

Abstract

Background: Evidence –based guidelines recommend strategies for reducing risk factors for secondary prevention of acute coronary syndromes, yet referral to and completion of programs to deliver this advice are poor.

Purpose: This paper aims to describe the complexity of factors that influence the referral and delivery of evidence-based cardiac rehabilitation (CR) programs in Australia and provides direction for solutions for clinicians and policy makers to consider. The Ecological Approach is used as a framework to synthesize evidence. The approach has five categories, the characteristics of which may act as barriers and enablers to the promotion and adoption of health behaviours and includes; a) interpersonal factors b) interpersonal processes c) institutional factors d) community networks and e) public policy.

Conclusions: Despite the context of strong evidence for efficacy this review highlights systematic flaws in the implementation of CR, an important intervention that has been shown to improve patient outcomes and prevent cardiac events. Recommendations from this review include standardization of program delivery, improving data capture, use of technological innovations and social networks to facilitate delivery of information and support and establishing a cohesive, consistent message through collaboration of key national organizations involved in CR.

Clinical Implications: These avenues provide direction for potential solutions to improve the uptake of CR and secondary prevention.

Keywords: cardiac rehabilitation, secondary prevention, referral, models of delivery

Introduction

Heart disease is a leading cause of death and disease burden world-wide.¹ In Australia it accounts for the greatest disease morbidity and nearly 20% of all deaths.² Acute coronary syndromes (ACS) defined as ST-segment elevation myocardial infarction (STEMI), non ST- segment elevation MI and unstable angina is a potentially life threatening event.³ In Australia 10% of the 7 million patient presentations (or 1800 presentations each day) to emergency departments per year are for chest pain or a suspected ACS.⁴ Patients diagnosed with an ACS are at high risk for further events including death and 50% may be readmitted with the same condition thus requiring evidence-based, best practice care to maximise outcomes.^{5,6}

International and Australian guidelines recommend strategies aimed at reducing the risk factors associated with ACS and to prevent admission and readmission to hospital.^{3,7,8,9} These guidelines recommend pharmacotherapy, lifestyle, physical activity and dietary advice delivered by expert clinicians through secondary prevention and cardiac rehabilitation (CR) programs.¹⁰

Recommendations for all patients who have experienced an ACS related event to attend CR are both consistent and strong (Table 1) and the benefits of exercise-based CR for secondary prevention of ACS are well established. A recent systematic review determined that exercise-based CR is associated with a lower risk of both overall mortality (relative risk(RR) 0.87, 95% confidence interval (CI): 0.75 to 0.99) and cardiovascular mortality (RR 0.74, 95% CI: 0.63 to 0.87) in patients up to 12 months following an ACS event.¹¹ In comparison to usual care, exercise-based CR also reduces the risk factors which contribute to the progression of ACS through greater reductions in total cholesterol (weighted mean difference (WMD), -0.37 mmol/L, 95% CI: -0.63 to -0.11 mmol/L), triglyceride levels (WMD, -0.23 mmol/L; 95% CI: -0.39 to -0.07 mmol/L), systolic blood pressure (WMD, -3.2 mm Hg; 95% CI: -5.4 to -0.9 mm Hg); and lower rates of self-reported smoking (odds ratio 0.64; 95% CI: 0.50 to 0.83).¹¹ These effects are independent of the method of CR delivery.¹¹ Despite the need for CR, referrals rates to programs are low, with only 46% of patients referred to an outpatient CR

program in the recent SNAPSHOT ACS registry.¹⁰ Further, completion of recommended programs is also poor with almost one third not finishing.¹²

Aside from ACS, CR is now being recommended for a growing population of heart disease patients including heart failure and according to recommendations from the Australian Cardiovascular Health and Rehabilitation Association (ACRA), patients with atrial fibrillation.^{13, 14} Rates for these conditions are increasing in parallel with population ageing. In Australia 1.8% of the total population (approximately 377,020 people) experience an ACS event, of whom 6.9% are aged 65-74 years (approximately 112,291 people), 8.9% aged 75-84 years (or approximately 87,415 people) and 15.1% are aged over 85 years (approximately 60,805 people).¹⁵ Similarly with heart failure and oedema, at 1.4% of the total Australian population (approximately 293,238 people), of whom 3.9% are aged 65-74 years (approximately 63,469 people), 8.0% aged 75-84 years (approximately 78,576 people) and 12.2% aged over 85 years (approximately 49,127 people).^[15] The current prevalence of atrial fibrillation is estimated at 2% of the total population (approximately 433,940 people).¹⁶

