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ORIGINAL ARTICLE

Participation of Aboriginal and Torres Strait Islander People in Conventional Cardiac Rehabilitation Programs: Analysis of the Queensland Cardiac Outcomes Registry

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Aims High-quality, culturally safe, secondary prevention care has the potential to improve the cardiovascular health of Aboriginal and Torres Strait Islander People in Australia (*hereafter collectively referred to as First Nations Peoples*). Despite this, there is a paucity of comprehensive data on cardiac rehabilitation (CR) participation among First Nations Peoples. The Queensland Cardiac Outcome Registry is a clinical registry that routinely collects point-of-care CR data. Therefore, the aim of this study is to (i) describe the First Nations populations referred to CR across Queensland, (ii) quantify rates of participation, and (iii) determine factors associated with CR attendance and completion.

Methods The cohort comprised 2,383 patients who identified as Aboriginal and/or Torres Strait Islander and were referred to one of 56 Queensland CR service extracted from Queensland Cardiac Outcome Registry (2020–2022). Bivariate and multivariable logistic regression analyses were used to identify factors associated with CR attendance and completion.

Results Over the study period, 50% (n=1,185) of First Nations patients in Queensland participated in at least one CR session. Of those who attended, 28% (n=333) completed CR (14% of the total cohort). The strongest predictors of CR attendance were having a coronary artery bypass graft or percutaneous coronary intervention procedure, living regionally (as opposed to remotely/very remotely), and coming from areas of higher socio-economic advantage. CR completion was more likely among men, those in older age groups (particularly 55–64 years), living in a major city, and non-smokers.

Conclusions This study provides the first known large-scale analysis of the uptake of CR programs among First Nations cardiac patients in Australia. We demonstrate that rates of attendance are higher among this cohort than previously reported. Barriers to attendance are described and highlight an important socio-economic gradient. There are clear opportunities for improving access to evidence-based secondary prevention programs for First Nations Peoples and benefits in collectively considering how unmet needs can be supported.

Keywords Aboriginal and Torres Strait Islander • Cardiac rehabilitation • Registry • Participation • First Nations Peoples

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Introduction

Cardiovascular disease (CVD) is a leading cause of premature death for Aboriginal and Torres Strait Islander people in Australia (*hereafter collectively referred to as First Nations Peoples*) [1]. Broad advancements in CVD prevention, treatment, and management that have benefited non-Indigenous populations have been slower to translate into comparable health outcomes for First Nations Peoples [2]. However, a recent report on the burden of disease among First Nations Peoples in Queensland [1] highlighted significant improvements across CVD with a rate reduction of 27% between 2011 and 2018. Potentially, these gains are reflective of population-wide reductions in major risk factors and/or improved access to effective primary health care, treatment, and secondary prevention [1].

Cardiac rehabilitation (CR) has Level 1 evidence for enhancing CVD outcomes, improving quality of life, and reducing hospital readmissions. High-quality, culturally safe secondary prevention care has the potential to improve the cardiovascular health of First Nations Peoples [3–5]. Despite this, little is known about the First Nations populations referred to CR programs and benefits they may gain from participation. Based on very limited literature, low levels of involvement of Australian First Nations Peoples [6], as well as a lack of cultural understanding by non-Indigenous staff [7], is evident. To date, little data beyond cross-sectional community surveys and small feasibility studies have been available to guide the development of systems that can better respond to the CVD needs of First Nations Peoples [2].

The Queensland Cardiac Outcomes Registry (QCOR) provides a unique opportunity to understand CR uptake and outcomes among First Nations Peoples in Queensland to determine service access gaps and potentially guide future service re-designing. Using QCOR data, members of the authorship team recently published the first Australian study on CR participation that included First Nations status within the analysis [8]. We showed that within Queensland, First Nations cardiac patients were more likely to decline CR (adjusted odds ratio [aOR] 1.65; 95% confidence interval [CI] 1.50–1.81) and if started, significantly less likely to complete traditional programs (aOR 1.60; 95% CI 1.29–1.98) than non-Indigenous patients. However, participation rates were much higher than previously reported with 50% of referred First Nations patients commencing CR and 28% of those who commenced completing CR. Further investigation is required to understand factors associated with participation in this cohort. Therefore, the aim of this study is to (i) describe the First Nations populations referred to CR across Queensland, (ii) quantify rates of participation, and (iii) determine factors associated with CR attendance and completion.

