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ORIGINAL ARTICLE

Development of Quality Indicators for Cardiac Rehabilitation in Australia: A Modified Delphi Method and Pilot Test

Robert Zecchin, MN [a,j], Dion Candelaria, MN [b,d], Cate Ferry, GradDipPH [c,j], Laila Akbar Ladak, MScN [b,d], Dawn McIvor [e,j], Kerry Wilcox, BN [f,j], Alexandra Bennett, PhD [g], Sheryl Bowen, BN, DipAppSci [h,j], Bridie Carr [i], Sue Randall, PhD [b], Robyn Gallagher, PhD, MN [b,d,j*]

[a]Western Sydney Local Health District (LHD), Sydney, NSW, Australia
[b]The University of Sydney Susan Wakil School of Nursing and Midwifery, Faculty of Medicine and Health, University of Sydney, Sydney, NSW, Australia
[c]National Heart Foundation of Australia (New South Wales Division), Sydney, NSW, Australia
[d]Charles Perkins Centre, The University of Sydney, Sydney, NSW, Australia
[e]Hunter New England LHD, Newcastle, NSW, Australia
[f]Northern NSW LHD, Lismore, NSW, Australia
[g]NSW Therapeutic Advisory Group (TAG), Sydney, NSW, Australia
[h]Mid North Coast LHD, Coffs Harbour, NSW, Australia
[i]Agency for Clinical Innovation (ACI) NSW, Sydney, NSW, Australia
[j]Australian Cardiovascular Health and Rehabilitation Association (ACRA), NSW, Australia

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Background International guidelines recommend cardiac rehabilitation (CR) for secondary prevention of cardiovascular disease, however, it is underutilised and the quality of content and delivery varies widely. Quality indicators (QIs) for CR are used internationally to measure clinical practice performance, but are lacking in the Australian context. This study reports the development of QIs for minimum dataset (MDS) for CR and the results of a pilot test for feasibility and applicability in clinical practice in Australia.

Methods A modified Delphi method was used to develop initial QIs which involved a consensus approach through a series of face-to-face and teleconference meetings of an expert multidisciplinary panel (n = 8), supplemented by an environmental scan of the literature and a multi-site pilot test.

Results Eight (8) QIs were proposed and sent to CR clinicians (n = 250) electronically to rate importance, current data collection status, and feasibility of future collection. The top six of these QIs were selected with an additional two key performance indicators from the New South Wales (NSW) Ministry of Health and two QIs from international registers for a draft MDS. The pilot test in 16 sites (938 patient cases) demonstrated median performance of 93% (IQR 47.1–100%). All 10 QIs were retained and one further QI related to diabetes was added for a final draft MDS.

Conclusions The MDS of 11 QIs for CR provides an important foundation for collection of data to promote the quality of CR nationally and the opportunity to participate in international benchmarking.

Keywords Cardiac rehabilitation • Quality indicators • Audit • Delphi method • Quality improvement

*Corresponding author at: Charles Perkins Centre, Sydney Nursing School, The University of Sydney, Room 2210, Level 2, Building D17, Sydney, NSW, 2006, Australia. Tel.: +61 2 86270279., Email: robyn.gallagher@sydney.edu.au

Introduction

Cardiovascular disease (CVD) continues to be a major cause of disability and premature death both globally [1] and locally in Australia [2]. CVD is a progressive disease, one in every five patients admitted to hospital with acute myocardial infarction (AMI), is readmitted within 30 days of discharge [3]. Therefore, secondary prevention strategies such as cardiac rehabilitation (CR) are crucial.

The most cost-effective secondary prevention strategy is comprehensive CR, which includes exercise training, health education, counselling, behaviour modification strategies, and support for self-management [4]. Participation in comprehensive CR reduces morbidity and mortality [5], improves overall health status and health-related quality of life [6,7], and decreases the economic burden of CVD [8]. Consequently, CR is strongly and consistently recommended in international clinical practice guidelines for the management of CVD, particularly for acute coronary syndrome (ACS) and chronic heart failure (CHF) [9–11].

