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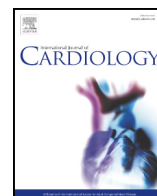
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Q4 Q3 Relationship between employment and mental health outcomes
2 following Cardiac Rehabilitation: an observational analysis from the
3 National Audit of Cardiac Rehabilitation

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ABSTRACT

Background: Employment status has been shown to impact mental health state and intervention outcomes, yet still to be studied in a Cardiac Rehabilitation (CR) population. This observational study investigated the relationship between employment status and mental health outcomes following Cardiac Rehabilitation (CR).

Methods: All patients with an eligible cardiovascular incident entered into the National Audit of Cardiac Rehabilitation (NACR) 1 January 2013–31st December 2015. Logistic regression comparing the association between employment status and normal mental health categories.

Results: A total of 24,242 CR patients with completed post CR assessments were included and had representative age and gender distribution (mean 65 years, 73.2% male). At baseline the unemployed status had a lower proportion of patients in normal healthy categories than other groups (T-test and chi-squared $p = <0.05$). The regression analyses revealed no significant association between retired and employed groups and outcome. There was significant association between unemployed patients and all mental health outcomes except anxiety; all p values < 0.05 and odds ratios between 0.525 and 0.772 showing less likelihood of achieving the normal healthy category.

Conclusions: This is the first UK study, using routinely collected data, to investigate, in the coronary heart disease population, the impact of employment status on outcomes. The findings were that when weighted for baseline differences, unemployed patients mostly had poorer outcomes. Teams involved in CR delivery should take particular care when interpreting mental health baseline measures when setting CR goals, especially in relation to unemployed patients, and efforts should be made in providing more patient tailored interventions.

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1. Introduction

Cardiac Rehabilitation (CR) is a highly evidenced based intervention for a variety of cardiac conditions, (1) significantly reducing cardiovascular mortality (RR 0.74, 95% CI 0.64–0.86) and hospital re-admission post CR (RR 0.82, 95% CI 0.70–0.96). [1,2] The modern United Kingdom (UK) CR population includes patients with conditions such as myocardial infarction, heart failure and angina, along with treatments such as percutaneous coronary intervention, coronary artery bypass graft and valve surgery. [1] The benefits of CR are derived from modifications to lifestyle risk factors and the management of psychosocial factors associated with well-being. The approach is globally recognised as multi-disciplinary and comprehensive including structured education sessions, exercise based interventions and psychosocial

support with agreed core components and minimum standards [3–5] yet less than 25% of programmes have access to psychosocial services. [6].

Current evidence in a post Percutaneous Coronary Intervention (PCI) population showed a link between employment, specifically unemployment, and lowered quality of life at baseline and 12 months post treatment [7]. This link between employment and health has scarcely been studied in CR, often only in uptake and participation [7–11]. The work by Strens et al. showed employment status at baseline was associated with reduced participation in CR post PCI (OR 0.54 CI 95% 0.44–0.68) or surgical intervention (OR 0.51 CI 95% 0.36–0.73) [8]. A study of patients following myocardial infarction found that unemployment was significantly associated with reduced intention to attend CR ($p = 0.007$) and increased drop out ($p = 0.044$) [9]. In a US study of underserved populations, patients were found to be less likely to attend CR if they were unemployed; however, conflict with work has also been identified as a common reason to not complete. [11] Although there is evidence of employment status affecting uptake and completion of CR, there is a dearth of evidence as to whether CR, as an intervention, is as

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effective in different employment statuses in terms of patient outcome. As such the aim of this study was to ascertain the general patient characteristics by employment status and investigate the association between employment status (employed, unemployed and retired) patient outcome following CR; specifically mental health and quality of life (QoL).

2. Methods

This study was reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines. [13].

2.1. Data

The analyses were performed using routinely collected patient level data from the UK NACR database from 1st January 2013 to 31st December 2015. According to the 2015 NACR report a total of 164 CR programmes across the UK enter into the NACR audit [6]. Information on patient's initiating event, treatment, individual risk factors, medication use, characteristics and outcomes of CR users is captured. Data is collected under 251 approvals which are reviewed annually by the Health and Social Care information Centre (HSCIC).

The analysis included all CR programmes in England, with valid patient data at both pre and post CR assessment including deprivation score as measured by the Index of Multiple Deprivation (IMD). Patients who had Myocardial Infarction with or without revascularisation were included to account for type of diagnosis/treatment. All patients with valid diagnosis/treatment entered were included, minimising selection bias.

