) [23]. A composite binary outcome was generated from these questionnaires, so either both domains of the HADS or both the GAD-7 and the PHQ-9 had to be reported in NACR for a patient to be considered screened for anxiety and depression.

2.3.2. Screening tools

The HADS consists of 14 items with seven items covering the domains anxiety and depression, respectively. The HADS is widely used in the CR settings [4] and is reliable and valid for the assessment of cardiac patients [21]. GAD-7 consists of seven items on general anxiety, while PHQ-9 consists of 9 items on depression. All questionnaires are scored on a scale from 0 to 3, with higher scores indicating more symptoms. Hence, HADS and GAD-7 scores will be in a range from 0 to 21, while PHQ-9 scores will have a score range of 0–27.

2.3.3. Exposure measures

Variables selected for adjustment were chosen a priori based on the literature on factors associated with psychosocial wellbeing and expert opinions, since the literature on the topic is sparse. Regarding sociodemographic variables, age was used as a continuous variable while gender was categorized as male or female. Marital status was categorized as single (single/widowed/separated) or partnered (married/partnered), and ethnic group as white or non-white. Index of multiple deprivation (IMD) is a measure that classifies the relative deprivation of a small area in England [24]. Seven domains of deprivation are weighted differently and aggregated into one single score. We categorized the IMD score into quintiles. With respect to clinical variables, we categorized treatment for ACS as either percutaneous coronary intervention (PCI), coronary artery bypass grafting (CABG) or medically managed. We used current smoking (yes/no), physical activity <150 min pr week (yes/no), and BMI (BMI $<$ 30 versus BMI $\geq$ 30) as binary variables. Data on comorbidity was collected from patients' medical history, which was verified by CR clinicians. We used depression, anxiety, diabetes, stroke, osteoporosis, hypertension, chronic obstructive pulmonary disease, asthma, and chronic back problems as binary variables (yes/no). Concerning provider level data, we used these as an indicator for quality of CR services. We categorized the CR programs as certified or not, according to the National Certification Program for Cardiac Rehabilitation in the UK [12,18,19]. To be classified as certified, the individual program had to meet all seven key performance indicators. To assess improvement over time we included year of CR.

2.4. Statistical analysis

Descriptive statistics were used to summarize the baseline characteristics in terms of means, standard deviations, and percentages. For comparing baseline characteristics between groups of screened versus non-screened, we used Student's t-test for continuous variables and Chi^2-test for categorical variables. For analysis of determinants for screening for anxiety and depression, we used a multivariate logistic regression model, applying odds-ratios. Since NACR contains a wide range of comorbidities (n = 18) we conducted a stepwise backward selection of these and chose beforehand to remove erectile dysfunction as it is a male only condition. Further eight comorbidities were removed in this process due to statistical insignificance.

The impact of missing cases in the multivariate analysis was tested using a forward stepwise selection of groups of core variables. Inclusion of variables did not alter the results in the first four steps, while the final step with inclusion of IMD led to change of significance level in gender and marital status. We chose to keep IMD in the main model as previous studies have shown a strong association with psychosocial burden [4] as well as mortality [25]. The full dataset is presented in the supplementary material (Supplementary material A).

Furthermore, we investigated the prevalence of anxiety and depression using the commonly clinical cut-off scores of HADS [21] and reported as numbers and percentages. We analyzed if anxiety and depression were evenly distributed across the five levels of IMD. We only included HADS scores in these sub analyses, as the scores represented the overall majority of the population and scoring range as well as cut-off scores differ from HADS in the remaining questionnaires.

A statistical level of <0.05 was applied to the analyses. All statistical

analyses were conducted using STATA version 16.

3. Results

3.1. Study population

The total study population consisted of 440,405 patients entered in the NACR database during a 4-year period (Fig. 1). Out of these, 138,018 had both assessment 1 and a diagnosis of ACS and constituted the study population. We found that 59.8% of the study population were screened for anxiety and depression at start of CR, while the remaining 40.2% were not. Among the screened patients, 91.3% (n = 75,315) were screened with HADS, while 8.9% (n = 7333) were screened with GAD-7 plus PHQ-9, and 0.2% (n = 141) with both combinations.

