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National survey of Australian cardiac rehabilitation programmes: does current exercise programming adhere to evidence-based guidelines and best practice?

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ABSTRACT

Objectives The efficacy of exercise-based cardiac rehabilitation (CR) for patient outcomes is well established, with better outcomes when delivery meets recommended guidelines. The aim of this study was to assess how well Australian practice aligns with national CR guidelines for exercise assessment and prescription.

Method This cross-sectional online survey was distributed to all 475 publicly listed CR services in Australia and consisted of four sections: (1) Programme and client demographics, (2) aerobic exercise characteristics, (3) resistance exercise characteristics and (4) pre-exercise assessment, exercise testing and progression.

Results In total, 228 (54%) survey responses were received. Only three of five Australian guideline recommendations were consistently reported to be followed in current CR programmes: assessment of physical function prior to exercise (91%), prescription of light-moderate exercise intensity (76%) and review of referring physician results (75%). Remaining guidelines were commonly not implemented. For example, only 58% of services reported an initial assessment of resting ECG/heart rate, and only 58% reported the concurrent prescription of both aerobic and resistance exercise, which may have been influenced by equipment availability ($p<0.05$). Exercise-specific assessments such as muscular strength (18%) and aerobic fitness (13%) were uncommonly reported, although both were more frequent in metropolitan services ($p<0.05$) or when an exercise physiologist was present ($p<0.05$).

Conclusions Clinically relevant deficits in national CR guideline implementation are common, potentially influenced by location, exercise supervisor and equipment availability. Key deficiencies include the lack of concurrent aerobic and resistance exercise prescription and infrequent assessment of important physiological outcomes including resting heart rate, muscular strength and aerobic fitness.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ The efficacy of exercise-based cardiac rehabilitation (CR) is well established.
⇒ Better patient outcomes when delivery matches guideline recommendations.
⇒ How well Australian CR adheres to national guidelines has not yet been evaluated.

WHAT THIS STUDY ADDS

⇒ Only three Australian guideline recommendations were consistently reported in current CR programmes: (1) assessment of physical function prior to exercise, (2) review of referring physician results and (3) prescription of light-moderate exercise intensity.
⇒ Guideline implementation was suboptimal for baseline haemodynamic assessment and the concurrent prescription of both aerobic and resistance exercise—elements that are associated with enhanced safety and better patient outcomes.
⇒ These deficiencies were more prevalent in regional/remote settings, without exercise physiologist supervision, and limited access to equipment. Given that Australian guidelines are themselves less rigorous/concordant with existing evidence than international ones, this implementation gap is highly relevant to effective clinical practice.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Future studies should include on-site auditing of CR protocols and outcomes to confirm the survey findings and evaluate future guideline adherence.
⇒ Nationwide reporting of individual programme outcome data, including patient-reported outcomes, is needed to evaluate and benchmark quality and effectiveness.
⇒ An update to the outdated national guidelines in conjunction with an educational initiative to aid dissemination is necessary to align service delivery with current evidence.

INTRODUCTION

Cardiac rehabilitation (CR) programmes include multidisciplinary interventions to improve health-related outcomes and reduce cardiovascular (CV) risk factors like physical inactivity, obesity, poor diet and smoking.[1] CR reduces the rate of CV complications following acute cardiac events, surgical interventions and chronic heart failure, and CV and all-cause mortality.[2] In addition, CR

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improves quality of life, and reduces the risk of hospital readmission and mortality in both coronary artery disease[2] (CAD) and heart failure.[3] In CAD specifically, aerobic exercise has been shown to reduce the rate of restenosis following angioplasty,[4] in conjunction with favourable changes in aerobic capacity and vascular function.[5]

CR practice in Australia is informed by: (1) a 2004 national framework from the National Heart Foundation of Australia (NHF),[6] (2) a 2015 guidance document outlining the core components of CR from the Australian Cardiovascular Health and Rehabilitation Association (ACRA)[7] and (3) a 2020 standardised programme resource from the Victorian branch of the NHF.[8] All three recommend light-moderate intensity aerobic exercise in addition to a comprehensive baseline assessment of clinical history and functional capacity. Both Australian and international guidelines also recommend resistance training to augment aerobic fitness and muscular strength,[9] citing no additional risk of adverse CV events.[10] This strong and consistent body of evidence has led to both aerobic and resistance exercise being included in both Australian and international CR guidelines[11] (see online supplemental tables 1 and 2), although no prescriptive detail for resistance exercise is present in Australian guidelines.

Given that benefits of CR are expected when it is implemented with fidelity to guidelines, it is important to investigate how well Australian CR programmes adhere to current recommendations regarding optimal assessment and exercise prescription. Although previous CR surveys have described service characteristics, cohort demographics and broad exercise prescription practices,[12 13] they have not included details on pre-exercise assessment, exercise modality and intensity, detailed analyses of potential factors, which may influence exercise testing and prescription, or concordance with national guidelines. Therefore, this investigation will gather information on current exercise assessment and prescription practices in Australian CR services to (1) evaluate the current state of practice and its fidelity to national guideline recommendations and (2) explore factors which may influence the effectiveness of CR service delivery around Australia.

METHODS

The study was a cross-sectional survey of all publicly listed CR services in Australia, correct on 27 January 2017. Potentially eligible services were identified from the publicly available online directory, hosted on the ACRA website.[14] Any services providing only telephone information were contacted to request email information. No exclusions were made based on any information provided within the database such as rehabilitation phase, type of services offered, location or funding model.

The survey was distributed via email on 1 February 2017 and was available for 4 weeks, with data collection ceasing on 28 February 2017. An initial email was distributed to the programme manager for all eligible services, outlining the purpose of the study and inviting them to complete the online survey. For emails that were 'undeliverable', a single follow-up telephone call was made to request updated email details. Two reminder emails were sent 1 and 3 weeks after the initial email to services who had not completed the survey nor declined participation in the study. To encourage completion, participants who completed the entire survey were entered into a prize draw for a tablet computer, fitness watch or small gift voucher.

The survey was hosted and designed within the Survey Monkey website[15] and consisted of four sections: (1) programme and client demographics, (2) aerobic exercise training characteristics, (3) resistance training characteristics and (4) pre-exercise assessment, exercise testing and progression. Section 1 collected basic programme and client details including location, remoteness (defined using postcode and the Australian Statistical Geography Standard classifications),[16] phase of rehabilitation, typical diagnoses, sex proportion, age range and supervisor qualification details. Sections 2 and 3 collected information on the use of aerobic and resistance exercise respectively, including exercise intensity, monitoring and reasons for selecting specific intensities. Exercise intensity was defined as per the American College of Sports Medicine[17] and included very light-light (VO_{2max} <45%, Borg RPE <11), moderate (VO_{2max} 45%–59%, Borg RPE 11–12), hard (VO_{2max} 60%–84%, Borg RPE 13–16) and very hard-maximal (VO_{2max} ≥85%, Borg RPE ≥17). Section 4 gathered information on the type of pre-exercise assessment and exercise tests used and how exercise training sessions were progressed. The design of previous Australian surveys[12 13] was considered to ensure novel information was collected. The survey primarily contained categorical variables with the option to include additional open-ended feedback on each question. To reflect the variable nature of clinical practice, participants could choose more than one option for many questions.