2.2. Cardiac Rehabilitation

CR is conducted according to the British Association for Cardiovascular Prevention and Rehabilitation (BACPR) core components [3]. Typically programmes run for 8–12 weeks, twice weekly with structured education and exercise components.

2.3. Employment status

Employment status was categorised as employed, unemployed or retired. Being employed was classified as either full or part time employment, self-employed or as part of a government training scheme. Unemployed was defined as; unemployed, looking after family/home, permanently sick/disabled, temporarily sick or injured, student or other reasons for not working.

Employment status is often defined in a variety of ways, most commonly employed–unemployed comparisons are made sometimes including a third group; such as retired [15]. In the UK CR population the mean age of males is 66 years and females is 70 years, with approximately two thirds of population reported as being retired [6]. As such this study will include three employment groups; employed, unemployed and retired.

2.4. Outcome measures

Anxiety and depression symptoms were separately measured on the Hospital Anxiety and Depression Scale (HADS) (score range 0–21) with higher scores representing worse symptoms, patients were grouped as healthy normal category (<8) and unhealthy score (8+) [16]. Quality of life in relation to feelings and general quality of life were assessed on the Dartmouth COOP (score per item 1–5), responses were dichotomised (healthy normal score 1–3, unhealthy score 4–5) [16].

2.5. Statistical Analysis

The analyses were conducted in STATA 13.1. Baseline characteristics were compared across groups using Chi² or T-test as appropriate. Standardised differences were calculated for continuous variables, with >0.1 classified as meaningful. Unemployed and retired groups were compared to the baseline employed group [17]. Regression models were run comparing the unemployment and retired populations to the reference category employed. Relevant important covariates were included in the analysis. Age (years), Gender (male/female) and number of comorbidities have both been shown to influence the outcomes following a variety of different interventions, including CR [18,19]. The duration of CR (length of core rehabilitation) was accounted for in analysis. The type of event/treatment prior to CR is likely to affect the patients' outcomes, to account for this variation patients were coded as medically managed or re-vascularised as shown in the NACR statistics report [6]. The IMD was calculated and ranked, from the most deprived to the least deprived regions, at for all 209 clinical commissioning groups and was included in this analysis [20]. Individual patients were assigned an IMD score according to where their General Practitioner (GP) was located within England. IMD was split into 10 equal sized groups 'deciles', with 1 being the most deprived group.

Logistic regressions were used to investigate the association between employment status, as an independent variable, and mental health outcomes as the dependent variable. Significance was set at the $p < 0.05$ level. Data model checking was performed to ensure that the models were a good fit through assumptions associated with the regressions.

3. Results

3.1. Study population

The study sample is summarised in Fig. 1 and the population characteristics are summarised in Table 1. A total of 24,242 patients were included in the analyses.

The population is representative of patients accessing CR [6], with an average age of 65 years (SD 11.9) and majority male participants (73.2% male). The average duration of CR for this study falls within the NICE guidelines of 8–12 weeks, with this population averaging 9 weeks. The distribution of the employment statuses is similar to the national level, which has stayed static at 58% retired for the past 6 years [6]. The patients were evenly distributed across the IMD deciles with the highest proportion in the 8th decile.

In terms of baseline scores by employment group, mean HADS were 2 points higher on average in the unemployed group (mean anxiety 7.7, depression 6.4) compared to the other two groups. Overall unemployed patients had the smallest proportion classified as normal on the HADS. The unemployed group also had the smallest proportions of patients reporting normal QoL readings in relation to feelings and general QoL, around 10% lower in comparison. The number of comorbidities was lowest in the employed group and duration of CR was greater, by 4 days, in the unemployed group. Naturally, the age was significantly different in the retired population with a 14 years greater average.