Positionality Statement

Our authorship team reflects diverse perspectives driven by research and professional background, career-stage, gender, and race. The team includes Aboriginal researchers (A.G., R.M.), public health and/or CVD academics (E.E.T., M.L.G., A.G., R.M., L.A.J., A.C.S., and V.O.M.) cardiology clinicians (W.Y.S.W.), and a policy maker (S.P.) working in First Nations health research and/or cardiovascular health service delivery.

Methods

Study Design and Governance

Approval of the protocol and deidentified QCOR data was provided by the Human Research Ethics Committee of The University of Queensland, Australia (HREC/2022/QMS/84592). Data access was obtained via the Statewide Cardiac Clinical Informatics Unit with permission also obtained by the QCOR CR sub-committee and QCOR data custodian. The Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines were used to report this study [9] with a checklist included as Supplementary Material S1.

Data Source

The QCOR was established by the Queensland Cardiac Clinical Network in 2012 and collects point-of-care clinical and operational data through direct entry systems (via the QCOR web portal). The Statewide Cardiac Clinical Informatics Unit performs data quality audits and analysis functions and maintains the registry data collections and applications. Details on QCOR are described elsewhere [10] and annual reports are available online [11].

CR Services

During the study period, 56 CR services actively contributed data to QCOR across 14 hospital and health services in addition to one statewide phone-based program (Self-Management of Chronic Conditions service). The full list of the programs that contribute data are available via the QCOR annual report [11]; however, this study did not have access to any identify data of these sites.

Participants

We included participants (age range 16–91 years) who identified as First Nations and were referred to one of the 56 Queensland public CR programs during a 3-year timeframe, from 1 January 2020 to 31 December 2022. The QCOR population includes those referred to a Queensland public CR program with ST-elevation myocardial infarction (STEMI), non-STEMI, unstable angina, arrythmia, congestive heart failure, valve disease, stable angina and "other" (e.g., elective admissions, cardiomyopathy, pericarditis, rheumatic heart disease). Patients who died between hospital discharge and referral to CR were also excluded from the analysis.

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Measures

Primary outcome variables
"CR attendance" is defined as undertaking the CR pre-assessment and "Completed CR" defined as the submission of a post-assessment report.

Covariates
The following socio-demographic, clinical, psychosocial, and behavioural variables were included either as covariates or in the descriptive analyses.

- *Socio-demographic* characteristics assessed were age (grouped into ≤44, 45–54, 55–64 and ≥65 years) and sex (male/female). Geographic location (major city, inner regional, outer regional, remote, very remote) based on the Australian Statistical Geographic Standard classifications [12] and the Socio-Economic Index for Areas Index of Relative Advantage and Disadvantage [13] were both derived from patient's home postcode.
- *Clinical variables.* Classification of a principle cardiac event in QCOR is based on International Classification of Diseases, Tenth Revision, Australian Modification diagnosis coding [14] and includes STEMI, non-STEMI, unstable angina, arrythmia, congestive heart failure, valve disease, stable angina, or other. Procedure information captures the most recent cardiac procedures, which is recorded at time of referral and includes percutaneous coronary intervention (PCI), coronary artery bypass graft (CABG) surgery, valve replacement or repairs, and insertion of cardiovascular implantable electronic devices (including permanent pacemakers, cardiac resynchronisation therapy (CRT) pacemakers/defibrillators], and implantable cardioverter defibrillator).
- *Cardiovascular risk factors* included: cigarette smoking ("current": within 30 days of cardiac event, "former": greater than 30 days prior to event, and "never"), physical activity at time of event as self-reported by patient ("sufficiently active": report activity levels ≥ to recommended guidelines for their age, "insufficiently active": lower levels than recommended guidelines, "inactive": no physical activity other than activities of daily living) [15], body mass index (BMI) derived from height and weight collected at pre/post assessments (recategorised into underweight/healthy (BMI: 15–24.99), overweight (BMI: 25–29.99), obese (BMI: 30–60).
- *Psychosocial risk factors* were collected at the time of CR pre- and post-assessment and, as such, are only available for those who commenced CR and included depression and anxiety screening at pre-assessment (none, mild, moderate, severe) as per the 4-item Patient Health Questionnaire [16].