At the conclusion of data collection, survey responses were downloaded from Survey Monkey and stored on secure servers hosted by the University of Sydney. Data were subsequently coded and analysed using the SPSS Statistical Software V.22 (IBM). Incomplete surveys were not excluded from final analyses, however, analyses at the question-level included all available and valid responses. Categorical variables are presented as number (n) and proportion of overall responses to each individual question (%). Where appropriate, categories were collapsed for more concise and simplified comparisons, for example, exercise intensities 'vigorous' and 'maximal' were collapsed into a single 'vigorous-maximal' category (online supplemental table 3). Dependent variables were defined a priori as service demographics, screening and assessment type, exercise frequency and exercise intensity. Exploratory analyses examining potential relationships between dependent variables and categorical

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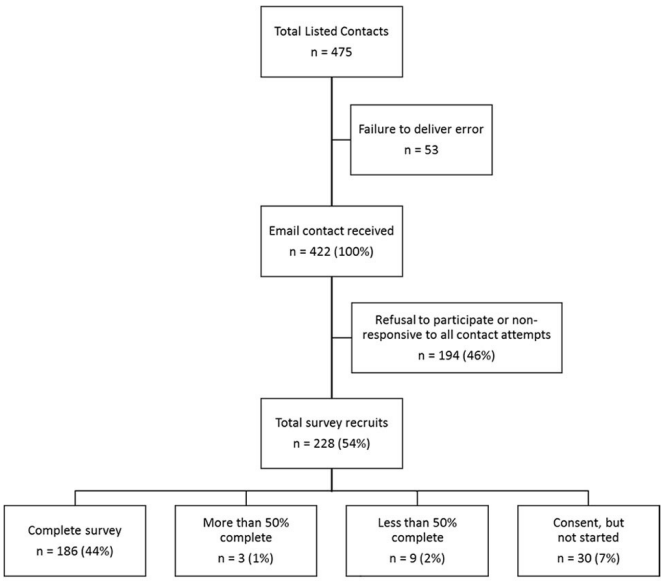

Figure 1 Flow of respondents through the recruitment phase. n, number of respondents; (%), proportion of total respondents that received email contact.

variables of interest used the Fisher's exact test statistic, with $p<0.05$ accepted as statistically significant. Pearson's χ^2 statistic was deemed inappropriate due to the limited sample size.[18] These detailed analyses are presented in online supplemental tables 4–6, along with OR and 95% CIs.

RESULTS

The survey was distributed to all 475 contacts listed in the ACRA database, with 422 emails received. In total, 228 (54%) responded, including 186 (44%) complete surveys, 12 (3%) incomplete surveys and 30 (7%) providing only consent but not commencing the survey (figure 1).

Service characteristics

New South Wales and Victoria represented 48% of total survey respondents (24% each; table 1). Queensland and Western Australia had the highest response rates, with 41% and 38% of listed services responding. The majority of respondents were located within metropolitan (Remoteness Area (RA) 1, 47%) and regional areas (RA2, 24%; RA3, 13%), with limited respondents in remote areas (RA4, 1%; RA5, 2%). A median of 2 (range: 1–6) different healthcare professional disciplines directly supervised exercise in each service. Nurses and physiotherapists were the most common exercise supervisors (70% and 68%, respectively), while exercise physiologists were present in only 30% of services (figure 2). Compared with regional services, metropolitan services enrolled more patients aged 50–59 (OR (95% CI): 3.59 (1.27 to 10.15); online supplemental table 4A), more inpatients (17.76 (2.31 to 136.49); online supplemental table 4B) and more patients with 'Other CAD' diagnoses (5.92 (1.29 to 27.16); online supplemental table 4C). Regional services enrolled more patients aged 70+compared with to metropolitan services (0.44 (0.23 to 0.84); online supplemental table 4A). Service remoteness was not associated with differences in exercise supervisor.

Table 1 Characteristics of responding services, expressed as number of survey responses and proportion of responses within each characteristic

Characteristic (n=198)	Survey responses, n (%)	
State		
New South Wales	48	(24.2)
Victoria	48	(24.2)
Queensland	31	(15.7)
Western Australia	26	(13.1)
South Australia	15	(7.6)
Tasmania	3	(1.5)
Australian capital territory	1	(0.5)
Northern territory	1	(0.5)
Not specified	25	(12.6)
Remoteness		
Metropolitan (RA1)	92	(46.5)
Inner regional (RA2)	48	(24.2)
Outer regional (RA3)	26	(13.1)
Remote (RA4)	2	(1.0)
Very remote (RA5)	3	(1.5)
Not Specified	27	(13.6)
Exercise supervisor*		
Nurse	138	(69.7)
Physiotherapist	135	(68.2)
Exercise physiologist	60	(30.3)
Other allied health professional	38	(19.2)
Occupational therapist	7	(3.5)
Medical doctor	2	(1.0)

*% reported for each exercise supervisor row.
RA, remoteness area.

Pre-exercise assessment

The average number of assessments per service was 3±2, with only two respondents not reporting any initial screening or assessments (figure 3). Among the three key assessments recommended in the Australian guidelines (see online supplemental table 1), evaluation of physical function was the only procedure consistently reported (91%) by participating services. The other two recommendations, review of referring physician results and resting ECG or heart rate (ECG/HR), were reported substantially less often (75% and 58%, respectively). Two additional assessment domains recommended by international (but not Australian) guidelines, aerobic fitness and cardiac function, were reported infrequently (13% and

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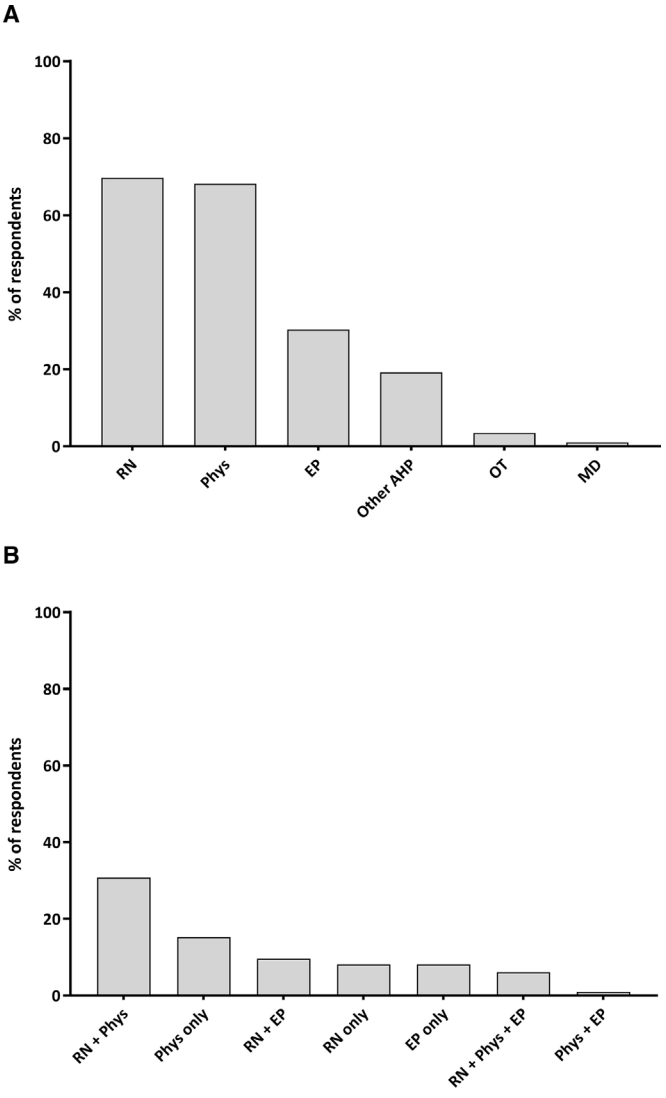

Figure 2 Summary of supervisors overseeing the exercise component of each programme, expressed as proportion of respondents (%; n=198). Note that (A) shows prevalence of supervisors where respondents could select more than one option, whereas (B) shows the cumulative prevalence of different supervisor combinations for the three most prevalent supervisor types. AHP, allied health professionals; EP, exercise physiologist; MD, medical doctor; OT, occupational therapist; Phys, physiotherapist; RN, registered nurse.

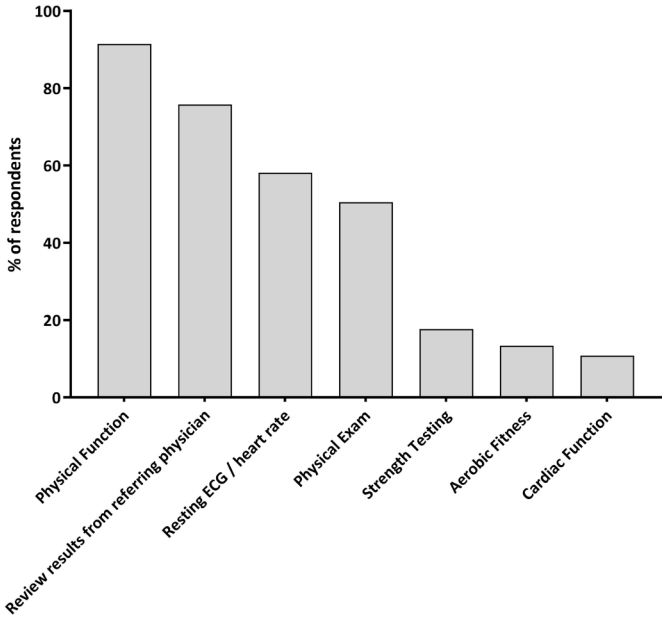

Figure 3 Summary of screening and testing procedures conducted prior to first exercise session, expressed as proportion of respondents (%; n=186). Note that each respondent was able to make multiple selections.