3.2. Baseline characteristics

Table 1 describes the study population, comparing screened with non-screened for anxiety and depression. At baseline the two groups differed in terms of statistical significance on all characteristics (p < 0.001 for all). The subgroups more likely to be screened were those with younger age, being male, being partnered, white ethnicity, living in the least deprived areas, treated with PCI or CABG, non-smoking, physically active>150 min weekly, and having a BMI < 30. Regarding comorbidities, patients with depression, anxiety, osteoporosis, chronic back problems, and asthma were more likely to be screened than patients without the comorbidities. Patients with chronic obstructive pulmonary disease, diabetes, stroke, and hypertension were less likely to be screened than patients without these comorbidities. At the provider level, we found that certified CR centers were more likely to screen for anxiety and depression compared to uncertified CR centers. For development over time, we found that patients were less likely to be screened in 2016 compared to the following years.

3.3. Logistic regression model

Table 2 shows the adjusted odds-ratios (OR) for being screened for anxiety and depression, with the inclusion of 44,119 cases. In relation to socio-demographics, younger patients (OR 0.99; 95% CI: 0.99–0.99; p < 0.001) and patients with non-white ethnicity (OR 0.82; 95% CI: 0.75–0.89; p < 0.001) were less likely to be screened for anxiety and depression. Patients living in the least deprived areas were more likely to be screened for anxiety and depression, compared to the most deprived area (OR 1.39; 95% CI: 1.27–1.55; p < 0.001). We found no statistically significant associations between being screened and gender and marital status, respectively.

With respect to the clinical variables, treatment with CABG or medically managed patients were less likely to be screened for anxiety and depression compared to patients treated with PCI (OR 0.84; 95% CI: 0.77–0.92; p < 0.001) (OR 0.71; 95% CI: 0.67–0.75; p < 0.001). Patients who were currently smoking (OR 0.57; 95% CI: 0.52–0.61; p < 0.001), were physically active<150 min/week (OR 0.60; 95% CI: 0.57–0.64; p < 0.001), had a BMI ≥ 30 (OR 0.77; 95% CI: 0.73–0.81; p < 0.001) were less likely to be screened.

We found five comorbidities that were positively associated with screening for anxiety and depression. These were depression (OR 1.15; 95% CI: 1.03–1.28; p = 0.012), anxiety (OR 1.24; 95% CI: 1.11–1.38; p < 0.001), osteoporosis (OR 1.25; 95% CI: 1.03–1.52; p = 0.025), chronic back problems (OR 1.82; 95% CI: 1.66–2.00; p < 0.001), and asthma (OR 1.12; 95% CI: 1.03–1.23; p = 0.012). We also found four comorbidities that were negatively associated with screening for anxiety and depression, including chronic obstructive pulmonary disease (OR 0.84; 95% CI: 0.74–0.96; p = 0.012), diabetes (OR 0.93; 95% CI: 0.88–0.99; p = 0.024), hypertension (OR 0.95; 95% CI: 0.90–0.99; p = 0.033), and stroke (OR 0.85; 95% CI: 0.76–0.96; p = 0.007).

Provider level data showed that certification of CR centers was positively associated with screening for anxiety and depression (OR 1.55; 95% CI: 1.47–1.62; p < 0.001). With respect to changes in screening over time, the data showed an incremental negative trend