Table 1 also shows the proportion change from baseline to post rehabilitation into the normal group (HADS < 8 and Dartmouth ≤ 3) for the 4 mental health outcomes split by employment status. The results show that all groups had improvements across the four outcome measures, but the largest improvements were observed in the unemployed group. 170

3.2. Outcomes

The results from the regression analyses are presented in Table 2. The results consistently, apart from anxiety, showed that unemployed patients are significantly associated with worse mental health post 174

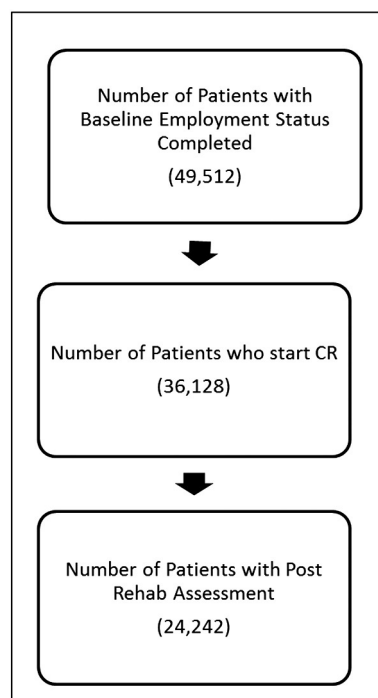


Fig. 1. Flow diagram showing patients' numbers from assessment 1 with a valid employment status field, starting core rehabilitation and then a valid assessment 2 post rehabilitation. Of the number with assessment 1 49% go on to have an assessment 2.

Table 1

Baseline and change in patient characteristics and outcome measures by employment status.

Baseline characteristics	Employment status groups			
	Employed	Unemployed	Retired	Total
Count n (%)	13,820 (27.9)	8253 (16.7)	27,439 (55.4)	49,512**
Male (%)	84.2	73.1	67.7	73.2**
Mean age (SD)	56.1 (9.1)	56.2 (10.3)	72.9 (7.5) ^a	65.5 (11.9)**
Number of comorbidities (median)	1	2 ^a	2 ^a	2**
Duration of CR days (median)	63	67 ^a	63	63**
% in Normal Category				
HADS anxiety mean (%)	69.7	57.9	77.4	72.3**
HADS depression mean (%)	83.8	69.0	83.9	81.7**
Dartmouth feelings (%)	85.0	76.8	88.1	85.4**
Dartmouth quality of life (%)	95.6	91.8	95.6	95.0**
Change from baseline in outcomes	% Change into Normal Category by Employment Status			
	Employed	Unemployed	Retired	Total
HADS anxiety (%)	7.1	8.0	4.6	6.1
HADS depression (%)	5.8	8.4	5.3	5.7
Dartmouth feelings (%)	5.9	6.4	4.3	5.3
Dartmouth quality of life (%)	2.6	3.6	2.4	2.6

t Q1 Standardised differences ^a > 0.1 from employed group and Chi Squared * = p < 0.05 and ** = p < 0.001.

175 rehabilitation (all p < 0.05). The depression results showed unemployed
 176 patients were 26% less likely to be in the normal category (p < 0.034),
 177 and patients were 23–45% less likely to be in the normal category for
 178 Dartmouth feelings and QoL (p < 0.001). No significant associations
 179 were found between the retired population and mental health outcomes.

180 4. Discussion

181 The overriding result of this study is that although all employment
 182 groups show improvements in all post CR mental health outcomes,
 183 when compared to the employed group, unemployed patients were
 184 less likely to be in the normal category, post CR, for depression and Dart-
 185 mouth feelings and QoL. Anxiety was inputted in a model as well, how-
 186 ever, no significant association was found despite unemployed patients
 187 having a lower percentage in the baseline normal group. Interestingly
 188 work by Meyer et al. showed the complexity surrounding anxiety and
 189 outcome when they found that some level of anxiety, even as high as
 190 ≥ 10 on the HADS score, is associated with a beneficial reduction in
 191 cardiovascular events in a subset of cardiac patients undergoing PCI
 192 (p = 0.014) [21].

193 When compared at baseline, unemployed patients' mental health is
 194 consistently worse than the employed or retired population. Although
 195 the unemployed group make the greatest improvements pre to post
 196 CR this is likely due to worse pre CR starting point and some level of
 197 the other groups experiencing ceiling effects.

198 The unemployed patients' at follow-up were significantly (15–26%)
 199 less likely to be in the normal category for the HADS Depression and

Dartmouth questions; this result was not significantly represented in
 the anxiety measure.

This seems consistent with the literature, in that unemployment has
 an association at baseline with poorer mental health [7,10,23]. The work
 by Waddell concluded a similar effect of employment status on mental
 health outcomes, in that unemployed status can be detrimental to men-
 tal health [23]. Additionally Brown and Jin's work also showed higher
 odds of poorer mental health in unemployed patients [12,22].