The implication of these statistics is that with Australia's ageing demographic profile, there is a rapidly expanding population for whom CR is recommended. This expansion is most concerning because it is occurring alongside an escalation in prevalence rates of obesity and diabetes that can lead to disease progression of coronary heart disease and increased risk of an ACS.¹⁷ Further, though the risk factor profile for the development of these conditions is similar, tailoring CR to meet the specific needs of each heart condition is required, though much less is known about referral and participation in non-ACS populations.^{18,19} This paper aims to describe the complexity of factors that influence the current referral and delivery of evidence-based cardiac rehabilitation and secondary prevention programs in Australia and provides direction for solutions for clinicians and policy makers to consider.

Material and methods

The Ecological Approach framework was used to synthesise the evidence and identify the barriers and enablers to the referral and delivery of CR and secondary prevention information (Figure 1).²⁰ The framework is appropriate for assessing both population and individual level determinants of health and interventions.²⁰ An individual's health and health behaviours are influenced by intrinsic and extrinsic factors at multiple levels.²¹ The framework describes five categories of characteristics which may be barriers and enablers to the promotion and adoption of health behaviours; a) *intrapersonal factors*, relating to the characteristics of the person and their own knowledge, attitudes, behaviour, skills, and concept of self, b) *interpersonal processes* and primary groups, relating to the influence and degree of support from family, friends and health professional relationships, c) *institutional factors*, relating to the influence of systems and bureaucratic organisations, d) *community networks*, relating to the system effects of connections between and among organisations and institutions and e) *public policy*, relating to the allocation of resources and/or public restrictions on potentially harmful behaviours such as smoking and alcohol.²⁰

Intrapersonal factors

At the intrapersonal level, extrinsic factors include; finances, time, family support system, and competing life priorities. Intrinsic factors are determinants of behaviour including knowledge, attitudes, beliefs, culture, gender, religion, values, goals and coping skills.²⁰ An individual's illness perception also influences their attitude and behaviour.²² Approximately 50% of CR eligible patients attribute their illness to non-modifiable factors or psychosocial factors such as hereditary and stress and therefore perceive little cognitive need for behaviour change.²³ Lack of knowledge about CR has been consistently found to be a predictor of non-participation in CR.^{24,25} Many patients confuse CR with outpatient clinics, or exercise testing and others see CR as primarily non-personalised, group exercise that will provide little gain.^{26,27} Patient beliefs that they can manage their risk factors on their own has been found to be one of the most common reasons for patients to refuse or complete a program.²⁸ A systematic review by Neubeck and colleagues, found that some patients were embarrassed to participate in group exercise due to their perception that CR is for people who are

older and/or require greater support.²⁶ The coping style of the individual can therefore affect their decision to participate, with some patients finding it confronting to attend CR because they are reminded of their illness.^{29,30}

Interpersonal processes

At the interpersonal level, an individual's behaviour can be influenced through formal and in-formal social interactions with their family, friends and their healthcare providers.³⁰ Vicarious experience, (role modelling), is a powerful influence on individuals, especially when the individual is ambivalent about behaviour change.^{31,32} Not only can families provide support, they tend to have similar behaviours such as diet and exercise routine.^{32,33} However one of the strongest predictors of behaviour change is clinician recommendation.³¹ Clinician lack of knowledge or scepticism about the value of CR and contraindications to patient exercise and/or safety concerns are factors that may contribute to a clinician's decision not to refer a patient to CR.^{31,32} However clinician scepticism may not be related to an understanding of the evidence-base for CR effectiveness, but may indicate concern about the quality of the local program.^{32,34}

