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Cardiac rehabilitation services in New Zealand: access and utilisation

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Abstract

Aim To identify factors associated with patient referral to, uptake of, and completion of cardiac rehabilitation programmes in New Zealand.

Methods Information was collected on referrals to cardiac rehabilitation during February 2002. Routinely collected hospitalisation data were obtained for men and women aged over 35 years with specified coronary episodes. The data were merged, and four predictive logistic regression models developed.

Results There were 2001 people either hospitalised or referred to cardiac rehabilitation. Of the 1696 hospitalised, 36% were referred for rehabilitation. After adjusting for ethnicity, women were less likely to be referred: odds ratio (OR)=0.72 [95% confidence interval (CI) 0.57–0.91]. With each 10-year age increase, there was a lower likelihood of referral (OR=0.74; 95%CI 0.67–0.82).

Of those people who were referred to inpatient rehabilitation, 83% were referred to an outpatient programme. Lack of access to transport was associated with reduced likelihood of referral (OR=0.44 95%; CI 0.28–0.70) and with attendance (OR=0.54; 95%CI 0.33–0.88). Those who had previously attended a cardiac rehabilitation programme were significantly more likely to attend, and compared to those aged 65 to 74 years, those older or younger were less likely to complete the programme. Some associations with deprivation were found, but none with ethnicity.

Conclusion This study demonstrated considerable scope for improvement in referral to, uptake of and completion of cardiac rehabilitation programmes in New Zealand. It highlighted the need to improve referral processes, promotion, provision, delivery and monitoring of cardiac rehabilitation services.

Comprehensive multifactorial cardiac rehabilitation following a myocardial infarction (MI) has been shown to reduce mortality and morbidity, and to improve quality of life.[1–5] Benefits have also been shown for people following percutaneous transluminal coronary angioplasty (PTCA), coronary artery bypass grafting (CABG), and those with stable angina and chronic heart failure.[6,7] However international research has demonstrated generally low rates of referral and participation to cardiac rehabilitation.[8–10] Referral and participation have been found to be an issue for the elderly, women, ethnic minorities and those of lower socioeconomic status. [11–16]

In New Zealand, an audit of a cardiac rehabilitation centre showed that over 25% of patients admitted to the coronary care unit or high dependency ward were not referred to cardiac rehabilitation, and 56% of eligible patients did not attend the programme. [17]

This study investigates factors associated with referral and utilisation of cardiac rehabilitation programmes in New Zealand. It is the second of a two part national

audit designed to benchmark service provision prior to the launch of the new guidelines for cardiac rehabilitation in New Zealand.[18]

Methods

Data collection—The audit aimed to include all cardiac patients who were hospitalised during February 2002 and met the following inclusion criteria: men and women aged 35 and over admitted to a public hospital in New Zealand with MI, acute coronary syndrome, PTCA, CABG, or heart failure.

Thirty of the 38 cardiac rehabilitation centres agreed to take part in the audit: four were in recess, two were serviced by larger nearby centres (part of the audit), one centre agreed too late to participate and one was a private hospital.

Data was collected by cardiac rehabilitation nurses using a form which had been pre-tested by cardiac rehabilitation nurses to ensure clarity and acceptability, and its content and format modified following responses received. Audit forms were posted to all cardiac rehabilitation centres and one of the lead investigators acted as a point of contact to resolve queries.

Centre staff were asked to initiate an audit form on receipt of each referral to their programme, and to retain it until the patient had either completed the phase II programme or a period of 16 weeks had elapsed. The completed forms were then returned to the National Heart Foundation for data entry and analysis. No patient names were included, but to enable matching against the national hospital discharge records, patients were identified by their unique NHI number, sex, birthdate, and residential address.

The cardiac rehabilitation programme audit form sought basic information on: patient demographics and ethnicity, admitting condition, source of referral, referral to inpatient cardiac rehabilitation (phase I), referral and utilisation of the outpatient cardiac rehabilitation programme (phase II), potential barriers to attending phase II, and factors which influenced completion of phase II.

Potential barriers included employment status (in full-time or part-time paid work, retired, or other), physical or mental disability, no private telephone, living alone, lack of access to transport, not receiving a written invitation, whether the person had previously attended a phase II programme, and whether English was their first language. Completion of the phase II programme was deemed to be attendance at four or more sessions during a period of 12 weeks from the date of hospital discharge.