11%, respectively). The assessment of muscular strength was reported by 18% of participating services.

Metropolitan services more frequently assessed aerobic fitness, strength and resting ECG/HR than regional services (OR (95% CI): 3.59 (1.27 to 10.15), 5.44 (1.97 to 15.00), 2.29 (1.22 to 4.32), respectively, online supplemental table 5C). However, service location was not associated with the assessment of cardiac function, physical function, use of a physical examination or review of referring physician results. The presence of a supervising exercise physiologist was associated with an increased frequency of both aerobic fitness (OR (95% CI): 4.39 (1.83 to 10.53), online supplemental table 5F) and muscular strength testing (5.00 (2.27 to 11.04), online supplemental table 5F) compared with services without an exercise physiologist.

Exercise prescription

Most (97%) programmes prescribed exercise, however, only 74% and 65% reported 'always' prescribing aerobic or resistance exercise, respectively, with only 58% reporting they 'always' prescribed both types simultaneously and were thus concordant with guidelines to prescribe both exercise modalities. Consistent with Australian guidelines, moderate intensity exercise was most consistently reported, making up 70% of aerobic and 67% of resistance exercise prescription responses, while 16% and 13% of respondents reported a higher intensity ceiling for their patients (figure 4). Common aerobic exercise modalities were indoor cycling (90%), treadmill walking/running (81%) and indoor/outdoor walking/running (70%). Resistance exercise was most commonly performed using free weights (95%), resistance bands (69%) or the patient's own bodyweight (68%).

Both aerobic and resistance exercise prescription frequency and intensity were associated with the exercise equipment used in services. The use of an indoor cycle, rowing ergometer or any type of resistance training equipment was significantly associated with a higher prevalence of concurrent exercise prescription ($p<0.05$). Additionally, the services that used weight-lifting machines more commonly prescribed vigorous-maximal intensities rather than low-moderate intensities of resistance exercise (OR (95% CI): 4.25 (1.76 to 10.27), online supplemental table 6H). Somewhat surprisingly,

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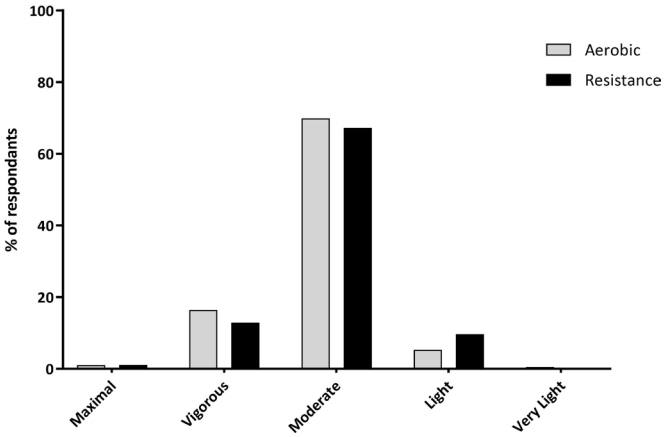

Figure 4 Summary of highest reported intensity, expressed as proportion of respondents (% Aerobic, n=189; resistance, n=186).

vigorous-maximal intensities of resistance exercise were also more commonly prescribed than low-moderate intensities in services using body weight resistance exercises (4.00 (1.14 to 13.97), online supplemental table 6H). Neither remoteness or supervisor discipline were associated with differences in the intensity or frequency of aerobic or resistance exercise, nor the concurrent prescription of both.

Adherence to national/international guidelines was the most commonly reported reason for exercise intensity selection in aerobic (80%) and resistance exercise (68%). During aerobic exercise, respondents more frequently reported that intensity was selected to minimise cardiac-related safety concerns than to minimise musculoskeletal concerns (60% vs 37%, p<0.001), whereas during resistance exercise, musculoskeletal concerns were more frequently reported than cardiac-related concerns (58% vs 53%, p<0.001). The most frequently reported ways that aerobic and resistance exercise were progressed were through intensity (83% and 86%, respectively) and volume/time (63% and 75%, respectively). Progression of exercise via increases in duration or frequency of sessions was less common, while retesting exercise performance to establish a new maximal capacity was reported by less than 12% of respondents.

DISCUSSION

The key finding of this investigation was that only three Australian guideline recommendations were consistently reported in current CR programmes: (1) assessment of physical function prior to exercise, (2) review of referring physician results and (3) prescription of light-moderate exercise intensity. Importantly, current practices appear suboptimal in elements associated with better patient outcomes and enhanced safety such as the pre-exercise assessment of resting ECG/HR and the concurrent prescription of both aerobic and resistance exercise, which were not reported by a large proportion of responding services (42% for both). Exploratory analyses revealed that these deficiencies were more prevalent in regional/remote settings, without exercise professional supervision, and limited access to equipment. Given that Australian guidelines are themselves less rigorous/concordant with existing evidence than international ones,[11] this implementation gap is relevant to effective clinical practice, suggesting the need to improve service delivery in Australian CR.

Our survey fills a significant knowledge gap. Among previous CR surveys, only four have presented data on exercise intensity,[12 13 19 20] two within Australia. Our findings share some consistency with results from previous Australian surveys. Specifically, the majority of survey responses were from New South Wales and Victoria,[13] exercise was commonly supervised by a nurse or physiotherapist,[12] and walking or indoor cycling were the most common aerobic exercise modes.[12]

Pre-exercise assessments

In concordance with Australian guideline recommendations, assessment of physical function and physician referral, and prescription of light-moderate exercise intensity were consistently reported by the majority of programmes, independent of service location and supervisor type, and consistent with previous Australian surveys.[12 13] High uptake of physical function assessments may be related to the testing method employed, with the 6 min walk test (6MWT) the most common assessment of physical function in Australian CR practice.[12] Importantly, the 6MWT is a valid and reliable outcome measure in CR,[21] which has strong prognostic value with mortality if less than 300 m,[22] and is easily implemented in most clinical settings with minimal equipment or personnel required. Consequently, the 6MWT is recommended in European guidelines as an accepted assessment of exercise tolerance in CR, where access to an exercise stress test is not possible.[23] In the Australian context, where our study found a low uptake of exercise capacity assessments, 6MWT may be a useful alternate method of assessing the functional response to CR, where mean pre–post improvement has been reported to exceed 20% in a single-centre study of 2524 CR participants.[24] However, observational data from Australia suggest that exercise capacity assessments are needed in practice to accurately classify initial exercise capacity and subsequently tailor exercise prescription in CR.[25]

The specific assessment of resting ECG is recommended in major North American and European guidelines,[23 26] despite the inconclusive prognostic benefit in high-risk cohorts.[27] In the present study, 42% of services failed to assess resting ECG/HR. This deficiency was more apparent in regional services compared with metropolitan ones, and in services not often using costly exercise equipment, suggesting that funding or equipment limitations may play a role implementation of this recommendation. A previous Australian survey investigating the implementation of psychosocial assessments in CR found that time, funding and resources were the key barriers to a more comprehensive assessment

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uptake,[28] similar to what we observed in exercise assessment and prescription elements described above. Only one previous CR survey in North America has reported on guideline-recommended ECG assessment, similarly finding that a resting ECG was performed in 47% of phase II programmes in the state of Ohio, USA.[29]

Exercise modalities

Most surveyed services (97%) prescribed exercise, however, 47% failed to meet the national recommendations to concurrently prescribe both aerobic and resistance exercise. The uptake of concurrent exercise was more prevalent in services with access to resistance exercise equipment and aerobic exercise ergometers. The concurrent prescription of both aerobic and resistance exercise is recommended in all major international CR guidelines,[23 26] and is efficacious for improvements in CV risk factors like obesity, cardiorespiratory fitness, plasma lipids, inflammation and psychological health.[30] The positive effect of aerobic exercise on cardiorespiratory fitness is well established,[31] however, recent meta-analyses have shown that the inclusion of resistance exercise has an additive effect on cardiorespiratory fitness compared with isolated aerobic exercise programmes in CAD,[9 32] thus highlighting the importance of including both exercise modalities for optimal outcomes. In addition to this aerobic fitness benefit, with advancing CV disease (CVD), the role of skeletal muscle becomes increasingly important for the maintenance of physical function, quality of life and independence, particularly in the most deconditioned cardiac patients with chronic heart failure and cardiac cachexia.[33] Notably, high intensity resistance training improves skeletal muscle impairments and exercise capacity in chronic heart failure, largely explained by skeletal muscle adaptations rather than central cardiac adaptations.[34] Furthermore, the inclusion of resistance training becomes increasingly more important with ageing patients given its unique ability to address age-associated comorbidities including falls, osteoporosis, frailty and sarcopenia,[35] which are not improved with aerobic training.