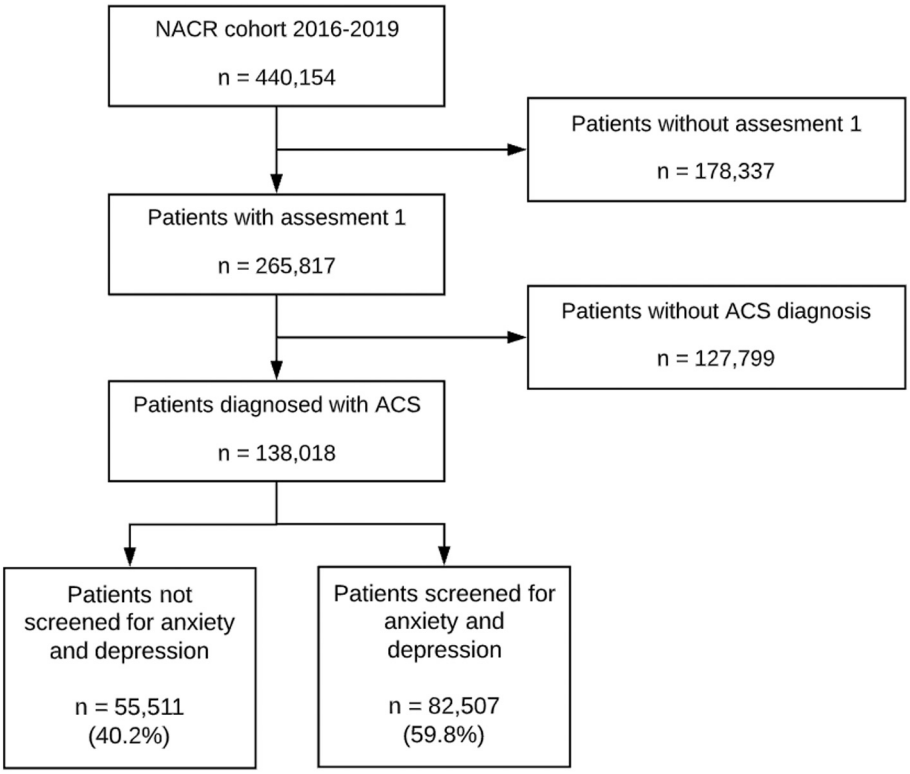

Fig. 1. Flowchart of the study population.

Table 1
Baseline characteristics of patients with acute coronary syndrome with first assessment in cardiac rehabilitation, stratified by screening for anxiety and depression (*p*-value between non-screened vs. screened).

Variables	Total	Non-screened	Screened	p-value*
Socio-demographics n (%)				
Age: mean (SD), range (n=138,018)	65.2 (12.3), 18-118	66.2 (13.0), 18-118	64.6 (11.7), 18-102	<0.001
Gender (n=136,408)				<0.001
Female	37,592 (27.6)	16,488 (43.8)	21,144 (56.2)	
Male	98,816 (72.4)	37,880 (38.3)	60,936 (61.7)	
Marital status (n=94,969)				<0.001
Single	24,334 (25.6)	9,430 (38.8)	14,904 (61.2)	
Partnered	70,635 (74.4)	24,246 (34.3)	46,389 (65.7)	
Ethnic group (n=112,379)				<0.001
Non-White	10,770 (9.6)	4,866 (45.2)	5,904 (54.8)	
White	101,609 (90.4)	38,178 (37.6)	63,431 (62.4)	
Index of Multiple Deprivation (n=114,104)				<0.001
Lowest quintile	21,314 (18.7)	10,559 (49.5)	10,755 (50.5)	
Second quintile	21,841 (19.1)	9,564 (43.8)	12,277 (56.2)	
Third quintile	23,273 (20.4)	9,143 (39.3)	14,128 (60.7)	
Fourth quintile	23,809 (20.9)	8,636 (36.3)	15,173 (63.7)	
Highest quintile	23,869 (20.9)	7,466 (31.3)	16,403 (68.7)	
Clinical data n (%)				
Treatment for ACS (n=138,018)				<0.001
Percutaneous coronary intervention	90,053 (65.2)	33,439 (37.1)	56,614 (62.9)	
Coronary artery bypass grafting	9,596 (7.0)	3,568 (37.2)	6,028 (62.8)	
Medically managed	38,369 (27.8)	18,504 (48.2)	19,865 (51.8)	
Smoking at start of CR (n=118,967)				<0.001
Yes	14,065 (11.8)	6,609 (47.0)	7,456 (53.0)	
No	104,902 (88.2)	33,656 (32.1)	71,246 (67.9)	
Physical activity<150 min/week (n=87,646)				<0.001
Yes	48,233 (55.0)	12,068 (25.0)	36,165 (75.0)	
No	39,413 (45.0)	5,808 (14.7)	33,605 (85.3)	
BMI (n=138,018)				<0.001
MI ≥ 30	63,327 (45.9)	32,687 (51.6)	30,640 (48.4)	
BMI < 30	74,691 (54.1)	22,824 (30.6)	51,867 (69.4)	
Comorbidities n (%) (n=107,580)				
Depression				<0.001
Yes	8,697 (8.0)	2,644 (30.4)	6,053 (69.6)	
No	98,883 (92.0)	37,675 (38.1)	61,208 (61.9)	
Anxiety				<0.001
Yes	8,043 (7.5)	2,317 (28.8)	5,726 (71.2)	
No	99,537 (92.5)	38,002 (38.2)	61,535 (61.8)	
Osteoporosis				<0.001
Yes	1,994 (1.9)	607 (30.4)	1,387 (69.6)	
No	105,586 (98.1)	39,712 (37.6)	65,874 (62.4)	
Chronic back problems				<0.001
Yes	9,937 (9.2)	2,146 (21.6)	7,791 (78.4)	
No	97,643 (90.8)	38,173 (39.1)	59,470 (60.9)	
Asthma				<0.001
Yes	9,178 (8.5)	3,203 (34.9)	5,975 (65.1)	
No	98,402 (91.5)	37,116 (37.7)	61.286 (62.3)	
Chronic obstructive pulmonary disease				<0.001
Yes	4,059 (3.8)	1,811 (44.6)	2,248 (55.4)	
No	103,521 (96.2)	38,508 (37.2)	65,013 (62.8)	
Diabetes				<0.001
Yes	24,018 (22.3)	9,957 (41.5)	14,061 (58.5)	
No	83,562 (77.7)	30,362 (36.3)	53,200 (63.7)	
Stroke				<0.001
Yes	4,822 (4.5)	2,152 (44.6)	2,670 (55.4)	
No	102,758 (95.5)	38,167 (37.1)	64,591 (62.9)	
Hypertension				<0.001
Yes	49,107 (45.7)	19,081 (38.9)	30,026 (61.1)	
No	58,473 (54.3)	21,238 (36.3)	37,235 (63.7)	
Provider level data n (%)				
CR Certification (n=138,017)				<0.001
Yes	76,176 (55.2)	25,523 (33.5)	50,652 (66.5)	
No	61,841 (44.8)	29,988 (48.5)	31,853 (51.5)	
Year of CR (n=138,018)				<0.001
2016	31,129 (22.6)	13,567 (43.6)	17,562 (56.4)	
2017	33,523 (24.3)	13,351 (39.8)	20,172 (60.2)	
2018	35,627 (25.8)	13,828 (38.8)	21,799 (61.2)	
2019	37.739 (27.3)	14,765 (39.1)	22,974 (60.9)	