Statistical Analysis

Continuous variables were presented as means and standard deviations, and categorical variables as numbers and percentages. Pearson chi-square tests and *t*-tests were used to compare characteristics of participants who attended vs those who did not attend CR. Unadjusted (bivariate) and multivariable logistic regression analyses were used to assess factors associated with CR attendance and completion. Variable selection for inclusion in the multivariable logistic regression analyses was based on both statistical and conceptual importance. Predictor variables with $p \leq 0.2$ were considered for inclusion in the multivariable model to reduce omitted-variable bias. Activity level was included based on conceptual grounds [17]. Other psychosocial and behavioural risk factors (e.g., symptoms of anxiety/depression) were not included in the regression of CR completers due to large numbers of missing data. For each logistic regression analysis, aOR and 95% CIs were estimated and reported. All analyses were conducted with SPSS (version 28.0, IBM Corporation, Armonk, NY, USA), Stata (version 18.0, StataCorp, College Station, TX, USA) and R Studio. A two-sided probability test was used for all statistical tests with significance levels set at $p<0.05$.

Results

Characteristics of the Cohort

In our 3-year study period, 35,535 people were referred to public CR programs across Queensland. Of these, a total of 2,383 (7%) identified as First Nations (Aboriginal: n=1,916, 80.40%; Torres Strait Islander: n=274, 11.50%; or both: n=193, 8.10%) (Figure 1). By comparison, the estimated proportion of First Nations Peoples in Queensland is 4.6% [18].

First Nations cardiac patients referred to CR programs were widely dispersed across Queensland with 56%

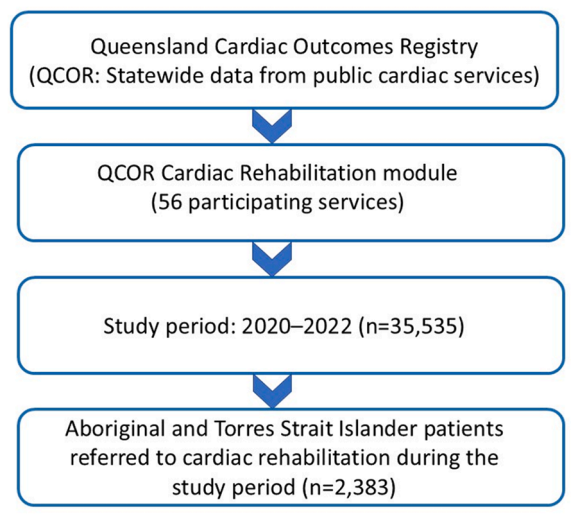

Figure 1 Study cohort from overall cardiac rehabilitation service data in the Queensland Cardiac Outcomes Registry.

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(n=1,324) residing in regional areas and 23% (n=538) living in remote locations. Regarding cardiovascular risk factors, smoking rates were high (30% current smokers, n=293) among both men and women, with the highest rates among those aged between 45 and 54 years (38% current smokers, n=111). Positive depression/anxiety screening scores (using 4-item Patient Health Questionnaire) were reported in 23% (n=199) of screened patients (total n=850), with women having higher scores than men (30%, n=98 of women screened positive vs 19%, n=101 of men; p=0.001). Risk factors varied by level of remoteness (Figure 2). Rates of obesity and symptoms of anxiety/depression were lower within the strata living in remote locations compared to those in regional and metropolitan settings. Smoking and levels of physical activity were the inverse, with 40% (n= 72) of the remote cohort smoking compared to 27% (n=149) and 29% (n=72) in regional and metropolitan areas, respectively.

CR Participation

The socio-demographic, clinical, and behavioural risk factors of First Nations Peoples in Queensland referred to CR; and reported CR participation is summarised in Table 1. Overall, 50% (n=1,185) attended a CR pre-assessment and 50% declined. Of those who attended, 30% (n=333) completed CR (14% of the total cohort). First Nations Peoples were more likely to decline CR if they were female (54% declined vs 47%, p=0.001), lived in remote locations (63% vs 42% declined in major cities, p<0.001) and from areas of higher socio-economic disadvantage (55% declined vs 33% in areas of high advantage, p=0.001). Regarding clinical diagnoses, patients with arrythmia (a condition not mandated as part of program eligibility) were more likely to decline CR than any other condition group (67% declined, p<0.001), and patients who had received a CABG were more likely to attend.