Aerobic exercise intensity

The prescription of low-moderate intensity aerobic exercise most commonly is also consistent with Australian guideline recommendations. However, it should be noted that these guidelines themselves may require updating considering the rapidly expanding body of evidence since their last revision in 2004. High-intensity aerobic exercise has demonstrated promising improvements in health and fitness compared with lower intensities of exercise in patients with CVD.[36] Although the risk of CV events is greater during high intensity compared with moderate intensity aerobic exercise, the major CV event rates for patients with CVD remain very low at 1/11 333 patient-exercise hours.[37] As a result, recent guidelines from Europe and North America have extended aerobic exercise intensity thresholds to include higher intensities,[23 26] with some evidence of uptake in CR services in the Netherlands.[20]

Resistance exercise intensity

Australian guidelines do not currently include any specific resistance exercise intensity recommendations, thus, it is more difficult to assess the appropriateness of Australian CR service delivery in this regard. All but 13% of services reported low or moderate intensity resistance training. In contrast, major international guidelines from Europe and North America provide detailed recommendations for moderate-vigorous intensity resistance training,[23 26] with uptake apparent within a national CR survey in the Netherlands.[20] The benefits of moderate-intensity resistance exercise in CR are well established, however, despite some emerging evidence, more research is needed to properly evaluate the use of high-intensity resistance exercise in this setting,[9] given its safety and efficacy for improving health and functional outcomes in other chronic disease cohorts.[38]

Limitations

A limitation of the current study was the lower response rate in comparison to previous Australian surveys[12 13] which may, in part, be explained by this investigation's significantly shorter enrolment period, broader inclusion criteria and survey distribution method independent of national governing bodies. Furthermore, identifying information was not collected in the survey, which limited the ability to identify and remove duplicate entries from the final analysis. The current survey also did not allow for the addition of any programme outcome information or open-ended qualitative responses, which is necessary to properly evaluate the operation and effectiveness of national CR programmes. The self-reported nature of this survey must be acknowledged as a limitation, which could be improved by using an audit-based research study, similar to the ongoing work in the UK.[39]

CONCLUSION

The main finding of this study is that only three Australian guideline recommendations were consistently reported in current CR programmes: (1) assessment of physical function prior to exercise, (2) review of referring physician results and (3) prescription of light-moderate exercise intensity. Key deficiencies include the lack of concurrent exercise prescription and the infrequent assessment of resting HR and ECG, which may be influenced by location, exercise supervisor and equipment availability. The scarcity of muscular strength and aerobic fitness assessments could have implications on the quality of tailored exercise prescription, where actual prescription is unable to be informed by individual capacity.

Implications for future research and practice

Future work should incorporate programme outcome data into the evaluation of programme effectiveness. In addition, assessment of patient-reported outcomes such

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as quality of life and satisfaction would be a vital addition to the staff-centred and facility-centred nature of all previous surveys, including this one. Future studies including the on-site auditing of protocols and outcomes in CR would provide evidence as to whether changing these elements does indeed improve adherence to guidelines, and more importantly, patient outcomes.

To address the issue of suboptimal pre-exercise assessment and prescription in Australian CR programmes described above, additional funding and resources may be required to overcome potential uptake and accessibility barriers, ensure the continued education of practitioners and encourage the concurrent prescription of both exercise modalities as recommended by current guidelines. Specifically, these may include (1) the employment or support of exercise physiologists to aid in the uptake of exercise-specific assessments, (2) the additional funding to ensure the appropriate equipment is available for all guideline-required assessment and prescription practices and (3) an update of the national guideline so there is a clear policy that services can use to justify equipment requests.

Finally, an update of the 2004 national guidelines to bring them closer to current international recommendations and existing evidence, followed by an educational initiative and review of service equipment and staffing policies may be warranted for the broad range of allied health disciplines involved in Australian CR, to facilitate the translation of clinical trials evidence into practice.

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Patient and public involvement Patients and/or the public were not involved in the design, or conduct, or reporting, or dissemination plans of this research.

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Supplementary Tables

Supplementary Table 1: Guideline Comparisons – Assessment

Clinical Status	**Australian[1,2]**	**European[3]**	**American[4]**	**Survey results[§]**
Review Medical History	✓	✓	✓	
Review Referral/Discharge Reports	✓		✓	75%
Review of Co-morbidities and Smoking Status	✓	✓	✓	
Adherence to Medical Regime	✓	✓	✓	
Assess Cognitive Function			✓	
Assess Psychosocial Health	✓	✓	✓	
Assess Health-Related Quality of Life	✓		✓	
Current Physical Activity Levels	✓	✓	✓	
Physical Assessment				
Cardiac Imaging (Echocardiography)		✓	✓	11%
Muscular Strength Assessment				18%
Peak Aerobic Exercise Capacity		✓	✓	13%
Physical Exam and Review of Systems		✓	✓	51%
Physical Function	✓			91%
Resting Radial Pulse and /or ECG	✓	✓	✓	58%

Supplementary Table 2: Guideline Comparisons – Exercise Prescription

	Australian[1,2]	**European[3]**	**American[4]**	**Survey results[§]**
Guidelines Specific to each CV Diagnosis		✓		
Aerobic Exercise (AE) Recommended	✓	✓	✓	74%
AE Frequency	Most days	3-7 days/wk	3-5 days/wk	1-2 days /wk[5,6]
AE Intensity	Light-moderate	Light-vigorous 50-80% $VO2_{max}$ /HR_{max} 10-14 RPE	Light-vigorous 50-80% $VO2_{max}$	Moderate (70%)
AE Volume	≥ 30 mins	30-60 min/day ≥ 150 min/wk	20-60 min	46-60 min[5,6]
AE Type	Walking	Walking, jogging, cycling, swimming, rowing, stair climbing, elliptical trainers, dancing	Walking, treadmill, cycling, rowing, stair climbing, arm/leg ergometry, or others as appropriate	Cycling, treadmill, walking (>65%)

	Australian[1,2]	**European[3]**	**American[4]**	**Survey results[§]**
Resistance Exercise (RE) Recommended	✓	✓	✓	65%
RE Frequency		2 days/ wk	2-3 days/wk	1-2 days /wk[5,6]
RE Intensity		Light-moderate 30-60% 1RM RPE 12-15	To moderate fatigue	Moderate (67%)
RE Volume		1 set 8-25 reps	1-3 sets 10-15 reps 8-10 whole body exercises	
RE Type			Bodyweight, resistance bands, free weights, pulleys, machines	Free weights, resistance bands, bodyweight (>65%)

[§], prevalence of responses from this survey; CV, cardiovascular; AE, aerobic exercise; VO_{2max}, maximal oxygen uptake; HR_{max}, maximal heart rate; RE, resistance exercise; 1RM, 1 repetition maximum; RPE, rate of perceived exertion.

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Supplementary Table 3: Preparation of statistical categories for analysis

	Original	Revised and collapsed
Remoteness	Remoteness Area (RA) 1	Metropolitan
	RA 2-5	Regional and Remote
Exercise prescription	Always	Always
	Mostly, sometimes, rarely, never	Less frequently-never
Exercise intensity	Vigorous, maximal	Vigorous-maximal
	Very light, light, moderate	Very light-moderate

Supplementary Table 4: Effect of remoteness on service and patient characteristics

Table 4a: Influence of remoteness on the prevalence of patient age ranges

Age range	Remoteness	Prevalence	OR (95% CI)	p-value
50	Metropolitan	1.1%	0.26 (0.03 to 2.55)	0.325
	Regional	4.1%		
50-59	Metropolitan	20.7%	3.59 (1.27 to 10.15)	**0.014***
	Regional	6.8%		
60-69	Metropolitan	45.7%	1.46 (0.78 to 2.74)	0.269
	Regional	36.5%		
70+	Metropolitan	27.2%	0.44 (0.23 to 0.84)	**0.015***
	Regional	45.9%		

The prevalence column represents the percentage of services within metropolitan (n=92) and regional (n=74) areas that have ≥50% of enrolled patients within the specified age range. Odds ratios were calculated with metropolitan services as the reference category.