Abbreviations: SD: standard deviation, ACS: acute coronary syndrome, CR: cardiac rehabilitation.
*p-values are based on t-test for continuous variables and chi^2 test for categorical variables.

from 2016 to 2019 (OR 0.84; 95% CI: 0.78–0.90; p < 0.001).

3.4. Prevalence of anxiety and depression stratified by IMD

For both HADS anxiety and depression scores we found an incremental decrease in scores, from the lowest to the highest level of IMD (Table 3). We found that 33% (n = 24,910) of the population suffered from clinically relevant levels of anxiety (HADS anxiety scores 8–21), and 22% (n = 16,570) from clinically relevant levels of depression (HADS depression scores 8–21). When stratifying by IMD we found a statistically significant difference in prevalence for both anxiety and depression ($p > 0.001$). The prevalence of anxiety varied from 21.8% in the lowest quintile to 19.0% in the highest quintile. For depression, we found a prevalence of 23.7% in the lowest quintile and 17.9% in the highest quintile.

4. Discussion

This study showed that a range of both patient characteristics and the service quality at provider level determine the likelihood of patients

Table 2
Multiple adjusted odds-ratios for screening for anxiety and depression (n = 41,119).

Variables	Odds ratio	95% CI low	95% CI high	p-value
Socio-demographic				
Age (continuous)	0.99	0.99	0.99	**<0.001**
Female gender	0.96	0.91	1.02	0.181
Marital status (single)	0.96	0.90	1.01	0.138
Ethnic group: Non-white (yes)	0.82	0.75	0.89	**<0.001**
Index of Multiple Deprivation:	Reference			
Lowest quintile				
Second quintile	1.20	1.11	1.31	**<0.001**
Third quintile	1.29	1.19	1.40	**<0.001**
Fourth quintile	1.17	1.08	1.27	**<0.001**
Highest quintile	1.39	1.27	1.51	**<0.001**
Clinical				
Treatment for ACS: *PCI*	Reference			
CABG	0.84	0.77	0.92	**<0.001**
Medically managed	0.71	0.67	0.75	**<0.001**
Current smoking (yes)	0.57	0.52	0.61	**<0.001**
Physical activity<150 min/ week (yes)	0.60	0.57	0.64	**<0.001**
BMI ≥ 30 (yes)	0.77	0.73	0.81	**<0.001**
Comorbidity				
Depression (yes)	1.15	1.03	1.28	**0.012**
Anxiety (yes)	1.24	1.11	1.38	**<0.001**
Osteoporosis (yes)	1.25	1.03	1.52	**0.025**
Chronic back problems (yes)	1.82	1.66	2.00	**<0.001**
Asthma (yes)	1.12	1.03	1.23	**0.012**
Chronic obstructive pulmonary disease (yes)	0.84	0.74	0.96	**0.008**
Diabetes (yes)	0.93	0.88	0.99	**0.024**
Hypertension (yes)	0.95	0.90	0.99	**0.033**
Stroke (yes)	0.85	0.76	0.96	**0.007**
Provider level				
Certified cardiac rehabilitation center (yes)	1.55	1.47	1.62	**<0.001**
Year of CR: *2016*	Reference			
2017	0.99	0.92	1.07	0.795
2018	0.89	0.82	0.96	**0.002**
2019	0.84	0.78	0.90	**<0.001**