Institutional factors

Cardiac Rehabilitation programs currently face substantial challenges in terms of cost and difficulty of access and often do not accommodate the needs of patients in relation to transport, location and employment, for those who are still in the workforce and/or have other social and family commitments. Institutional factors can combine to form the system through which the patient must navigate, access and complete their CR program.^{35,36} There are 370 CR programs listed in ACRA's CR registry, the majority (78%) of which are delivered as a face-to-face, group-based programs.³⁷ Participants in these programs are usually expected to attend the program twice per week for an hour-long supervised exercise session over a 6-week period.¹³ Since the 1990s, literature has reported low attendance rates for these programs with currently only 25% of ACS patients in Australia accessing a minimum level of effective secondary prevention.^{6,38}

Research and development into alternative models of care has been aimed at improving access and completion of programs.³⁹ In general, these alternative models have an individualized case management approach with a baseline assessment, a period of active engagement with the intervention and follow-up assessment on completion.³⁹ In contrast to the face-to-face group models of centre-based care, such programs may be delivered at the participants home, via telephone, or digitally. Further, these programs have demonstrated improvements in reduction of cardiovascular risk factors, with similar benefits regardless of program location or duration and outcomes are equal if not better from home-based programs.^{12,33} In Australia, research into alternative models include the CHOICE (Choice of Health Options In prevention of Cardiovascular Events) and the COACH (Coaching On Achieving Cardiovascular Health) programs which utilize a telephone-based approach to deliver health messages.^{40,41,42,43} The COACH program has achieved success in translation into clinical practice and the CHOICE program is notable for being readily accepted by people who did not access a facility-based CR program.^{40,41,42} Internet-based interventions also show promise in improving cardiovascular health. Most recently an Australian group reported the results of a smart-phone application-based CR program, which demonstrated significantly better uptake and adherence, compared to a face-to-face group program.⁴⁴ With Australia's cities geographically concentrated in coastal areas, these alternative models offer potential improvements in access and more flexible options for patients, however the utilization of alternative programs by health services is also poor.⁴⁰

Community networks

Community networks and contexts can substantially influence the implementation of CR and secondary prevention evidence-based recommendations, with key factors including organizational representation and data capture.²⁰

Organizational representation

Currently multiple organizations declare they represent CR providers and services and there are varying levels of inter-organizational collaboration despite having the same overall goal. These organizations include the Secondary Prevention Alliance (SPA), ACRA, the National Heart

Foundation of Australia (NHFA), the Cardiac Society of Australia and New Zealand, Exercise and Sports Science Australia and the Heart Research Centre. Three publications were released between 2013-2015 by three of the above organizations but without reference to each other. The first was the Heart Foundation's "Improving the Delivery of Cardiac Rehabilitation in Australia" strategy in 2014, describing a plan to improve CR service provision in Australia through 6 priorities for action. These include: 1) support national, state and territory efforts to integrate referral to CR services as a standard component of cardiac care, 2) establish uniform quality performance measures, data collection and routine reporting, 3) increase public awareness of CR and its benefits, 4) enhance health professional engagement and education on the importance and effectiveness of CR, 5) identify funding reform to drive service improvements and increase referrals and participation and 6) document and promote key principles and examples of good practice in the provision of different models of CR throughout Australia.⁴⁵ The second was SPA's 2013 launch publication in the Medical Journal of Australia.⁴⁶ Recognizing a need to unite national stakeholders eager to address the growing concern of increasing numbers of Australians having repeat heart attacks, SPA's aim is to provide a strong, singular voice to support and facilitate the changes that need to be made. The Alliance is made up of key national healthcare, clinical, government, non-government, research and consumer organizations and the SPA released their achievement reports on-line in August 2014.⁴⁶ The third publication in 2015 was ACRA's Core Components of Cardiovascular Disease Secondary Prevention and Cardiac Rehabilitation, which aims to identify the essential content of a secondary prevention program that should underpin all CR services in Australia.¹⁴ There are five components including; a) all eligible patients should be referred to a CR program according to individual need, b) all eligible patients should receive an individual initial assessment c) CR services should facilitate return to or improvement on baseline everyday functioning, d) services should be tailored to provide lifestyle education and skills to motivate and enable patients to achieve self-care and e) CR services should collect a minimum set of data that measures service performance and effectiveness in order to conduct continuous quality improvement.¹⁴ These publications provide a few examples of the many available to illustrate that there are multiple organisations working independently on what are shared issues. Further, informational networks could be further developed, though the NHFA has excelled in the

provision and development of CR promotion, including use of social media and have been powerful in raising the profile of CR and secondary prevention evidence in recent years.