A data set was provided by the New Zealand Health Information Service (NZHIS) that included all patients with a New Zealand hospital stay during February 2002—with any one or more of the following International Classification of Diseases (ICD 9) codes as a discharge diagnosis: 402, 410.1–410.9, 413, 422, 428, 429.1, or 429.3—or one of the procedures: 36.01, 36.02, 36.06, 36.07, 36.11–36.14.

Approval for the study was obtained from the Auckland Ethics Committee on behalf of the other 12 regional ethics committees in New Zealand.

Data management of audit forms—Audit forms were coded as described below, entered into a database, and then merged with hospitalisation data.

Ethnicity provided for multiple responses to nine categories including ‘other’. These were converted to a single ethnicity variable using the following rule: if any mention of Maori, then code as Maori; if no mention of Maori but any mention of Pacific Island ethnicity, then code as Pacific; if no mention of Maori or Pacific but any mention of Asian ethnicity, then code as Asian; otherwise, code as ‘NZ European or other’. [19]

The main medical condition provided for classification into one (only) of the following five categories: myocardial infarction, acute coronary syndrome/unstable angina, post-CABG, post-PTCA (with or without stent), and heart failure. Although terminology around diagnosis is changing, at the time of the study, some hospitals were using myocardial infarction and some were using acute coronary syndrome; hence the need to provide for both. Source of referral to cardiac rehabilitation provided for one only of the following eight categories: medical team, ward nurse, cardiac rehabilitation nurse, ward nurse, other hospital, general practitioner, practice nurse, patient, and other health professional (for example physiotherapist). These were coded as categorical variables.

Utilisation and outcome data included whether the patient was referred to Phase II; and if so, whether that included a written invitation, whether they attended, and how many visits they attended.

In addition to the unique identifying number of the patient (NHI), the NZHIS data included sex, date of birth, discharge diagnoses and procedures, and latest residential area coded using the NZ Census area unit. By matching against 1996 census area unit, the NZ Deprivation Index (NZDep96) was obtained. This is a score developed from New Zealand census data to indicate economic and social deprivation of neighbourhoods, based on several indicators of socioeconomic deprivation. [20]

Validity of NHI numbers recorded on the audit forms was checked and corrected (where possible) through the centres. The two sources of data were merged based on NHI number. For those individuals where there was an audit form and no corresponding hospital record, the identifiers were sent to NHI to establish any recent discharge with a cardiac diagnosis, even if not coded as its primary diagnosis. When this process could not match a hospital discharge record, NZHIS provided the NZDep96 code for the latest address known for the patient.

Data management of NZHIS records—NZHIS discharge records, which were not associated with an audit form, were coded according to the discharge codes into the same medical categories as the audit form (MI, PTCA, CABG, etc). Where more than one condition was coded, a priority system was established—so MI was coded as a priority before acute coronary syndrome/unstable angina, ahead of post coronary artery bypass grafting, ahead of post angioplasty, and finally ahead of heart failure. Likewise, ethnicity was classified for NZHIS data as for the audit form.

NZDep96 codes were grouped into quintiles (coded Q1–Q5) and a separate category (Q6) made for those for whom no NZDep96 quintile had been allocated (for example, there were too few people in the mesh block, indistinguishable address on the census record, or audit form not matched with NHI record).

Patients with a residential address or other details which indicated they lived overseas, or where the hospital discharge record indicated they had died during hospital admission or were day patients, were excluded from analyses

Statistical analysis—Because of the known association between variables (particularly age, sex, and ethnicity), no univariate analysis are presented. Instead, logistic regression models were used to adjust for the many competing potential predictors.

Four predictive models were developed to identify:

1. Characteristics associated with referral to cardiac rehabilitation.
2. Factors associated with referral to Phase II in those patients referred to cardiac rehabilitation.
3. Factors associated with attending Phase II if patients were referred.
4. Factors associated with completing a cardiac rehabilitation programme if referred to Phase II.

In each predictive model, sex, age, ethnicity, and deprivation were included. Other variables (available at eligibility) were made available and were progressively eliminated according to size of estimate (closest to unity) and p-value (distance from zero) until only significant variables remained in the model. Referent groups were generally the 'No' category—but to distinguish associations for either high or low deprivation areas for NZDep96, the referent group was the central group (quintile 3).

In all models, age was initially entered as continuous and regression co-efficients calculated for each 10 year increase. In the fourth model, age as a continuous variable was not significant, and, instead, age was entered as a single categorical variable (under 65 years, 65–74, and over 75 years) with the central group as the referent group.

Once the most parsimonious model was produced, each variable was systematically reinserted to check whether it would improve the model fit in combination with the variables already present.