Abbreviations: CI: confidence interval, ACS: acute coronary syndrome, PCI: percutaneous coronary intervention, CABG: coronary artery bypass grafting.

Table 3
Prevalence of anxiety and depression, measured by the Hospital Anxiety and Depression Scale (HADS), and stratified by Index of Multiple Deprivation.

HADS Scores	**HADS-Anxiety (n = 75,400)**	**HADS-Depression (n = 75.376)**
Mean (SD), range	6.0 (4.4), 0–21	4.7 (3.9), 0–21
Normal (0–7) n (%)	50,490 (67%)	58,806 (78%)
Clinically relevant anxiety and depression scores (8–21) n (%)	24,910 (33%)	16,570 (22%)
Proportion of patients with clinically relevant anxiety and depression scores, stratified on Index of Multiple Deprivation (HADS 8–21)		
Index of Multiple Deprivation	**HADS-Anxiety (n = 20,374)** * $p < 0.001$	**HADS-Depression (n = 13,486)** * $p < 0.001$
Lowest quintile n (%)	4445 (21.8%)	3190 (23.7%)
Second quintile n (%)	4196 (20.6%)	2869 (21.3%)
Third quintile n (%)	3950 (19.4%)	2576 (19.1%)
Fourth quintile n (%)	3915 (19.2%)	2440 (18.1%)
Highest quintile n (%)	3868 (19.0%)	2411 (17.9%)

* Missing cases due to missing data on Index of Multiple Deprivation.

with ACS being screened for anxiety and depression in routine CR. To our knowledge, this is the first study to investigate this within the cardiac field.

Regarding patient characteristics, we found three sociodemographic determinants that reduced the likelihood of being screened for anxiety and depression. These were younger age, non-white ethnicity, and living in areas of high social deprivation. One simple explanation for reduced screening in the non-white ethnicity group could be language barriers, as the screening tools are available only in English, however that is not likely to be the full explanation. Looking at the IMD, areas with high social deprivation are negatively associated with screening practice. At the same time, mean HADS scores were higher in areas with high social deprivation which is in alignment with the literature [4,15,26]. This signals that the prevalence of anxiety and depression might currently be underreported for these areas, as screening apparently is underperformed at the present time. We do not know if it is the low-risk patients who are not being screened for anxiety and depression in areas of high social deprivation. However, since the psychosocial burden is high and this is strongly associated with poor outcomes [4,25,27], further research is needed to investigate these associations in order to improve quality of care and the patients' health outcomes. Inequality in access to cardiac treatment has been reported previously [28], emphasizing the need for systematic quality improvements to ensure state-of-the-art CR across IMD, including screening for anxiety and depression.

Our results show that patients treated with PCI are more likely to be screened for anxiety and depression compared with patients treated with CABG or medically managed patients. This suggests that CR programs prioritize the patients differently depending on cardiac treatment, despite guidelines recommending screening of all patients with ACS [7]. In addition, we found that current smoking, low level of physical activity and high BMI are negatively associated with the screening practice. Although the presence of multiple modifiable risk factors at the same time is known to be associated with high prevalence of anxiety and depression [14,26] the current study indicates this was not associated with an increased likelihood of screening. We can only speculate if this may be attributed to CR staff prioritizing their sparse resources on supporting patients' somatic lifestyle changes, even though anxiety and depression act as barriers for successful behavioral change [29].