CR Participation Across Geographical Locations

CR participation rates varied across the Queensland Hospital and Health Services (HHS) and did not necessarily relate to availability of services (Figure 3). HHSs with the highest levels of attendance included the regions of South West, Central West, West Moreton, and Wide Bay. Whereas the lowest rates of attendance to these traditional public services included the Cairns and Hinterland region, the Torres and Cape, and the Darling Downs. In some of these regions with low attendance (e.g., Darling Downs) alternate programs are available through the Aboriginal Community-Controlled Health Organisations (not depicted in Figure 3).

Predictors of CR Attendance and Completion

Table 2 presents the results of two multivariable logistic regression analyses assessing factors associated with CR attendance (i.e., completed an initial assessment) and CR completion (i.e., completed a final assessment). For unadjusted results, see Supplementary Table 1. The strongest predictors of CR attendance were having a CABG or PCI procedure, living regionally (as opposed to remotely/very remotely), and coming from areas of higher socio-economic advantage. CR completion was more likely among men, those in older age groups (particularly 55–64 years), coming from a major city, and non-smokers.

Discussion

Overall, 50% (n=1,185) of First Nations cardiac patients in Queensland referred to CR participated in at least one session. Of those who attended, 28% (n=333) completed CR (14% of the total cohort). This is the first known time

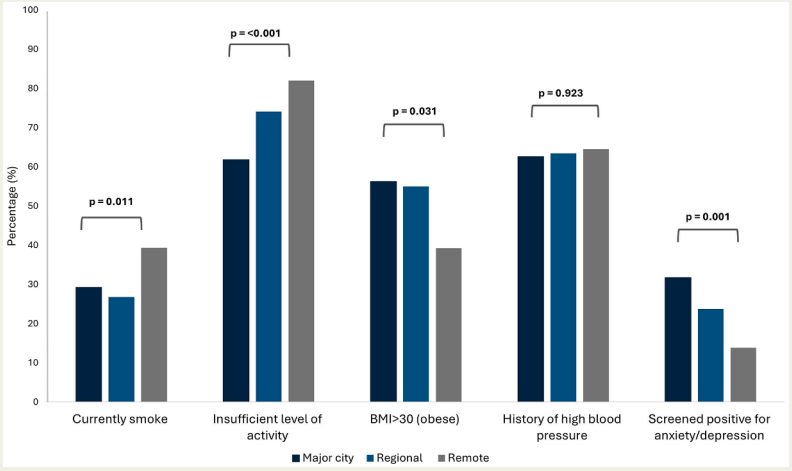

Figure 2 Cardiovascular risks of First Nations patients referred to cardiac rehabilitation by geographical location (major city/regional/remote). Smoking, activity level (n=985); body mass index (BMI, n=543); history of blood pressure (n=984); screened for anxiety/depression (n=848). Statistical test=chi-square.

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Table 1 First Nations attenders of CR vs non-attenders.