Data Capture

Currently there are only fragmented and non-standardized data capture processes to document the patient journey through the system in both in-hospital, outpatient and community phases of CR programs, with no single database where information relating to all components of CR can be collected and housed. Regular measurement of CR service delivery outcomes, evaluation of service effectiveness and improvements are all central to managing CR programs well and require systematic and standardized data capture and audit. Establishing these processes requires access to detailed records of CR delivery in medical records and databases, developed from standardized datasets, with use of data linkage techniques to measure outcomes.

Other data issues arise because medical record documentation of in-hospital (Phase 1) CR often inconsistently records the reason for referral refusal and any follow-up action, thus limiting an understanding of the patients who participate in CR and those who refuse and why. Community or outpatient (Phase 2) CR programs record details of patient assessment and patient attendance in site-based records but these data are rarely forwarded to or integrated into medical records or primary care records apart from a summary letter to the general practitioner. There is also a lack of documentation of program content at any phase, particularly of a patient's ongoing plan for managing self-care (Phase 3). To date, no study has reviewed these data even though Phase 3 is recommended in evidence-based guidelines. Further data issues also include lack of an electronic medical record, which would enable the regular audit of CR services. Outcomes such as readmissions, secondary events and death have only recently been linked to CR site records through data linkage techniques.⁴⁷ Collection of standardized minimum datasets for service and clinical outcomes are only just emerging.

Public policy

International and Australian guidelines for all patients experiencing an ACS to participate in CR are consistent across multiple organizations. However, the source, clarity and details of these recommendations vary across guidelines, making the application more uncertain in reality. For instance, the model and content of the CR program that is being recommended is not always identified and may be referred to as comprehensive^{3,48,49,50} or exercise-based^{49,50,51,52} or more simply CR alone in the absence of detail.⁵³ Only one guideline identified a subgroup of patients that most warranted referral to CR, specifically those patients who had multiple risk factors or were high-risk.⁵² Furthermore, the timing of referral and commencement of CR is unclear in the recommendations with referral recommended to occur before hospital discharge in only two guidelines and no timing provided in others.^{49,50,51} Finally, given the inequities in socio-demographic groups attending CR and the paradox that the groups at highest risk are least likely to participate, it is unexpected that accessibility is not a consistent criteria.^{54,55} Accessibility to CR for patients was included as a strong recommendation in only one guideline⁵³ and reference made to the needs of indigenous populations in another.⁴⁸

Discussion

Through the lens of the Ecological Approach Framework and using current evidence, this paper has identified the intrapersonal, interpersonal, institutional, community and public policy barriers and enablers in relation to delivery of CR programs and highlights a complex interplay between these factors. Whilst the medical and public health goal should be to increase referral and completion of CR programs and prevent recurrence of heart events in patients, our review has generated several important questions that need to be answered through research and/or changes to existing practice. With a growing body of evidence for alternative CR programs which may facilitate easier access and program completion for patients, why aren't alternative programs more widely implemented by health services? How will standardization of CR programs through the core components promoted by ACRA have benefits? Given the many social, demographic and community components of our patient's lives, do we need to further utilize technological innovations and social networks to increase access,

flexibility and options for patients to access secondary prevention counselling? Does a lack of a consistent message from multiple lead organizations which promote CR lead to clinician and patient confusion?

Funding models and systems may limit the uptake of alternate models of CR delivery. The majority of CR program delivery is still the face-to-face, group model of centre-based care that has been unchanged for at least 20 years.¹³ Though CR programs have been based upon evidence-based guidelines developed to assist with implementation into clinical practice, funding models and systems are often limited and fragmented, potentially compromising the effective delivery and tailoring of services. Sustainable business models and skills are required to develop and support effective services. This includes the need for advocacy to improve the Medicare Benefits Scheme, the primary funder of universal health care insurance in Australia, to encompass secondary prevention program models of care delivery. The availability of CR programs beyond office hours and week-days needs to be increased and shared contractual workforce arrangements between primary and hospital care sectors should also be improved so that community-based programs can be delivered effectively. Such changes have the potential to deliver more flexible programs that address some of the limiting factors for patients such as access, convenience, transport and employment restrictions.