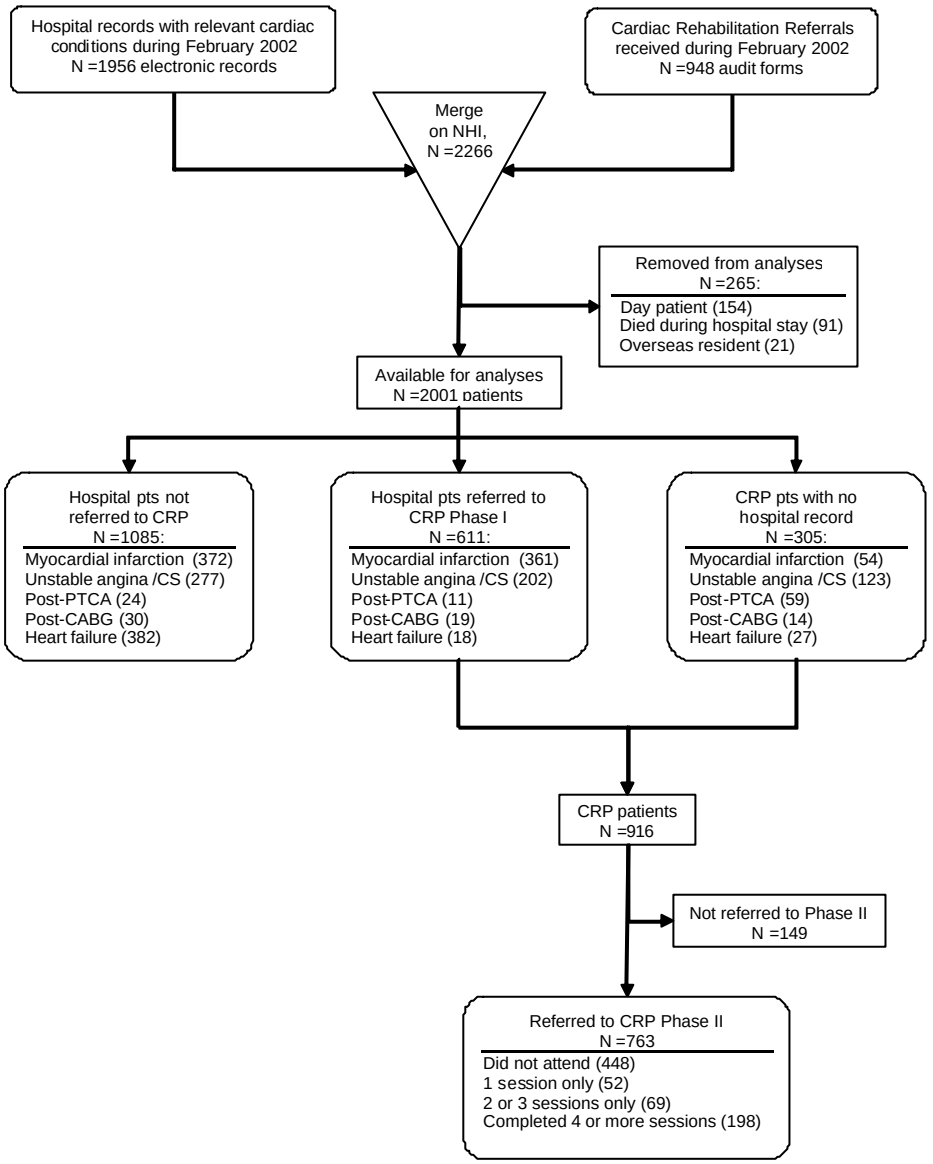
To assess the correlation between Maori ethnicity and NZDep decile, a Cochran-Armitage Trend test was conducted with all available records. Throughout, the SAS 8.02 package [21] was used for analysis, and p values of 0.05 or less were taken as statistically significant.

Results

2266 people were found for the specified admission period—comprising 1956 with hospital records and 948 with a cardiac rehabilitation audit form. 2001 patients remained after excluding patients who died during admission (91), day patients (154), and overseas residents (21). Of these 2001 patients, 1085 had a hospital record but no

audit form, 611 had both an audit form and a hospital record, and 305 had an audit form only. The data matching process and study flowchart are shown in Figure 1.