Variable	Total n=2,357 (%)[a]	Attended CR=1,185 (50%)	Did not attend CR=1,172 (50%)	p-value
Socio-demographic				
Sex				**0.001**[b]
Male	1,328 (56)	707 (53)	621 (47)	
Female	1,029 (44)	478 (46)	551 (54)	
Age, years (SD)	2,357	55.78 (12)	54.88 (13)	**0.041**[c]
<44	451 (19)	205 (45)	246 (55)	0.055[b]
45–54	647 (27)	326 (50)	321 (50)	
55–64	697 (30)	365 (52)	332 (48)	
>65	562 (23)	289 (51)	273 (49)	
Geographic location	2,344			**<0.001**[b]
Major city	502 (21)	291 (58)	211 (42)	
Inner regional	446 (19)	260 (58)	186 (42)	
Outer regional	863 (37)	376 (44)	487 (56)	
Remote	136 (6)	50 (37)	86 (63)	
Very remote	397 (17)	205 (52)	192 (48)	
SEIFA (IRSAD)	2,336			**0.001**[b]
Quintile 1 (most disadvantaged)	885 (38)	402 (45)	483 (55)	
Quintile 2	632 (27)	328 (52)	304 (48)	
Quintile 3	584 (25)	314 (54)	270 (46)	
Quintile 4	177 (8)	99 (53)	87 (47)	
Quintile 5 (most advantaged)	58 (3)	39 (67)	19 (33)	
Primary diagnosis	2,357			**<0.001**[b]
Arrhythmia	66 (3)	22 (33)	44 (67)	
CHF	141 (6)	63 (45)	78 (55)	
NSTEMI	784 (33)	408 (52)	376 (48)	
Stable angina	137 (6)	88 (64)	49 (36)	
STEMI	404 (17)	218 (54)	186 (46)	
Unstable angina	245 (10)	127 (52)	118 (48)	
Valvular disease	112 (5)	58 (52)	54 (48)	
Other	468 (20)	201 (43)	267 (57)	
Most recent procedure	1,250			
CABG	282	197 (70)	85 (30)	**<0.001**[b]
PCI	815	491 (60)	324 (40)	**<0.001**[b]
CIED	30	12 (40)	18 (60)	0.272[b]
Valve	123	70 (57)	53 (43)	0.131[b]

p-values are bolded where the result was statistically significant. "Other" included diagnosis not otherwise classified such as elective admissions, cardiomyopathy, pericarditis, rheumatic heart disease.

[a]Total based on 2,357 as 26 missing data points related to CR participation.

[b]Statistical test=chi-square.

[c]Statistical test=t-test.

Abbreviations: CR, cardiac rehabilitation; SD, standard deviation; SEIFA, Socio-Economic Index for Areas; IRSAD, Index of Relative Socio-Economic Advantage and Disadvantage; CHF, congestive heart failure; NSTEMI, non–ST-segment elevation myocardial infarction; STEMI, ST-segment elevation myocardial infarction; CABG, coronary artery bypass graft; PCI, percutaneous coronary intervention; CIED, cardiovascular implantable electronic devices including permanent pacemakers, cardiac resynchronisation therapy pacemakers, and implantable cardioverter defibrillator.

comprehensive data on CR participation among eligible First Nations Peoples has been reported. Our findings also demonstrate that the strongest predictors of CR attendance among First Nations Peoples were having a CABG or PCI procedure, living regionally (as opposed to remotely/very remotely), and coming from areas of higher socio-economic advantage. CR completion was more likely among men, those in older age groups (particularly 55–64 years), coming from a major city, and non-smokers.

Furthermore, non-attendance (of traditional CR programs) appears higher in certain HHS areas including the Cairns and Hinterland region, the Torres and Cape, and the Darling Downs. In part, this may be due to lack of availability of CR programs (e.g., in the Torres and Cape) which