Table 4b: Influence of remoteness on the prevalence of patient enrolment timepoint

Enrolment timepoint	Remoteness	Prevalence	OR (95% CI)	p-value
Inpatient	Metropolitan	19.6%	17.76 (2.31 to 136.49)	**<0.001*** **
	Regional	1.4%		
< 12 weeks post-event	Metropolitan	57.6%	0.88 (0.47 to 1.63)	0.751
	Regional	60.8%		
12-52 weeks post-event	Metropolitan	12.0%	1.12 (0.43 to 2.95)	1.000
	Regional	10.8%		
1+ years post-event	Metropolitan	9.8%	2.56 (0.67 to 9.85)	0.229
	Regional	4.1%		

The prevalence column represents the percentage of services within metropolitan (n=92) and regional (n=74) areas that have ≥50% of enrolled patients within the specified time range. Odds ratios were calculated with metropolitan services as the reference category.

Table 4c: Influence of remoteness on the prevalence of patient diagnoses.

Diagnosis	Remoteness	Prevalence	OR (95% CI)	p-value
Heart Failure	Metropolitan	6.5%	5.09 (0.60 to 43.28)	0.133
	Regional	1.4%		
Myocardial Infarction	Metropolitan	33.7%	0.94 (0.49 to 1.79)	0.871
	Regional	35.1%		
Revascularisation	Metropolitan	51.1%	0.80 (0.43 to 1.47)	0.532
	Regional	56.8%		
Other CAD	Metropolitan	14.1%	5.92 (1.29 to 27.16)	**0.013***
	Regional	2.7%		

The prevalence column represents the percentage of services within metropolitan (n=92) and regional (n=74) areas that have ≥50% of enrolled patients with the specified diagnosis. Odds ratios were calculated with metropolitan services as the reference category. CAD, Coronary Artery Disease.

Table 4d: Influence of remoteness on the prevalence of personnel supervising exercise

Supervisor type	Remoteness	Prevalence	OR (95% CI)	p-value
Nurse supervisor	Metropolitan	68.5%	0.75 (0.38 to 1.49)	0.492
	Regional	74.3%		
Physiotherapist supervisor	Metropolitan	70.7%	1.38 (0.72 to 2.66)	0.405
	Regional	63.5%		
Exercise Physiologist supervisor	Metropolitan	37.0%	1.58 (0.81 to 3.08)	0.187
	Regional	27.0%		

The prevalence column represents the percentage of services within metropolitan (n=92) and regional (n=74) areas that have the specified supervisor. Odds ratios were calculated with metropolitan services as the reference category.

Supplementary Table 5: Factors affecting screening and testing procedures

Table 5a: Influence of guideline use for aerobic exercise intensity prescription on the prevalence of testing and screening procedures

Assessment type	AT guidelines used	Prevalence	OR (95% CI)	p-value
Cardiac Function Testing	Yes	10.8%	1.00 (0.31 to 3.19)	1.000
	No	10.8%		
Aerobic Fitness Testing	Yes	15.5%	3.22 (0.72 to 14.33)	0.176
	No	5.4%		
Physical function	Yes	94.6%	4.83 (1.68 to 13.91)	**0.005****
	No	78.4%		
Strength Testing	Yes	19.6%	2.01 (0.66 to 6.13)	0.336
	No	10.8%		
Resting ECG/HR	Yes	61.5%	2.10 (1.01 to 4.35)	0.062
	No	43.2%		
Physical Exam	Yes	54.7%	2.23 (1.06 to 4.72)	**0.043***
	No	35.1%		
Review of Physician Results	Yes	78.4%	1.96 (0.90 to 4.28)	0.092
	No	64.9%		

The prevalence column represents the percentage of services using the specified assessment that did (n=148) or did not (n=37) use aerobic training guidelines to guide their aerobic intensity prescription. Odds ratios were calculated with 'Yes' guideline use as the reference category. AT, aerobic training; ECG, electrocardiogram; HR, heart rate.

Table 5b: Influence of reasons for resistance exercise intensity prescription on the prevalence of testing and screening procedures

Assessment type	RT guidelines used	Prevalence	OR (95% CI)	p-value
Cardiac Function Testing	Yes	11.1%	1.13 (0.41 to 3.09)	1.000
	No	10.0%		
Aerobic Fitness Testing	Yes	15.9%	2.08 (0.74 to 5.83)	0.177
	No	8.3%		
Physical function	Yes	96.8%	7.63 (2.34 to 24.81)	**<0.001*** **
	No	80.0%		
Strength Testing	Yes	21.4%	2.46 (0.95 to 6.31)	0.066
	No	10.0%		
Resting ECG/HR	Yes	65.1%	2.44 (1.30 to 4.57)	**0.007** **
	No	43.3%		
Physical Exam	Yes	55.6%	1.88 (1.00 to 3.50)	0.060
	No	40.0%		
Review of Physician Results	Yes	80.2%	2.02 (1.01 to 4.04)	0.066
	No	66.7%		

The prevalence column represents the percentage of services using the specified assessment that did (n=126) or did not (n=60) use resistance training guidelines to guide their resistance intensity prescription. Odds ratios were calculated with 'Yes' guideline use as the reference category. RT, resistance training; ECG, electrocardiogram; HR, heart rate.

Table 5c: Influence of remoteness on the prevalence of testing and screening procedures

Assessment type	Remoteness	Prevalence	OR (95% CI)	p-value
Cardiac Function Testing	Metropolitan	13.0%	1.70 (0.61 to 4.77)	0.452
	Regional	8.1%		
Aerobic Fitness Testing	Metropolitan	20.7%	3.59 (1.27 to 10.15)	**0.014***
	Regional	6.8%		
Physical function	Metropolitan	91.3%	0.93 (0.31 to 2.80)	1.000
	Regional	91.9%		
Strength Testing	Metropolitan	28.3%	5.44 (1.97 to 15.00)	**0.001****
	Regional	6.8%		
Resting ECG/HR	Metropolitan	68.5%	2.29 (1.22 to 4.32)	**0.011***
	Regional	48.5%		
Physical Exam	Metropolitan	51.1%	0.99 (0.54 to 1.83)	1.000
	Regional	51.4%		
Review of Physician Results	Metropolitan	80.4%	1.63 (0.79 to 3.35)	0.201
	Regional	71.6%		

The prevalence column represents the percentage of services within metropolitan (n=92) and regional (n=74) areas that used the specified assessment. Odds ratios were calculated with metropolitan services as the reference category.

Table 5d: Influence of a registered nurse supervising exercise on the prevalence of testing and screening procedures

Assessment type	Exercise supervisor	Prevalence	OR (95% CI)	p-value
Cardiac Function Testing	Nurse supervisor on staff	8.5%	0.48 (0.19 to 1.24)	0.130
	Nurse supervisor absent	16.1%		
Aerobic Fitness Testing	Nurse supervisor on staff	10.0%	0.41 (0.17 to 0.96)	0.058
	Nurse supervisor absent	21.4%		
Physical function	Nurse supervisor on staff	93.1%	1.92 (0.68 to 5.45)	0.256
	Nurse supervisor absent	87.5%		
Strength Testing	Nurse supervisor on staff	16.2%	0.71 (0.32 to 1.56)	0.407
	Nurse supervisor absent	21.4%		
Resting ECG/HR	Nurse supervisor on staff	56.9%	0.86 (0.45 to 1.62)	0.746
	Nurse supervisor absent	60.7%		
Physical Exam	Nurse supervisor on staff	55.4%	1.92 (1.01 to 3.63)	0.055
	Nurse supervisor absent	39.3%		
Review of Physician Results	Nurse supervisor on staff	72.3%	0.50 (0.22 to 1.12)	0.097
	Nurse supervisor absent	83.9%		

The prevalence column represents the percentage of services using the specified assessment that did (n=130) or did not (n=56) have a nurse supervise the exercise component. Odds ratios were calculated with 'Nurse supervisor on staff' as the reference category. ECG, electrocardiogram; HR, heart rate.