Figure 1. Flowchart of cardiac rehabilitation audit



Of the 1085 eligible patients with a hospital record and no audit form, 52.1% were men and 47.9% were female (Table 1). The majority (74.4%) were between the ages of 55–84 years, and 13.9% were aged over 85 years. The ethnic composition of this group of patients was 'New Zealand Europeans and others' (82.2%), Maori (11.6%), Asian (4.1%), and Pacific Islanders (2.1%). Heart failure and myocardial infarction were the main admitting conditions—35.2% and 34.5% respectively.

Of the 916 eligible patients with cardiac rehabilitation audit forms; 64.6% were men and 34.9% were female. Most (74.8%) were between the ages of 55–84 years, with 3.3% aged over 85 years. 'New Zealand Europeans and others' were the largest ethnic

group (84.1%), followed by Maori (9.9%), Asians (2.5%), and Pacific Islanders (3.3%). Myocardial infarction (45.3%) and unstable angina (35.4%) were the main cardiac conditions (Table 1).

Table 1. Characteristics of cardiac hospitalisations and rehabilitation patients

	Unmatched hospitalised patients		Matched CRP patients		Unmatched CRP patients	
	N=1085 (54.2%)		*N=611 (30.5%)*		*N=305 (15.2%)*	
	n	**%**	**n**	**%**	**n**	**%**
Gender						
Men	565	52.1	400	65.5	192	63.0
Women	520	47.9	211	34.5	109	35.7
Age (years)						
15–44	36	3.3	28	4.6	22	7.2
45–54	89	8.2	89	14.6	48	15.7
55–64	177	16.3	151	24.7	79	25.9
65–74	302	27.8	203	33.2	89	29.2
75–84	329	30.3	120	19.6	44	14.4
85+	151	13.9	20	3.3	10	3.3
Ethnicity						
European and other	822	75.8	508	83.0	246	80.7
Maori	126	11.6	59	9.7	32	10.5
Asian	45	4.1	15	2.5	8	2.6
Pacific Islander	23	2.1	25	4.1	6	2.0
Not specified	69	6.4	4	0.7	13	4.3
Main cardiac condition*						
Myocardial infarction	372	34.5	361	59.1	54	17.7
Unstable angina & ACS	277	25.5	202	33.1	123	40.3
Post CABG	30	2.8	19	3.1	14	4.6
Post-PTCA	24	2.2	11	1.8	59	19.3
Heart failure	382	35.2	18	2.9	27	8.9
NZDep96						
Quintile 1 (least deprived)	197	18.2	139	22.8	60	20.0
Quintile 2	199	18.3	125	20.5	52	17.1
Quintile 3	186	17.1	114	18.7	42	13.8
Quintile 4	188	17.3	109	17.8	41	13.4
Quintile 5 (most deprived)	214	19.7	108	17.7	48	15.7
Not available	101	9.3	16	2.6	62	20.3

*Only one choice permitted. CRP=cardiac rehabilitation programme; ACS: acute coronary syndrome; CABG: coronary artery bypass grafting; PTCA: percutaneous transluminal coronary angioplasty;
Note: Number may not always add to the total due to missing data.

Characteristics if patients in relation to referral to and attendance at cardiac rehabilitation are shown in Table 2.

The factors most associated with being referred to cardiac rehabilitation following a hospital admission with a cardiac condition are shown in Table 3. Being female (OR=0.72; 95%CI 0.57–0.91), increasing age (OR=0.74; 95%CI 0.67–0.82), or having a diagnosis of heart failure (OR=0.11; 95%CI 0.06–0.19) were all independently associated negatively with referral to the cardiac rehabilitation team

(Phase 1) after adjusting for ethnicity and deprivation quintile. Compared to those with unstable angina or acute coronary syndrome, revascularisation and MI patients were much more likely to be referred for cardiac rehabilitation. No association with ethnicity was evident.

Table 2. Characteristics of patients at different stages of cardiac rehabilitation

	Referred to		Attended	Completed
	Phase I n=916 %	Phase II n=767 %	Phase II n=319 %	Phase II n=198 %
Employed:				
In paid work	31	33	34	30
Retired	56	54	53	57
Not retired or in paid work	12	13	13	13
First language is English	87	88	90	90
Has physical or mental disability	13	12	13	12
Lives alone	21	20	18	18
No private phone	18	17	18	17
Transport:				
Has access to private transport	83	85	89	89
Programme provides transport	2	2	2	2
No access to private or programme transport	15	13	9	9
Written invitation to Phase II	71	84	86	88
Attended Phase II previously	35	11	16	14

Table 4a shows that referral to phase II was negatively associated with increasing age (OR=0.76; 95%CI 0.63–0.90) and no access to transport (either private or programme) (OR=0.44; 95%CI 0.28–0.70). Those post-revascularization (OR=4.30; 95%CI 2.51–7.35) and post-myocardial infarction (OR 2.72; 95%CI 0.63–0.90) were more likely to receive referral to phase II cardiac rehabilitation.