The effectiveness of CR depends on the quality of content and delivery in practice. Despite this, deficits and inconsistencies commonly occur. Cardiac rehabilitation services vary widely in terms of program elements, overall structure [4] and delivery [12]. For instance, disparities are evident for equity and access [13] with the lowest participation rates observed in patients of low socio-economic status and those living in rural areas [14]. Moreover, attendance rates are generally suboptimal, although the groups who may benefit most from increased attendance are the elderly, women, and those with comorbid conditions [15]. As a result, measuring the quality of CR performance has become an international concern [16].

Measuring health care quality through evidence-based quality indicators (QIs) is associated with improved patient experience and patient outcomes [17]. QIs for CVD prevention and CR have been developed in the USA, Canada, Japan, and in several European countries, but are strikingly lacking in Australia [18–22], despite the national promotion of evaluation and quality improvement as core components of CR [23]. Locally-relevant, internationally-accepted and well-defined QIs are needed [24] to determine its feasibility, relevance, and applicability in the current settings before widespread implementation occurs [20].

The aim of this paper is to describe the process of developing QIs for a minimum dataset (MDS) for CR and report the findings of the pilot test for feasibility and relevance in Australian CR settings.

Methods

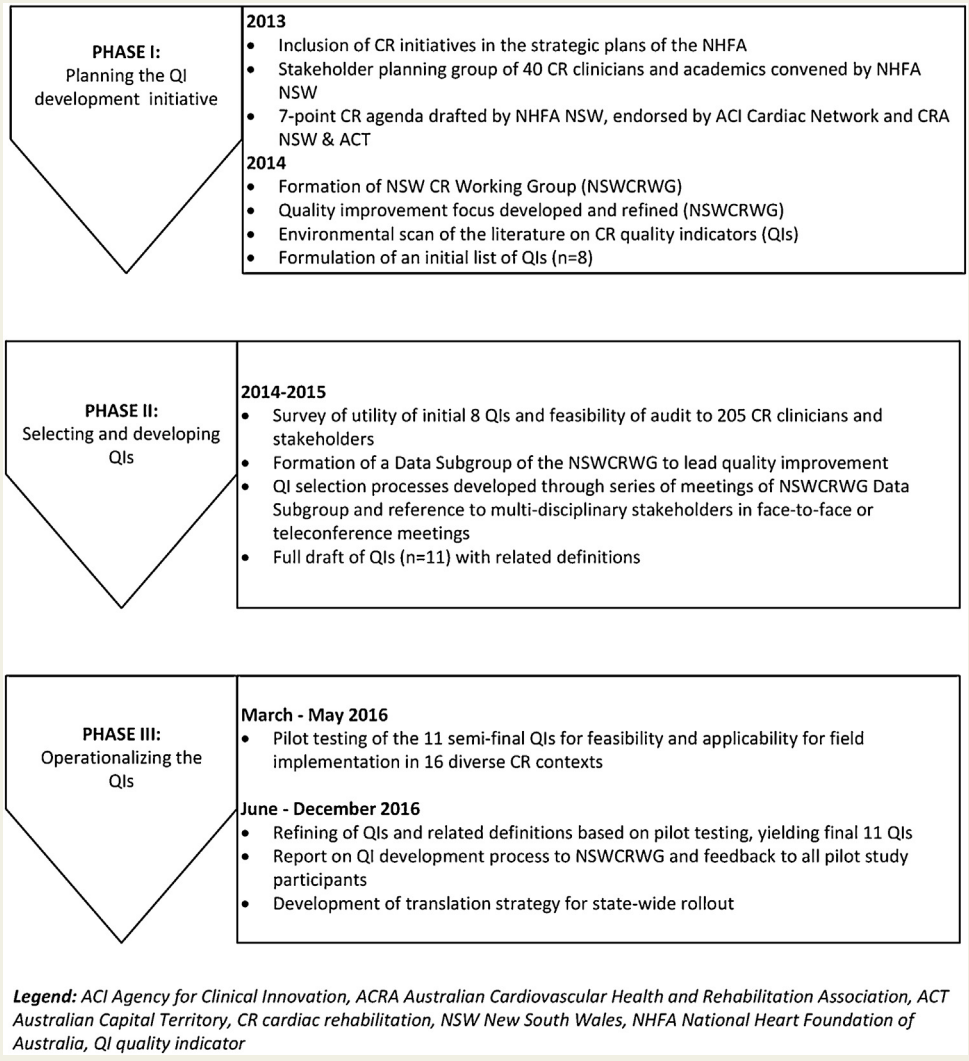
A systematic modified Delphi approach was utilised in the development of QIs for MDS for CR, which comprised three phases outlined in Figure 1. The modified Delphi technique enabled the consensus to be reached between the diverse stakeholders involved and to accommodate the distance stakeholders would need to travel across NSW for face-to-face meetings.