Table 5e: Influence of a physiotherapist supervising exercise on the prevalence of testing and screening procedures

Assessment type	Exercise supervisor	Prevalence	OR (95% CI)	p-value
Cardiac Function Testing	Physio supervisor on staff	9.6%	0.70 (0.27 to 1.82)	0.461
	Physio supervisor absent	13.1%		
Aerobic Fitness Testing	Physio supervisor on staff	7.2%	0.22 (0.09 to 0.53)	**0.001****
	Physio supervisor absent	26.2%		
Physical function	Physio supervisor on staff	92.0%	1.26 (0.43 to 3.63)	0.782
	Physio supervisor absent	90.2%		
Strength Testing	Physio supervisor on staff	14.4%	0.52 (0.24 to 1.11)	0.103
	Physio supervisor absent	24.6%		
Resting ECG/HR	Physio supervisor on staff	60.0%	1.27 (0.69 to 2.36)	0.527
	Physio supervisor absent	54.1%		
Physical Exam	Physio supervisor on staff	51.2%	1.08 (0.59 to 2.00)	0.876
	Physio supervisor absent	49.2%		
Review of Physician Results	Physio supervisor on staff	76.0%	1.03 (0.51 to 2.11)	1.000
	Physio supervisor absent	75.4%		

The prevalence column represents the percentage of services using the specified assessment that did (n=125) or did not (n=61) have a physio supervise the exercise component. Odds ratios were calculated with 'Physio supervisor on staff' as the reference category. ECG, electrocardiogram; HR, heart rate.

Table 5f: Influence of an exercise physiologist supervising exercise on the prevalence of testing and screening procedures

Assessment type	Exercise supervisor	Prevalence	OR (95% CI)	p-value
Cardiac Function Testing	EP supervisor on staff	10.7%	0.99(0.36 to 2.74)	1.000
	EP supervisor absent	10.8%		
Aerobic Fitness Testing	EP supervisor on staff	26.8%	4.39 (1.83 to 10.53)	**0.001****
	EP supervisor absent	7.7%		
Physical function	EP supervisor on staff	91.1%	0.94 (0.31 to 2.85)	1.000
	EP supervisor absent	91.5%		
Strength Testing	EP supervisor on staff	35.7%	5.00 (2.27 to 11.04)	**<0.001*****
	EP supervisor absent	10.0%		
Resting ECG/HR	EP supervisor on staff	60.7%	1.17 (0.62 to 2.22)	0.746
	EP supervisor absent	56.9%		
Physical Exam	EP supervisor on staff	55.4%	1.32 (0.70 to 2.47)	0.426
	EP supervisor absent	48.5%		
Review of Physician Results	EP supervisor on staff	78.6%	1.25 (0.59 to 2.64)	0.709
	EP supervisor absent	74.6%		

The prevalence column represents the percentage of services using the specified assessment that did (n=125) or did not (n=61) have an EP supervise the exercise component. Odds ratios were calculated with 'EP supervisor on staff' as the reference category. EP, exercise physiologist; ECG, electrocardiogram; HR, heart rate.

Supplementary Table 6: Factors affecting exercise prescription

Table 6a: Influence of guideline use on exercise prevalence and intensity prescription

Exercise prescription characteristic	Guidelines used	n	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	AT guidelines used	151	61.6%	1.89 (0.91 to 3.90)	0.096
	AT guidelines not used	37	45.9%		
'Always' Aerobic Exercise	AT guidelines used	151	79.5%	2.64 (1.23 to 5.68)	**0.018***
	AT guidelines not used	37	59.5%		
AT moderate intensity or lower	AT guidelines used	151	80.0%	1.92 (0.54 to 6.81)	0.419
	AT guidelines not used	37	88.5%		
'Always' both Aerobic and Resistance	RT guidelines used	126	64.3%	1.92 (1.03 to 3.59)	0.055
	RT guidelines not used	60	48.3%		
'Always' Resistance Exercise	RT guidelines used	126	69.8%	1.77 (0.94 to 3.35)	0.099
	RT guidelines not used	60	56.7%		
RT moderate intensity or lower	RT guidelines used	126	82.0%	2.37 (0.77 to 7.28)	0.156
	RT guidelines not used	60	91.5%		

The prevalence column represents the percentage of services using the specified exercise prescription that did or did not use AT or RT guidelines to guide their resistance intensity prescription. Odds ratios were calculated with 'Yes' guideline use as the reference category. AT, aerobic training; RT, resistance training.

Table 6b: Influence of remoteness on exercise prevalence and intensity prescription

Exercise prescription characteristic	Remoteness	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	Metropolitan	65.2%	1.28 (0.68 to 2.41)	0.519
	Regional	59.5%		
'Always' Aerobic Exercise	Metropolitan	79.3%	1.15 (0.58 to 2.40)	0.850
	Regional	77.0%		
'Always' Resistance Exercise	Metropolitan	69.6%	1.17 (0.61 to 2.25)	0.738
	Regional	66.2%		
AT moderate intensity or lower	Metropolitan	73.9%	2.28 (0.98 to 5.33)	0.071
	Regional	86.6%		
RT moderate intensity or lower	Metropolitan	80.0%	2.14 (0.83 to 5.52)	0.122
	Regional	89.6%		

The prevalence column represents the percentage of services within metropolitan (n=92) and regional (n=74) areas that used the specified exercise prescription. Odds ratios were calculated with metropolitan services as the reference category. AT, aerobic training; RT, resistance training.

Table 6c: Influence of nurse supervisor on exercise prevalence and intensity prescription

Exercise prescription characteristic	Exercise supervisor	n	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	Nurse supervisor on staff	138	55.8%	1.03 (0.56 to 1.90)	1.000
	Nurse supervisor absent	60	55.0%		
'Always' Aerobic Exercise	Nurse supervisor on staff	138	73.9%	1.03 (0.52 to 2.05)	1.000
	Nurse supervisor absent	60	73.3%		
'Always' Resistance Exercise	Nurse supervisor on staff	130	66.9%	1.39 (0.74 to 2.62)	0.329
	Nurse supervisor absent	59	59.3%		
AT moderate intensity or lower	Nurse supervisor on staff	122	84.4%	0.53 (0.24 to 1.15)	0.142
	Nurse supervisor absent	54	74.1%		
RT moderate intensity or lower	Nurse supervisor on staff	118	87.3%	0.53 (0.22 to 1.25)	0.166
	Nurse supervisor absent	51	78.4%		

The prevalence column represents the percentage of services using the specified exercise prescription that did or did not have a nurse supervise the exercise component. Odds ratios were calculated with 'Nurse supervisor on staff' as the reference category. AT, aerobic training; RT, resistance training.

Table 6d: Influence of physiotherapist supervisor on exercise prevalence and intensity prescription

Exercise prescription characteristic	Exercise supervisor	n	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	Physio supervisor on staff	135	57.0%	1.21 (0.66 to 2.20)	0.544
	Physio supervisor absent	63	52.4%		
'Always' Aerobic Exercise	Physio supervisor on staff	135	77.8%	1.88 (0.97 to 3.63)	0.082
	Physio supervisor absent	63	65.1%		
'Always' Resistance Exercise	Physio supervisor on staff	128	63.3%	0.84 (0.44 to 1.60)	0.629
	Physio supervisor absent	61	67.2%		
AT moderate intensity or lower	Physio supervisor on staff	122	82.8%	0.73 (0.33 to 1.61)	0.530
	Physio supervisor absent	54	77.8%		
RT moderate intensity or lower	Physio supervisor on staff	115	86.1%	0.71 (0.30 to 1.69)	0.495
	Physio supervisor absent	54	81.5%		

The prevalence column represents the percentage of services using the specified exercise prescription that did or did not have a physio supervise the exercise component. Odds ratios were calculated with 'Physio supervisor on staff' as the reference category. AT, aerobic training; RT, resistance training.