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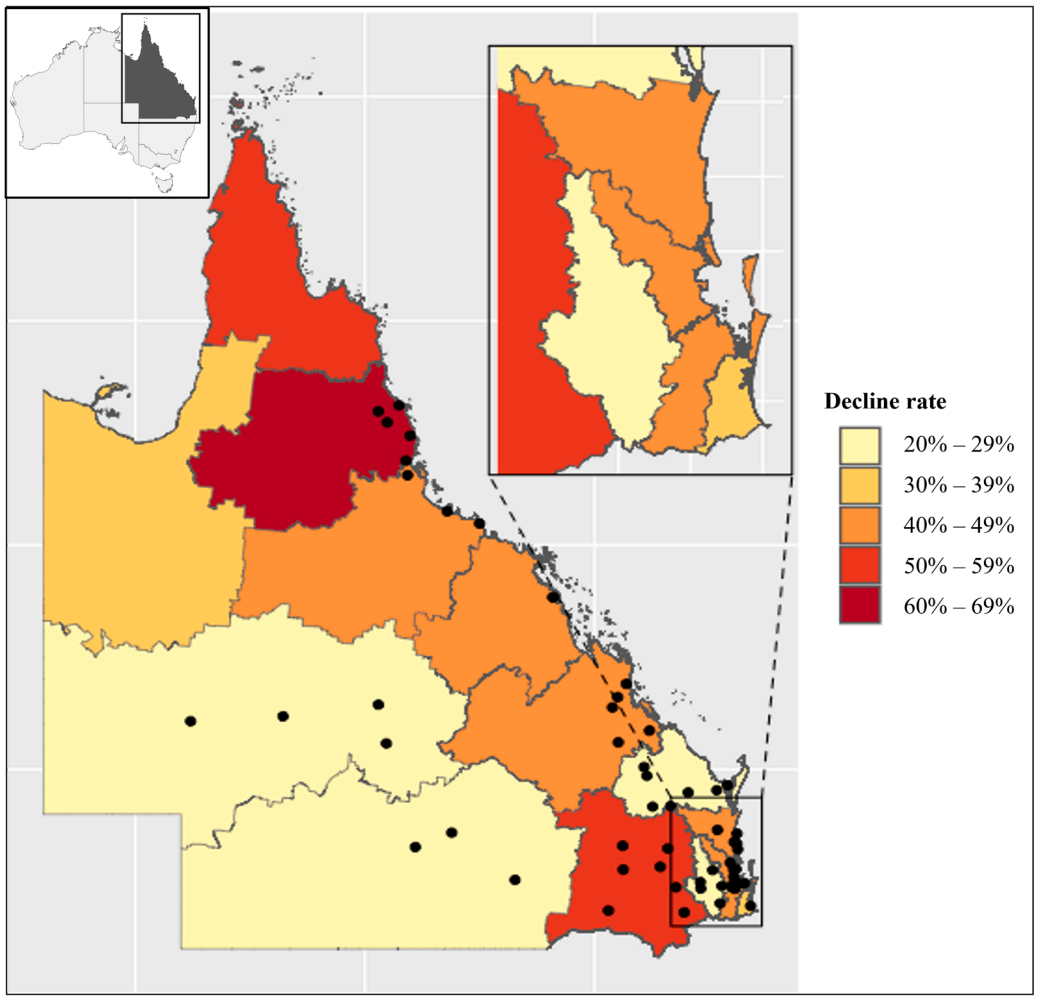

Figure 3 Cardiac rehabilitation uptake among First Nations cardiac patients across Queensland Hospital and Health Services (HHS). Colour is representative of cardiac rehabilitation uptake rates. Dots represent public cardiac rehabilitation services available across the state. Uptake rates are determined by percentage of declined referrals per HHS.

was exacerbated during this data collection period due to coronavirus disease-2019 resulting in travel restrictions, staff redeployment, and challenges with some services pivoting to telehealth [19]. In contrast, low levels of traditional program uptake may be due to the availability of First Nations-led programs (e.g., the Goondir Health Service [20] in the Darling Downs region or programs run by the Institute for Urban Indigenous Health such as 'Work it out' [21], or the 'Deadly Steps Together' program [22] in West Moreton). Currently, these programs do not enter data into QCOR, so we are unable to determine if these decline rates represent service access gaps or preferences for different service types. Improved data linkage is required to better determine service gaps, but also importantly to identify services with high rates of engagement so lessons and learnings can be shared. If patients had attended programs not included in the QCOR register, then the actual overall CR attendance rate could potentially be higher than what we have reported here.

Many factors that impacted participation (e.g., living remotely, younger age, and smoking status) have been previously identified among non-Indigenous patients [23]. However, these issues are likely compounded in the First Nations cohort due to interpersonal racism and impacts of institutional racism, lower socio-economic status, greater geographical isolation and greater cardiovascular risk profiles [7]. The young nature of this cohort should be noted (nearly 20% of the cohort were <45 years of age). The literature has previously reported that the younger age at which First Nations Peoples are diagnosed with a cardiac event adds another layer of discomfort when attending a group with older participants [24]; thus, necessitating the need for novel approaches. Further, greater consideration is required to ensure programs are supportive places for those with high cardiovascular risk profiles, such as current smokers, who have been repeatedly shown to drop out of CR at higher rates than their non-smoking counterparts [25].

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Table 2 Predictors of CR attendance and completion among First Nations patients.