Phase I: Planning the QI Development Initiative

The impetus for this initiative was the National Heart Foundation of Australia's (NHFA) strategic plan ''For All Hearts 2013–2017'', which stated the intention to establish uniform data collection and achieve agreement on quality performance measures and indicators for CR to improve service provision in Australia. In November 2013, as part of implementing this strategic plan, the NHFA (NSW Division) invited 40 CR clinicians and academics to a one-day workshop. Quality improvement in CR was a prominent feature during the discussion, leading to the identification of seven focus areas, which were defined as the *CR 7-point Plan 2014*. This plan was subsequently endorsed by peak bodies including the Agency for Clinical Innovation—Cardiac Network (ACI-CN) and the Australian Cardiac Rehabilitation Association (ACRA) NSW and Australian Capital Territory (ACT). The *CR 7-point Plan 2014* became the driving force for stakeholders to collaborate and form a NSW CR Working Group (NSWCRWG), a sub-committee of ACI-CN led by the NHFA NSW. This working group included representatives from multiple disciplines as well as key stakeholders from Local Health Districts (LHD), NHFA NSW, ACI-CN, ACRA NSW/ACT and the NSW Therapeutic Advisory Group (TAG). An extensive environmental scan of the literature was undertaken of PubMed, CINAHL and EBSCO databases and reports from the American Heart Association, British Heart Foundation, European Society of Cardiology and Canadian Society of Cardiology. The environmental scan identified eight initial QIs and formed the basis of a survey questionnaire. The questionnaire aimed to assess the current state of CR data collection in terms of frequency, methods, perceived importance of collecting QIs in monitoring and improving the delivery of CR services and feasibility of future QI collection. The clinician participants were asked to rate the identified eight QIs in terms of their perceived significance and to provide recommendations for a mechanism to monitor and ultimately improve the performance of CR services in NSW.

Phase II: Selection and Development of the QIs

In May 2014, the survey developed in Phase I was distributed electronically to CR clinicians across NSW (n = 205). A data working group (DWG), as a sub-group of the NSWCRWG was developed to assist with the data management including the analysis of the survey results, planning and management of future QI initiatives. A leading CR expert was elected as chair, CRWG members self-nominated to join the DWG and an academic with expertise in data analysis joined the group. The initial eight QIs were revised and refined based on the



Legend: *ACI Agency for Clinical Innovation, ACRA Australian Cardiovascular Health and Rehabilitation Association, ACT Australian Capital Territory, CR cardiac rehabilitation, NSW New South Wales, NHFA National Heart Foundation of Australia, QI quality indicator*

Figure 1 Quality indicators development process diagram.

survey feedback and through consultation and consensus from a series of face-to-face and teleconference meetings of the multidisciplinary panel convened by the DWG. The top-rated six QIs were selected, the two Key Performance Indicators (KPIs) from the NSW Ministry of Health (MoH) (three KPIs merged into two) were retained, and two QIs were added, leading to the development of 10 QIs for the draft data dictionary (Figure 2).

Phase III: Implementing the QIs

A pilot test of the 10 identified QIs was carried out to assess feasibility and acceptability for field implementation. Pilot test sites were recruited through request for expressions of interest to the LHD representatives of the NSWCRWG, ensuring representation from metropolitan, regional, rural and remote settings. Site preparation included the draft data dictionary, instructions on data collection delivered via teleconference, email and/or phone call and a teleconference session to clarify processes. Cardiac rehabilitation sites (n = 16) participated collecting data from March to May 2016 with 983 patient cases included. Pilot sites provided feedback in a face-to-face meeting, which was used to finalise the QIs, refine the data dictionary, and streamline and standardise data collection processes.