Attendance at phase II was significantly associated with a person being post myocardial infarction (OR=1.56; 95%CI 1.03–2.35) or having previously attended the programme (OR=2.38; 95%CI 1.46–3.91). Lack of access to either private or programme transport was negatively associated with attendance (OR=0.54; 95%CI 0.33–0.88) (Table 4b).

Patients were less likely to complete the phase II cardiac rehabilitation programme (four or more sessions) if they were aged under 65 years (OR=0.60; 95%CI 0.41–0.87) or over 75 years (OR=0.55; 95%CI 0.33–0.92) or were living in middle quintile

neighbourhoods, quintiles 3 (OR=0.42; 95%CI 0.23–0.76), and quintile 4 (OR=0.49; 95%CI 0.28–0.87) (Table 4c).

Maori ethnicity and high NZDep decile were highly associated in the trend test (z-score=5.97, p<0.0001), showing evidence of increasing proportions of Maori in deciles that are more deprived.

Table 3. Factors associated with referral of patients hospitalised with heart condition(s) to phase 1 cardiac rehabilitation

	Adjusted OR* (95% CI) N = 1622		p-value
Medical condition(s)			
Unstable angina or ACS	1.00	-	<0.0001
Heart failure only	0.11	(0.06, 0.19)	
Post revascularisation (PTCA or CABG)	2.66	(1.91, 3.70)	
Myocardial infarction	1.68	(1.25, 2.24)	
Age (10 year increase)	0.74	(0.67, 0.82)	<0.0001
Women	0.72	(0.57, 0.91)	0.006

Notes
Only people with a relevant hospital admission and known ethnicity were eligible for this analysis.
*Adjusted for ethnicity and decile of NZ Deprivation index.

Discussion

This prospective audit aimed to identify factors significant in the referral of patients to cardiac rehabilitation, their uptake of the intervention and their completion of the programme in New Zealand. Having no access to transport, being a woman, being older, and a diagnosis of heart failure were all were significantly related to a reduced likelihood of referral to either phase I or phase II. Previous attendance at a programme and having a diagnosis of myocardial infarction were both predictive of attendance at phase II. No structural factors were found which influenced completion of the programme but age and coming from the middle deprivation quintiles were determinants of non-completion.

Limitations in the study design may have had some impact on accuracy of the results—the short duration over which the audit was conducted, and consequent small sample sizes of particular groups, may have resulted in measurement error. This audit could not consider the potential effects coexisting co-morbidities may have had on referral to and uptake of cardiac rehabilitation. The absence of hospitalisation records for a substantial portion of those with referrals to cardiac rehabilitation during the period of the audit suggests that these patients may have been referred from other areas; for example, outpatient clinics or primary care. Incomplete data on the audit forms will account for some of the non-matching between the audit forms and the

NZHIS data. Using busy clinical staff to collect data may have led to incomplete audit data, although possible errors or omissions in completion of forms were avoided by contacting staff for clarification.

Table 4. Models showing factors associated with various outcomes following referral to phase I cardiac rehabilitation

a) Referral to Phase II, given referral to Phase I

	Adjusted OR (95% CI) n=871		p-value
Medical condition(s)			<0.0001
Unstable angina or ACS	1.00	-	
Post revascularisation (PTCA or CABG)	4.30	(2.51, 7.35)	
Myocardial infarction	2.72	(0.63, 0.90)	
Age (10 year increase)	0.76	(0.63, 0.90)	0.002
Transport:			0.002
Has access to private transport	1.00	-	
No access to private or programme transport	0.44	(0.28, 0.70)	

b) Attendance at Phase II, given referral to Phase I

	Adjusted OR (95% CI) n=726		p-value
Medical condition(s)			0.02
Unstable angina or ACS	1.00	-	
Myocardial infarction	1.56	(1.03, 2.35)	
Previously attended Phase II	2.38	(1.46, 3.91)	0.0006
Transport:			0.002
Has access to private transport	1.00	-	
No access to private or programme transport	0.54	(0.33, 0.88)	

c) Completion of Phase II, given referral to Phase II

	Adjusted OR (95% CI) n = 742		p-value
Age:			0.01
65-74 years	1.00	-	
Over 75 years	0.55	(0.33, 0.92)	
Under 65 years	0.60	(0.41, 0.87)	
Deprivation:			0.02
Quintile 1 (least deprived)	1.00	-	
Quintile 3	0.42	(0.23, 0.76)	
Quintile 4	0.49	(0.28, 0.87)	

Notes:
All people with a CRP audit form and known ethnicity were eligible for all these analyses.
Adjusted for age, gender, ethnicity, and decile of NZ Deprivation index if not shown.