Standardization maybe an important concept in this environment permitting the delivery of evidence-based care by increasing health service delivery effectiveness and efficiency and eradicating unwanted variation, with the goal of ensuring widespread delivery of optimal care.⁵⁶ The interventional arms of research studies where alternative models of CR are tested have a standardized content that needs to be applied according to a protocol.^{41,42,43} If proven to be effective, the challenge is to translate these models into routine clinical practice, where implementation may deviate from the model as tested in the research environment, due to resources and systematic barriers. Thus heterogeneity of CR program delivery may compromise the effectiveness of programs. The process of

standardization of program delivery will be promoted by the five core components for quality delivery and outcomes of services for cardiovascular disease secondary prevention recently published by ACRA.¹⁴ Also, formalized coordinated care partnerships between country and metropolitan services using central referral systems (a form of standardization) may increase the potential for referral and access to programs. Some CR services have also adopted an opt-out CR referral process, where all patients eligible for CR are automatically referred to a program, but given information and the opportunity to refuse participation.^{57,58}

Social, demographic and community components are important considerations in patients' lives and mean that the centre-based model of CR delivery may be difficult for patients to access and therefore more flexible models are required. Technology innovations are increasingly being used to facilitate delivery of information to patients. A randomized trial comparing a smart-phone based home care model (CAP-CR) to traditional, centre-based delivery of CR in post MI patients, improved rates of uptake (80% vs 62%), adherence (94% vs 68%) and completion (80% vs 47%) ($p < 0.05$) with slight improvements in physiological and psychological health outcomes as well.⁴⁴ A recently published randomized clinical trial compared patients who in addition to usual care received 4 texts messages (advice, motivational reminders and support to change lifestyle behaviours) per week for 6 months compared to patients receiving usual care and found significant changes in LDL-cholesterol (79 vs 84 mg/dL, $p = 0.04$), systolic blood pressure (128.2 vs 135.8 mmHg, $p < 0.001$), body mass index (29.0 vs 30.3, $p < 0.001$), physical activity (MET; 936.1 vs 642.7 mins/wk, $p = 0.003$) and smoking (26.0% vs 42.9%, $p < 0.001$).⁵⁹ Networks are also becoming an increasing part of our lives and can be social, supportive or professional, existing in many different forms. Purpose-driven social networks in health care are increasing in the United States such as PatientsLikeMe, CureTogether, and DailyStrength.⁶⁰ ⁶¹ Consumers can find health resources at a number of different levels on the websites of health social networks. Services include accessing emotional support and information to question and answer chat sessions with expert clinicians and quantifying self-tracking.⁶⁰ Other platforms such as Hello Health are being trialled, where patients can pay a small fee to be part of a network within a clinician's

practice and access not only health information but also direct access to their health practitioner online.⁶¹ Such innovations have the potential to provide increased access, flexibility and social support, at the same time as being a forum to provide instruction and support on risk factor modification for secondary prevention of cardiac events. The technology and social network facilitated concept of health care delivery is understudied and needs to be tested in objective research designs that have adequate statistical power to measure morbidity and mortality, however it is clear that alternative modes of information delivery could be considered, which offer patients options with the goal of making lifestyle changes part of their everyday lives.

Lack of a consistent message may make it complex for clinicians and patients to decipher what is the best type of secondary prevention and a collaborative voice may be a useful mechanism to counter this. Leading cardiac professional and health promotion organizations have done a commendable job in the promotion of CR but the messages may be fragmented in dissemination as each organization may focus on slightly different aspects. For example, ACRA has focused on the core components and NHFA has focused on the 6 action priorities for CR.^{14,45} All of these aspects are important, yet the extent to which they may reach clinicians and are translated to practice may take time and be fragmented, thus organizational collaboration to disseminate such messages could be of benefit.