Factor	CR attendance (N=2,344)			CR completion (N=688)		
	aOR	95% CI	p-value	aOR	95% CI	p-value
Gender						
Female	Ref			Ref		
Male	1.14	0.96–1.36	0.134	1.77	1.23–2.54	**0.002**
Age (years)						
<44	Ref			Ref		
45–54	1.11	0.86–1.43	0.439	1.99	1.11–3.56	**0.020**
55–64	1.12	0.87–1.44	0.394	2.66	1.49–4.75	**0.001**
>65	1.13	0.87–1.48	0.351	2.19	1.21–3.99	**0.010**
Remoteness class						
Major city	1.29	0.97–1.72	0.080	2.17	1.05–4.51	**0.037**
Inner regional	1.55	1.18–2.03	**0.002**	1.79	0.90–3.53	0.095
Outer regional	0.76	0.60–0.97	**0.024**	1.11	0.56–2.23	0.762
Remote/very remote	Ref			Ref		
SEIFA (IRSAD)						
Quintile 1 (most disadvantaged)	Ref			Ref		
Quintile 2	1.21	0.98–1.51	0.083	1.17	0.74–1.86	0.486
Quintile 3	1.47	1.16–1.85	**0.001**	1.53	0.96–2.43	0.075
Quintile 4 and 5 (most advantaged)	1.21	0.87–1.69	0.259	1.07	0.58–2.23	0.762
Primary diagnosis						
Arrhythmia	0.78	0.44–1.38	0.390	1.47	0.42–5.18	0.547
CHF	1.04	0.68–1.58	0.850	0.38	0.16–0.92	**0.031**
NSTEMI	1.14	0.88–1.47	0.332	0.54	0.33–0.89	**0.016**
Stable angina	1.47	0.96–2.25	0.076	0.39	0.17–0.86	**0.020**
STEMI	Ref					
Unstable angina	1.09	0.77–1.53	0.635	0.43	0.21–0.86	**0.016**
Valvular disease	1.80	1.14–2.85	**0.012**	1.93	0.81–4.59	0.135
Other	0.91	0.67–1.22	0.519	0.79	0.435–1.44	0.447
Procedures						
CABG	3.14	2.35–4.21	<**0.001**	1.28	0.78–2.09	0.323
PCI	2.36	1.92–2.90	<**0.001**	0.86	0.55–1.32	0.490
Pre-activity levels						
Sufficiently active	-			0.89	0.53–1.47	0.640
Insufficiently active	-			0.82	0.52–1.29	0.383
Inactive	-			Ref		
Pre-smoking status						
Never smoked	-			1.96	1.17–3.26	**0.010**
Former smoker	-			1.92	1.23–3.00	**0.004**
Current smoker	-			Ref		

p-values are bolded where the result was statistically significant. "Other" included diagnosis not otherwise classified such as elective admissions, cardiomyopathy, pericarditis, rheumatic heart disease.

Abbreviations: CR, cardiac rehabilitation; aOR, adjusted odds ratio; CI, confidence interval; Ref, reference; SEIFA, Socio-Economic Index for Areas; IRSAD, Index of Relative Socio-Economic Advantage and Disadvantage; CHF, congestive heart failure; NSTEMI, non–ST-segment elevation myocardial infarction; STEMI, ST-segment elevation myocardial infarction; CABG, coronary artery bypass graft; PCI, percutaneous coronary intervention.

Proposed Solutions and Models of Care

Evidence from the literature suggests that culturally informed, solution-focused care can improve the cardiovascular health of First Nations Peoples [5]. Both (i) First Nations specific, and (ii) enhancements to standard CR programs have been proposed.

Firstly, focused, or dedicated programs for First Nations patients such as the hospital-based Better Cardiac Care programs have been developed and implemented in Queensland public hospitals with multidisciplinary teams that actively supports First Nations Peoples with heart disease [5,19]. These programs support patients to navigate the

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system and ensure education, counselling and transitional support are provided in culturally appropriate ways resulting in improved clinical outcomes (e.g., reduction in unplanned hospital admissions) [5,26]. Within CR specifically, culturally appropriate programs have been trialled in Western Australia within an urban Aboriginal Medical Service and were shown to improve cardiovascular risk factors [3]. Similar programs have also been implemented in Queensland (such as those previously mentioned: 'Work it Out' [21] and 'Deadly Steps Together'); however, further evaluation is likely required to determine outcomes.