The literature shows that comorbidity is associated with increased prevalence of anxiety and depression in cardiac patients [14,15,30]. Previous anxiety and depression are well-known predictors for recurrent psychological distress [4], and we found that patients with these comorbidities have higher odds for being screened for anxiety and depression. This could point towards CR staff giving extra attention to these high-risk patients, but potentially CR staff might also be more prone to screen patients with signs of psychosocial distress [31], underlining the importance of systematic screening. Further results on comorbidities were mixed with no obvious explanation. Some chronic patient subgroups, such as ACS patients with diabetes might be screened for anxiety and depression during the diabetes treatment pathway, so we can speculate if this leads to CR staff refraining from repeated screening.

With respect to provider level, the European Association of Preventive Cardiology has described screening for anxiety and depression as part of their future CR accreditation, underlining the importance of this area [32]. On the bright side, we found that certification of a CR center is positively associated with screening for anxiety and depression. This indicates, that even though screening for anxiety and depression is not a key performance indicator of the BACPR certification [19], focus on quality of care through certification might enhance other areas of care within CR. On the other hand, we also found that the odds for being screened deteriorate over the included four years. Again, we can only speculate if decrease in screening might be associated with evolving sparse resources or competing tasks of the involved CR staff. Also, barriers for registration in NACR might be a contributing factor [33]. CR centers in areas with high social deprivation and large numbers of psychosocially complex patients may appear as low-performing, reducing motivation to engage in feedback-driven quality improvement initiatives as the NACR [34]. Since we only included data from the first assessment in the CR pathway, there might be patients who have been screened at a later timepoint, or patients where conducted screening was not reported in the NACR system due to suboptimal registration practice.

Overall, screening practices in routine CR are still far from optimal

with only 60% of patients with ACS being screened for anxiety and depression, and inconsistency in the procedure across patient characteristics. A gap between guidelines and clinical practice regarding screening is previously reported [10,11,30] but results from this study illuminates the importance of implementing systematic screening procedures across all subgroups to mitigate inequity in CR delivery. Clinical implications include reflection on and adjustment of screening procedures locally. In addition, decision makers are called upon to allocate the necessary resources to safeguard the possibilities for screening for anxiety and depression in CR, as these conditions increases risk of both morbidity and mortality for cardiac patients [2,3].

In this study, we included patients with ACS at start of CR, but since anxiety and depression might also occur at a later point in time, more than one screening is required to identify patients at risk [6]. Pre-and post-screening in CR is warranted on both patient and provider level in order to be able to assess changes, and continuously support the individual patient, and to assess and improve the quality of care in CR [18,27].

Screening patients with ACS for anxiety and depression is crucial to identify this vulnerable subgroup, but obviously this is not sufficient. Collopy et al. points at a need for information provision in health care settings, to support cardiac patients in seeking help for mental health problems [35]. It is paramount that the CR center has an evidence-based treatment to offer to patients who screen positive for anxiety or depression [4,35]. Therefore, we find it important that CR centers reflect on procedures for referral to treatment for anxiety and depression, to best support the patient and tackle barriers [35]. Treatment could for instance be delivered onsite [36] or as an eHealth intervention, safeguarding treatment in times of the COVID-19 pandemic [37]. Here again, decision makers have a responsibility to help CR centers ensure available evidence-based treatment options.

4.1. Strengths and limitations

Observational data from clinical practice are appropriate to use when exploring associations, with the limitation that no causality can be inferred [38]. However, a strength of using routinely collected data from clinical practice in this study is the possibility of examining a broader population, as no patients are excluded e.g. to age-criteria as in controlled studies [39]. Another strength of this study is the high volume of patients, despite missing cases.

Limitations include the accessible variables in NACR, where other factors could possibly be co-existing determinants. As the vast majority of CR centers in the UK report to NACR, we consider the results to be representative, however patterns of screening practice might be different in the remaining CR centers with a risk of selection bias. Further research is needed to investigate if the results can be generalized to other cardiac populations or countries with different modes of CR delivery.

4.2. Conclusion

We found both patient and provider level determinants of screening for anxiety and depression. However, clinical practice is inconsistent in respect of patient assessment especially for high-risk groups. We recommend that clinicians should systematically screen patients to enable tailored interventions which in turn may mitigate inequity in CR delivery and thereby health outcomes of the patients.

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Declaration of Competing Interest

None

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Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ijcard.2022.02.004.

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