Table 6e: Influence of exercise physiologist supervisor on exercise prevalence and intensity prescription

Exercise prescription characteristic	Exercise supervisor	n	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	EP supervisor on staff	60	61.7%	1.43 (0.77 to 2.66)	0.279
	EP supervisor absent	138	52.9%		
'Always' Aerobic Exercise	EP supervisor on staff	60	76.9%	1.25 (0.62 to 2.53)	0.601
	EP supervisor absent	138	72.5%		
'Always' Resistance Exercise	EP supervisor on staff	56	75.0%	1.99 (0.99 to 3.99)	0.067
	EP supervisor absent	133	60.2%		
AT moderate intensity or lower	EP supervisor on staff	51	72.5%	2.11 (0.96 to 4.63)	0.087
	EP supervisor absent	125	84.8%		
RT moderate intensity or lower	EP supervisor on staff	50	78.0%	1.96 (0.83 to 4.62)	0.160
	EP supervisor absent	119	87.4%		

The prevalence column represents the percentage of services using the specified exercise prescription that did or did not have an EP supervise the exercise component. Odds ratios were calculated with 'EP supervisor on staff" as the reference category. EP, exercise physiologist; AT, aerobic training; RT, resistance training.

Table 6f: Influence of resistance training equipment on exercise prevalence

Exercise prescription characteristic	Equipment availability	n	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	Free weights	177	62.1%	NC	**<0.001*** **
	No free weights	21	0.0%		
'Always' Resistance Exercise	Free weights	177	68.4%	23.77 (3.00 to 188.64)	**<0.001*** **
	No free weights	12	8.3%		
'Always' both Aerobic and Resistance	Machine weights	66	69.7%	2.44 (1.31 to 4.57)	**0.006** **
	No machine weights	132	48.5%		
'Always' Resistance Exercise	Machine weights	66	75.8%	2.21 (1.14 to 4.32)	**0.025***
	No machine weights	123	58.5%		
'Always' both Aerobic and Resistance	Resistance bands	129	63.6%	2.56 (1.40 to 4.65)	**0.003** **
	No resistance bands	69	40.6%		
'Always' Resistance Exercise	Resistance bands	129	71.3%	2.49 (1.32 to 4.69)	**0.006** **
	No resistance bands	60	50.0%		
'Always' both Aerobic and Resistance	Bodyweight	127	71.7%	6.92 (3.61 to 13.28)	**<0.001*** **
	No bodyweight	71	26.8%		
'Always' Resistance Exercise	Bodyweight	127	76.4%	4.79 (2.49 to 9.19)	**<0.001*** **
	No bodyweight	62	40.3%	28.1%	

The prevalence column represents the percentage of services using the specified exercise prescription that did or did not have access to the specified equipment. Odds ratios were calculated with 'Yes' access to equipment as the reference category.

Table 6g: Influence of aerobic training equipment on exercise prevalence

Exercise prescription characteristic	Equipment availability	n	Prevalence	OR (95% CI)	p-value
'Always' both Aerobic and Resistance	Treadmill	155	59.4%	2.03 (1.02 to 4.03)	0.056
	No treadmill	43	41.9%		
'Always' both Aerobic and Resistance	Rowing ergometer	50	68.0%	2.01 (1.02 to 3.96)	**0.048***
	No rowing ergometer	148	51.4%		
'Always' both Aerobic and Resistance	Indoor cycle	172	60.5%	5.10 (1.95 to 13.34)	**0.001****
	No indoor cycle	26	23.1%		
'Always' Aerobic Exercise	Indoor cycle	172	77.9%	4.11 (1.76 to 9.64)	**0.001****
	No indoor cycle	26	46.2%		
'Always' Aerobic Exercise	Walking	133	78.2%	1.96 (1.02 to 3.78)	0.058
	No walking	65	64.6%		

The prevalence column represents the percentage of services using the specified exercise prescription that did or did not have access to the specified equipment. Odds ratios were calculated with 'Yes' access to equipment as the reference category.

Table 6h: Influence of aerobic and resistance training equipment on exercise intensity

Equipment availability	Highest exercise intensity	n	Prevalence	OR (95% CI)	p-value
Treadmill	Vigorous-maximal intensity AT	28	84.8%	1.36 (0.48 to 3.85)	0.631
	Light-moderate intensity AT	115	80.4%		
Walking	Vigorous-maximal intensity AT	27	81.8%	2.07 (0.80 to 5.36)	0.143
	Light-moderate intensity AT	98	68.5%		
Indoor Cycle	Vigorous-maximal intensity AT	32	97.0%	3.47 (0.44 to 27.39)	0.309
	Light-moderate intensity AT	129	90.2%		
Machine weights	Vigorous-maximal intensity RT	17	65.4%	4.25 (1.76 to 10.27)	**0.001****
	Light-moderate intensity RT	44	30.8%		
Bodyweight	Vigorous-maximal intensity RT	26	88.5%	4.00 (1.14 to 13.97)	**0.021***
	Light-moderate intensity RT	143	65.7%		
Free weights	Vigorous-maximal intensity RT	25	96.2%	0.54 (0.05 to 5.36)	0.491
	Light-moderate intensity RT	140	97.9%		
Resistance Bands	Vigorous-maximal intensity RT	20	76.9%	1.34 (0.50 to 3.58)	0.641
	Light-moderate intensity RT	102	71.3%		

The prevalence column represents the percentage of services using the specified equipment that used either vigorous-maximal or light-moderate as their highest prescribed exercise intensity. Odds ratios were calculated with 'Vigorous-maximal intensity' as the reference category.

Exercise in Australian Cardiac Rehabilitation Programs

Introduction and Consent

This survey is part of a research project being conducted by researchers at the University of Sydney, looking to explore how and why different types of exercise are used/not used in Australian cardiac rehabilitation practice. You have been identified from the Australian Cardiac Rehabilitation Association (ACRA) online directory as a potentially eligible facility for participation in this survey.

Your participation in this research study is completely voluntary. If you decide to participate in this research survey, you may withdraw at any time. If you decide not to participate in this study or if you withdraw from participating at any time, you will not be penalized and withdrawal will not affect your relationship with the researchers or the University of Sydney.

The procedure involves filling out an online survey that will take approximately15 minutes. We will not collect identifying information during the survey which may compromise the confidentiality or anonymity of your responses, and all subsequent data is stored in a password protected electronic format. The results of this study will be used for scholarly purposes only and may only be shared with University of Sydney representatives. This research has been approved by the University of Sydney Human Research Ethics committee.
If you have any questions about the research study, please contact Matthew Hollings via email at matthew.hollings@sydney.edu.au

Upon completion of the survey, you will be given the opportunity to enter a draw for:
1st Prize - your choice of an iPad mini 4 OR Samsung tablet
2nd Prize - Fitbit Alta
3rd Prize - $50 Eftpos Gift Card

ELECTRONIC CONSENT: Please select your choice below.

Clicking on the "agree" button below indicates that:

- you have read the above information
- you voluntarily agree to participate
- you are at least 18 years of age

If you do not wish to participate in the research study, please decline participation by clicking on the "disagree" button.

- ○ Agree
- ○ Disagree

Exercise in Australian Cardiac Rehabilitation Programs

Program and Client Demographics

What proportion of your cardiac patients are in each of the following categories?

	0%	1-24%	25-49%	50-74%	75-99%	100%
Inpatient	○	○	○	○	○	○
Outpatient (<12 weeks post-event/cardiac surgery)	○	○	○	○	○	○
Outpatient (12 weeks - 1 year post-event/cardiac surgery)	○	○	○	○	○	○
Outpatient (1+ years post-event/cardiac surgery)	○	○	○	○	○	○

What proportion of your typical cardiac patients have the following diagnoses?

	0%	1-24%	25-49%	50-74%	75-99%	100%
Heart Failure	○	○	○	○	○	○
Myocardial Infarction	○	○	○	○	○	○
Revascularisation (CABG, PCI, etc.)	○	○	○	○	○	○
Other Coronary Artery Disease (CAD) diagnosis	○	○	○	○	○	○

Other (please specify)

What proportion of your program are men?

0% 50% 100%

What are the most common age ranges in your program?

	0%	1-24%	25-49%	50-74%	75-99%	100%
<50 years	○	○	○	○	○	○
50-59 years	○	○	○	○	○	○
60-69 years	○	○	○	○	○	○
70+ years	○	○	○	○	○	○

Who typically supervises your exercise programs?