Secondly, models of care have also been developed for culturally safe CR program within non-Indigenous specific health services (e.g., conventional CR programs) [4]. To enable this, a combination of strategies (e.g., cultural awareness training, respectfully co-designing programs with the First Nations communities and/or Aboriginal Health Workers) were required to address non-Indigenous health professionals' awareness, attitudes, skills, and behaviours. Trust, relationship building, and two-way learning were also critical to supporting participant engagement [4] and have previously been reported in the literature as critical to engaging First Nations Peoples in secondary prevention services [7].

Further, broad improvements such as providing greater flexibility in accessing secondary prevention services (e.g., telehealth) are likely to have benefits across multiple population groups if carefully designed. In the broader First Nations literature, telehealth has been used to support linkages between local, community-led health service and other non-Indigenous care providers to enhance trust and engagement and may be another model worth considering for CR [27].

Each of these identified solutions can likely co-exist. It is important to note that any proposed solution requires careful co-design and co-creation with consumers and service providers. Here, we present data that elucidates some of the access gaps present for this cohort of cardiac patients. Crucial to any implementation of a new model of care is the ongoing partnership with First Nations consumers and services to support sustainable and effective improvements to care.

Strengths and Limitations

To our knowledge, this is the first statewide analysis of CR participation among First Nations Peoples. The study is strengthened by the large data size and inclusion of 56 services across Queensland. However, it should be noted that only public health services are included (no private services) and as previously mentioned, there is no current linkage with Aboriginal Community-Controlled Health Organisations. These data may not be generalisable to other jurisdictions and many of the processes in place in Queensland (e.g., electronic referral processes) may differ in other states or territories. Limitations with this QCOR data include no collection of number of sessions attended (currently being incorporated) and that non-attenders do not collect outcome measures (e.g., risk assessments or functional exercise capacity), meaning that health outcomes between attenders and non-attenders are unable to be compared. Additionally, these data are unable to elucidate any underlying social dimensions that potentially have a large aspect in influencing participation (e.g., user experience, perceptions and beliefs about the service and disease, and social experience gained from attending) [28]. Finally, we would like to note that additional ethical review could have been considered. While there was Indigenous co-authorship and involvement from the conception of the paper, with First Nations Peoples analysed as a specific group within a larger dataset, specialised Aboriginal and Torres Strait Islander Research Ethics review could have been sought to better uphold the principle of self-determination as per the The Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) Code of Ethics.

Conclusions

We present here the first large-scale analysis of the uptake of conventional CR programs among First Nations cardiac patients in Australia. We demonstrate that rates of attendance are higher among this cohort than previously reported. Barriers to attendance echo broader barriers previously described in the literature (e.g., living remotely, women, younger age, and high-risk cardiovascular profiles). Additionally, this analysis determined that socio-economic disadvantage was a major contributor to non-participation. There are clear opportunities for improving increased access to evidence-based secondary prevention programs via culturally informed and solution-focused care. Improved data linkage will support enhanced evaluation of such programs in the future. Lastly, ongoing partnerships with consumers and services providers are required to understand services gaps in-depth and co-design continual program improvements.

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Declaration of Competing Interests

S.P. and W.Y.S.W. are employed by Queensland Health. Queensland Health funded the development of the Queensland Cardiac Outcomes Registry (QCOR), and employs the Statewide Cardiac Clinical Unit, the business unit of QCOR.

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Author Contributions

The authors confirm contribution to the paper as follows: study conception and design: E.E.T., M.L.G., L.J., A.G.; analysis and interpretation of results: All authors; draft manuscript preparation: E.E.T., M.L.G., V.M., A.G., S.P., L.J., W.Y.S.W. All authors reviewed the results and approved the final version of the manuscript.

Data Availability Statement

The data underlying this article cannot be shared publicly due to ethics requirements. The data can be accessed via reasonable request to the Queensland Cardiac Outcome Registry.

Appendices

Supplementary data associated with this article can be found, in the online version, at https://doi.org/10.1016/j.hlc.2025.09.011.

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