Another type of organizational collaboration is amongst service-providers where forums for integrated information dissemination can occur. Recently through the South Australian Department of Health and Ageing Cardiac Clinical Network Prevention and Rehabilitation Workgroup, a collaboration of CR service providers was created with the aim of annually auditing CR services and their outcomes. This initiative has been facilitated by the development of an evidence-based minimum dataset, with the aim of reporting service level data to the provider, thereby providing a rationale for improvement and change. While this process is in its infancy and we are yet to see true motivation and advocacy for change, it is hoped that this collaboration may provide the structure and culture change for improvements to develop. Such collaborations may also create clinician confidence to advocate for

CR service improvement with health service administrators by using the data to support their argument.

Conclusion

Despite CR being an important intervention that has been shown to improve patient outcomes and prevent cardiac events, this review has highlighted systematic flaws in the implementation of CR. Recommendations from this review include standardization of program delivery, improving data capture, use of technological innovations and social networks to facilitate delivery of information and support and establishing a cohesive, consistent message through collaboration of key national organizations involved in CR. These avenues provide direction for potential solutions to improve the uptake of CR and secondary prevention.

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Table 1. International guidelines for acute coronary syndrome (unstable angina, myocardial infarction) references to cardiac rehabilitation.

Organisation	Guideline	Statement on Cardiac Rehabilitation
National Heart Foundation Australia (NHFA)/ Cardiac Society Australia and New Zealand(CSANZ)	Management of acute coronary syndrome(ACS) 2006 ³	Long-term management after control of myocardial ischaemia. All patients should have access to, and be actively referred to, comprehensive ongoing prevention and cardiac rehabilitation services.(p. S8, S24)
NHFA/ CSANZ	2011 Addendum to Management of ACS 2006 ⁴⁸	All patients with ACS should be given a written chest pain action plan and referred to comprehensive ongoing prevention and cardiac rehabilitation services. (Grade A evidence).Specific guidelines are available for indigenous populations. (Appendix algorithm)
European Society Cardiology (ESC)	Management of acute myocardial infarction(MI) presenting as ST-segment elevation MI(STEMI) ⁷	<i>Long-term therapies</i> <i>4.4.1.6 Exercise-based rehabilitation programme</i> Exercise-based rehabilitation has been shown to be effective at reducing all-cause mortality and the risk of re-infarction, as well as improving risk factors, exercise-based capacity and health-related quality of life after myocardial infarction
ESC 2014	Guidelines on myocardial	Secondary prevention and cardiac rehabilitation are an integral part of the

	revascularization ⁵¹	management strategy after revascularization, because such measures reduce future morbidity and mortality in a cost-effective way and can further ameliorate symptoms. (p.71)
ESC 2011	Management of ACS without persistent STEMI ⁵²	<i>Long-term management</i> Enrolment in a cardiac rehabilitation/secondary prevention programme can enhance patient compliance with the medical regimen and is particularly advised to those with multiple modifiable risk factors and to moderate to high risk patients in whom supervised guidance is warranted.
American Heart Association(AHA)/American College of Cardiology(ACC) 2014	Management of non-ST-segment elevation ACS ⁴⁹	<i>6.3.1. Cardiac Rehabilitation and Physical Activity. Recommendations. CLASS I</i> All eligible patients with NSTEMI-ACS should be referred to a comprehensive cardiovascular rehabilitation program either before hospital discharge or during the first outpatient visit (pp449–452). (Level of Evidence: B)
ACC/AHA 2013	Management of STEMI ⁵⁰	<i>11.1. Post-hospitalisation Plan of Care. Recommendations. CLASS I</i> Exercise-based cardiac rehabilitation/secondary prevention programs are recommended for patients

with STEMI.

(pp 598,599,600, 601).(Level of Evidence: B)

National Institute for Health and Care Excellence(NICE) 2010	Management of Unstable angina and NON-STEMI ⁵³	<i>Key priority for implementation</i> <i>MI – secondary prevention, NICE clinical guideline 172</i> Before discharge offer patients advice and information about: their diagnosis and arrangements for follow-up cardiac rehabilitation. Make cardiac rehabilitation equally accessible and relevant to all people after an MI, particularly people from groups that are less likely to access this service. These include people from black and minority ethnic groups, older people, people from lower socioeconomic groups, women, people from rural communities, people with a learning disability and people with mental and physical health conditions.
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FIGURE LEGEND

Figure 1. The Ecological Approach framework