To date the literature investigating the effect of employment on CR,
 has only compared how patients differ at uptake and dropout [8–11].
 This research has extended knowledge on the characteristics of those
 accessing CR from different employment groups and has identified an
 association between employment and outcome. In addition to existing
 research this current study has identified that from initiating event
 through to completion of CR there is a need for service tailoring to
 make sure all employment groups benefit from this intervention.

Overall this study enforces the importance of employment status on
 the CR population. Unemployed patients are less likely to attend CR and
 when they do attend they are less likely to be in three of the normal
 mental health outcome groups. This study's results, along with work
 on attendance and drop out suggest that commissioners may need to
 look at aligning the recruitment to and the delivery of CR by employ-
 ment status [8–12].

4.1. Limitations

One limitation of this study is the level of missing data. Although suf-
 ficiently powered for the purposes of this analysis, the inclusion of En-
 gland only patients and ~31% missing data at the post rehab assessment
 may have limited the generalisability of the findings, although the popu-
 lation did appear to be representative of patients accessing CR in the UK.
 [13].

5. Conclusion

This study identified a strong association between employment sta-
 tus and mental health outcomes. The extent of benefit to patients is sig-
 nificantly influenced by employment status in that being unemployed
 led to reduced benefit in depression and QoL compared to patients
 who were employed or retired. Existing evidence has already established
 a link between employment and mental health at baseline; however, this
 is the first study to show this impact on patient outcomes. As recom-
 mended by national associations, CR teams need to assess patients,

Table 2

Results from the Multivariate Regression Analysis; association between employment status and mental health outcomes.

	Odds ratio*	Sig.	95% CI	Observations	
<i>Effect of being unemployed in comparison to employed</i>					
HADS anxiety	0.934	0.56	0.743	1.175	23,209
HADS depression	0.734	0.034	0.552	0.977	23,244
Feelings	0.772	<0.001	0.675	0.884	21,618
Quality of life	0.525	<0.001	0.406	0.678	21,530
<i>Effect of being retired in comparison to employed</i>					
HADS anxiety	0.992	0.98	0.513	1.915	23,244
HADS depression	0.978	0.892	0.711	1.346	23,209
Feelings	0.988	0.872	0.849	1.149	21,618
Quality of life	0.802	0.151	0.593	1.084	21,530

239 based on the core components of CR, and consider employment status
 240 when tailoring care for individual patients. Future research should con-
 241 sider the staffing profile and types of tailored interventions that would
 242 enable unemployment patients to derive the same benefit.

Q6 Conflict of Interest

244 The authors report no relationships that could be construed as a con-
 245 flict of interest.

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References

- 255 [1] L.T.D.R. Anderson, N. Oldridge, A.D. Zwisler, K. Rees, N. Martin, R.S. Taylor, Exercise-
 256 based cardiac rehabilitation for coronary heart disease (Review), *Cochrane Libr.*
 257 (Issue 1) (2016) (2016 (1)).
 258 [2] NICE Clinical Guidelines 172 – secondary prevention in primary and secondary care
 259 for patients following myocardial infarction, [http://www.nice.org.uk/guidance/
 260 cg172/resources](http://www.nice.org.uk/guidance/cg172/resources).
 261 [3] British Association for Cardiovascular Prevention and Rehabilitation, The
 262 BACPR Standard and Core Components for Cardiovascular Disease Prevention
 263 and Rehabilitation, second ed., 2012 ([http://www.bacpr.com/resources/
 264 46CBACPRStandardsandCoreComponents2012.pdf](http://www.bacpr.com/resources/46CBACPRStandardsandCoreComponents2012.pdf) (accessed 7th August
 265 2015)).
 266 [4] M.F. Piepoli, U. Corra, S. Adamopoulos, et al., Secondary prevention in the clinical
 267 management of patients with cardiovascular diseases. Core components, standards
 268 and outcome measures for referral and delivery, *Eur. J. Prev. Cardiol.* 21 (6) (2012)
 269 664–681.
 270 [5] G.J. Balady, P.A. Ades, P. Comoss, et al., Core components of cardiac rehabilitation
 271 secondary prevention programs, *Circulation* 102 (2007) 1069–1073.