- [ ] Medical Doctor
- [ ] Registered Nurse
- [ ] Physiotherapist
- [ ] Exercise Physiologist
- [ ] Occupational Therapist
- [ ] Other tertiary qualified health professional (please specify below)

Other (please specify)

Exercise in Australian Cardiac Rehabilitation Programs

The use of aerobic exercise

Aerobic training is defined as the rhythmical contraction and relaxation of large muscle groups over a prolonged period of time, with the aim of improving cardiovascular fitness (e.g. walking, cycling). Please consider this definition when answering the following questions:

How often do you prescribe aerobic exercise as a component of your normal program?

- ○ Always
- ○ Mostly
- ○ Sometimes
- ○ Rarely
- ○ Never

Exercise in Australian Cardiac Rehabilitation Programs

The use of aerobic exercise

Aerobic training is defined as the rhythmical contraction and relaxation of large muscle groups over a prolonged period of time, with the aim of improving cardiovascular fitness (e.g. walking, cycling). Please consider this definition when answering the following questions:

What type of aerobic exercise is used? (can choose more than one option/s)

- ☐ Treadmill Walking/Jogging/Running
- ☐ Outdoor or Indoor Walking/Jogging/Running
- ☐ Indoor Cycling
- ☐ Outdoor Cycling
- ☐ Indoor Rowing
- ☐ Swimming
- ☐ Recreational Games/Sports

Other (please specify)

How do you monitor/prescribe aerobic exercise intensity? (can choose more than one option/s)

- ☐ Rate of Perceived Exertion (RPE)
- ☐ Heart Rate (HR max, HR reserve, etc.)
- ☐ Workload (e.g. Power, Force, Speed, rpm, etc.)
- ☐ Ischaemic Threshold
- ☐ Clinical Symptoms
- ☐ Don't monitor/prescribe intensity

Other (please specify)

What intensity of aerobic exercise is typically prescribed? (can choose more than one option/s)

- [ ] Near-Maximal to Maximal (>96% HRmax, >8.5/10 RPE)
- [ ] Vigorous (77-95% HRmax, 6-8.5/10 RPE)
- [ ] Moderate (64-76% HRmax, 4-6/10 RPE)
- [ ] Light (57-63% HRmax, 2-4/10 RPE)
- [ ] Very Light (<57% HRmax, <2/10 RPE)
- [ ] Not sure

Other (please specify)

Why do you prescribe aerobic exercise at your selected intensity? (can choose more than one option/s)

- [ ] Safety - less chance of cardiac-related incidents
- [ ] Safety - less chance of musculoskeletal-related incidents
- [ ] Adhering to national/international guidelines
- [ ] Advice from medical / health professional
- [ ] Optimise fitness outcome

Other (please specify)

Is there a reason you do not include aerobic exercise in your program? (can choose more than one option/s)

- [ ] Advice from medical specialist
- [ ] Staff not familiar with aerobic exercise supervision
- [ ] Unsure of dangers associated with this form of exercise
- [ ] Do not have required equipment/facilities

Other (please specify)

Exercise in Australian Cardiac Rehabilitation Programs

The use of resistance exercise

Resistance training is classified as any structured activity intended to specifically improve muscle strength or endurance (e.g. weights training, band-resistance, body-weight exercises, etc.). Please consider this definition when answering the following questions:

How often do you prescribe resistance training as a component of your normal program?

- ○ Always
- ○ Mostly
- ○ Sometimes
- ○ Rarely
- ○ Never

Exercise in Australian Cardiac Rehabilitation Programs

The use of resistance exercise

Resistance training is classified as any structured activity intended to specifically improve muscle strength or endurance (e.g. weights training, band-resistance, body-weight exercises, etc.). Please consider this definition when answering the following questions:

What equipment is used for resistance training? (can choose more than one option/s)

- [ ] Free Weights (Dumbells, Barbells)
- [ ] Machine Weights
- [ ] Resistance-bands
- [ ] Body Weight (Push ups, Suspension training, Squats, etc.)

Other (please specify)

How do you monitor/prescribe resistance training intensity? (can choose more than one option/s)

- [ ] Percent of Maximal Strength (% 1RM)
- [ ] Rate of Perceived Exertion (RPE)
- [ ] Heart Rate
- [ ] Specified Number of Repetitions
- [ ] Specified Weight
- [ ] Clinical Symptoms
- [ ] Don't monitor/prescribe intensity

Other (please specify)

What intensity is resistance training typically prescribed? (can choose more than one option/s)

- [ ] Near-Maximal to Maximal (8.5/10 RPE; >85% maximal strength)
- [ ] Vigorous (6-8.5/10 RPE; 70-84% maximal strength)
- [ ] Moderate (4-6/10 RPE; 50-69% maximal strength)
- [ ] Light (2-4/10 RPE; 30-49% maximal strength)
- [ ] Very Light (<2/10 RPE; <30% maximal strength)
- [ ] Not sure

Other (please specify)

Why do you prescribe resistance training at your selected intensity? (can choose more than one option/s)

- [ ] Safety - less chance of cardiac-related incidents
- [ ] Safety - less chance of musculoskeletal-related incidents
- [ ] Adhering to national/international guidelines
- [ ] Advice from medical / health professional
- [ ] Optimise fitness outcome

Other (please specify)

Is there a reason you do not include resistance training in your program? (can choose more than one option/s)

- [ ] Advice from medical specialist
- [ ] Staff not familiar with resistance exercise supervision
- [ ] Unsure of whether there are dangers associated with this form of exercise
- [ ] Unsure of whether there are benefits with these clients
- [ ] Do not have required equipment / facilities

Other (please specify)

Exercise in Australian Cardiac Rehabilitation Programs

Testing and Progression

What screening is performed for a new patient prior to their first exercise session? (can choose more than one option/s)

- [ ] Cardiac Function (e.g. treadmill stress test, stress-echo, etc.)
- [ ] Aerobic Fitness (maximal or submaximal)
- [ ] Physical Function (e.g. 6-minute walk, sit-to-stand, gait speed, balance, etc.)
- [ ] Strength Testing (e.g. maximal muscular strength/endurance)
- [ ] Resting ECG / heart rate
- [ ] Physical Exam
- [ ] Review results received from referring specialist/hospital/GP
- [ ] No testing prior to exercise

Other (please specify)

Are aerobic and/or resistance training intensity/volume made more challenging throughout the course of the program?

- ( ) Yes - Both
- ( ) Yes - Aerobic only
- ( ) Yes - Resistance only
- ( ) No - Both
- ( ) Not sure

How is **aerobic exercise** intensity/volume made more challenging? (can choose more than one option/s)

- [ ] Increase in frequency of session per week
- [ ] Increase in duration of some/all sessions
- [ ] Increase in time per activity
- [ ] Increase in speed/resistance
- [ ] Re-test to establish new maximal capacity
- [ ] N/A

Other (please specify)

How is **resistance training** intensity/volume made more challenging? (can choose more than one option/s)

- ☐ Increase in frequency of session per week
- ☐ Increase in duration of some/all sessions
- ☐ Increase in time/reps/sets per activity
- ☐ Increase in weight/speed/resistance
- ☐ Re-test to establish new maximal capacity
- ☐ N/A

Other (please specify)

Exercise in Australian Cardiac Rehabilitation Programs

Further Information and Contact

Would you like to enter the prize draw?

- ◯ Yes
- ◯ No

Would you like to be contacted to provide further information on the use of exercise within your program?

- ◯ Yes
- ◯ No

Researchers at the University of Sydney (Cumberland campus) will be offering a free 12-week exercise program for post-rehab cardiac patients to examine the feasibility of high-intensity exercise on outcomes of overall health and function. If you may have patients interested in being involved, would you like to be contacted with further information about the program?

- ◯ Yes
- ◯ No
- ◯ N/A - not located within NSW or Sydney region

Would you like to be contacted with outcomes of this research and/or the possibility of training packages from exercise professionals?

- ◯ Yes, both
- ◯ Yes, research outcomes only
- ◯ Yes, training package only
- ◯ No

If you answered 'Yes' to any of the above questions, please provide contact details below:

Name	
Qualification	
Facility Name / State	
Email	
Phone Number (optional)	

Exercise in Australian Cardiac Rehabilitation Programs

Thank you for your time

We would like to thank you for taking the time to complete the survey. Prizes will be drawn on 1st March 2017 and winners will be contacted soon after.

Good luck!