International research has demonstrated lower referral to cardiac rehabilitation programmes for women,[14,22–24] with women being 20% less likely to be referred.[22] This audit demonstrated a 28% lower referral rate for women after adjustment for age, medical condition, ethnicity and deprivation score. Cardiac rehabilitation programmes have proven benefits to women. Women who experience a cardiac event tend to have poorer psychological adjustment, are older, more likely to have other co-morbidities, and be more likely to be retired or living alone.[22] Further efforts are required to promote cardiac rehabilitation programmes for women.

The age distribution in Table 1 demonstrates a cardiac rehabilitation population predominantly over 65 years. It is projected the number of people aged 65 years and over will double by 2051.[25] This is a population susceptible to heart failure. Table 1 also shows that 35.2% of those patients with hospital records only had a diagnosis of heart failure compared to those patients with matched and unmatched audit forms—2.9% and 8.9% respectively.

Despite the documented benefits of cardiac rehabilitation for those with heart failure; improvement in disease related symptoms, quality of life and clinical outcomes[26] it remains an under utilised intervention for this patient group with pharmacology providing the mainstay of treatment. The audit that formed the first part of this study[27] showed that 82% (N=33) of responding cardiac rehabilitation programmes stated they provided a service for heart failure patients. With the heart failure nurse specialist a rare commodity in New Zealand multidisciplinary cardiac rehabilitation teams are well suited to accept the challenge of providing individualised follow up for people with heart failure and their families.

It appears that programmes catered comparatively well for those aged 65–74 years: those younger than 65 years and over 74 years are less likely to complete. Although employment status did not reach statistical significance, it is possible that part of the observed lower use among those younger than 65 years is related to their employment. There is a need for programmes to consider outcomes of importance to the elderly such as disability, independence and health-related quality of life.[28]

The ‘U’-shaped relationship of deprivation quintile with completion of phase II was unexpected—those in quintiles 3 and 4 were less likely to complete compared to those in the least deprived quintile. Socioeconomic inequalities in cardiovascular disease in New Zealand have become wider and as a result cardiovascular disease is increasingly associated with disadvantage.[29] Indeed, cardiac rehabilitation staff need to be mindful of the impact a person’s level of deprivation may have on their ability to attend the programme. Information on the socioeconomic status of all those referred to CRPs should be routinely collected and monitored to establish how responsive the programme is to those from lower deprivation levels.

There was no evidence in any of the models for an association with ethnicity that was independent of age and deprivation. For the models shown in Table 4, this may possibly be due to the low numbers of Maori and Pacific Island people included. In this study, there was a high correlation between deprivation and Maori ethnicity as demonstrated elsewhere.[29] Studies in the United States have consistently found that while both ethnicity and socioeconomic position predict access to care, ethnicity is the major determinant.[30] NZDep96 is an area based measure of deprivation and may not be a good proxy measure of either an individual’s level of deprivation or their

socioeconomic status, yet in this study it accounts for more variation in all models than ethnicity.[20]

The significant relationship found between access to transport and use of cardiac rehabilitation services, both in rate of referral and in attendance confirms findings in several other studies.[31–33] One potential strategy to overcome this barrier is to take rehabilitation to the person through home- or community-based cardiac rehabilitation services.[34]

The study did have limitations however its strength lies in the large amount of data available for analysis and the national perspective taken. For a low cost it provided benchmarking data for the service and highlighted the need to undertake a longitudinal study of this area to examine in more detail the issues related to referral to, uptake of and utilisation of cardiac rehabilitation services from a quantitative and qualitative perspective.

This study demonstrates there is considerable scope for improvement in referral to, uptake of and completion of cardiac rehabilitation programmes in New Zealand. It highlights the need to improve referral processes, to promote the benefits of cardiac rehabilitation for certain groups, namely women, those at each end of the age spectrum, those with heart failure and those living in areas of greater deprivation. It is important to design and implement innovative and more effective ways of delivering the service and to improve monitoring of cardiac rehabilitation services.

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