- [6] The National Audit of Cardiac Rehabilitation (NACR), Annual Statistical Report, NACR, 272
 UK, 2015 (http://www.cardiacrehabilitation.org.uk/docs/BHF_NACR_Report_2015.pdf
 273 (accessed 28th Feb 2016)). 274
 [7] S.J. Leslie, J. Rysdale, L. AJ, et al., Unemployment and deprivation are associated with 275
 a poorer outcome following percutaneous coronary angioplasty, *Int. J. Cardiol.* 122 276
 (2007) 168–196. 277
 [8] D. Strens, A. Colle, F. Vrijens, et al., Multidisciplinary outpatient rehabilitation follow- 278
 ing cardiac revascularization or valve surgery: patient related factors for uptake, *Eur.* 279
J. Prev. Cardiol. 20 (3) (2012) 422–430. 280
 [9] G. Mckee, M. Biddle, S. O'Donnell, Cardiac rehabilitation after myocardial infarction: 281
 what influences patients intentions to attend? *Eur. J. Cardiovasc. Nurs.* 13 (4) (2014) 282
 329–337. 283
 [10] B.J. Witt, R.J. Thomas, V.L. Roger, Cardiac rehabilitation after myocardial infarction: a 284
 review to understand barriers to participation and potential solutions, *Eura.* 285
Medicophys. 41 (2005) 27–34. 286
 [11] H.E. Valencia, P.D. Savage, P.A. Ades, Cardiac rehabilitation participation in under- 287
 served populations, *J. Cardiopulm. Rehabil. Prev.* 31 (2011) 203–210. 288
 [12] J. Brown, E. Demou, M.A. Tristram, et al., Employment status and health: understand- 289
 ing the health of the economically inactive population in Scotland, *BMC Public* 290
Health 12 (327) (2012) 1–9. 291
 [13] ISPM, University of Bern, STROBE statement, strengthening the reporting of obser- 292
 vational studies in epidemiology, [http://www.strobe-statement.org/fileadmin/
 293 Strobe/uploads/checklists/STROBE_checklist_v4_combined.pdf](http://www.strobe-statement.org/fileadmin/Strobe/uploads/checklists/STROBE_checklist_v4_combined.pdf)2009 (accessed 9th 294
 February 2015). 295
 [15] B. Moradi, M. Esmaeilzadeh, M. Maleki, L. Sari, Factors associated with failure to 296
 complete phase II cardiac rehabilitation: survey registry in Rajaie Cardiovascular 297
 Medical and Research Center, *Int. Cardiovasc. Res. J.* 5 (4) (2011) 139–142. 298
 [16] R.P. Snaith, The hospital anxiety and depression scale, *Health Qual. Life Outcomes* 299
 (2003) 1–4. 300
 [17] J.A. Durlak, How to select, calculate and interpret effect sizes, *J. Pediatr. Psychol.* 34 301
 (9) (2009) 917–928. 302
 [18] P. Doherty, A.S. Harrison, M. Knapton, V. Dale, Observational study of the relation- 303
 ship between volume and outcomes using data for the National Audit of Cardiac Re- 304
 habilitation, *Open Heart* 2 (2015), e000304, [http://dx.doi.org/10.1136/openhrt-
 305 2015-000304](http://dx.doi.org/10.1136/openhrt-2015-000304). 306
 [19] J.A. Doll, A. Hellkamp, L. Thomas, et al., Effectiveness of cardiac rehabilitation among 307
 older patients after acute myocardial infarction, *Am. Heart J.* 08 (01) (2015) 308
 855–864. 309
 [20] Department for Communities and Local Government, The English Indices of Depriva- 310
 tion 2015, Statistics Release, [https://www.gov.uk/government/uploads/system/
 311 uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf](https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/465791/English_Indices_of_Deprivation_2015_-_Statistical_Release.pdf). 312
 [21] T. Meyer, S. Hussein, W. Helmut, et al., Anxiety is associated with a reduction in both 313
 mortality and major adverse cardiovascular events five years after coronary 314
 stenting, *Eur. J. Prev. Cardiol.* 0 (0) (2013) 1–8. 315
 [22] R.L. Jin, C.P. Shah, T.J. Svoboda, The impact of unemployment on health: a review of 316
 the evidence, *Can. Med. Assoc. J.* 153 (3) (1995) 529–666. 317
 [23] G. Waddell, A.K. Burton, Is Work Good for Your Health and Well-Being? The Station- 318
 ary Office, 2006. 319
 320