Results

Selection of QIs

Phase I

From the environmental scan of the literature, the NSWCRWG selected eight potential QIs (Figure 2), which included assessment of medication prescription, assessment of smoking status, screening of psychological profile including depression, individualised assessment of risk factors, symptom self-management plan, assessment of functional capacity, communication with a general practitioner (GP), and assessment of behaviour change. These eight QIs formed

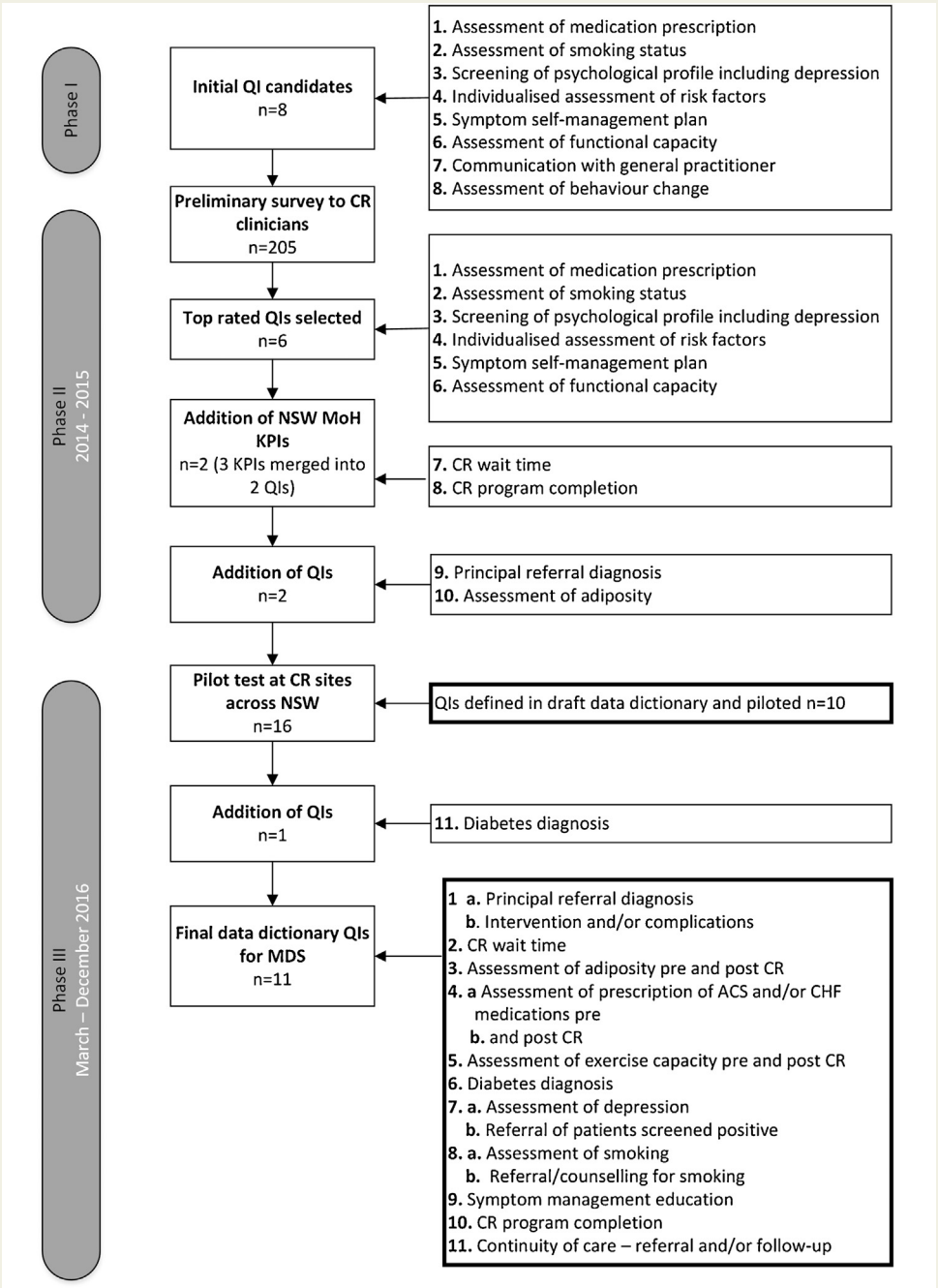


Figure 2 Development of QIs for MDS for CR Evaluation across NSW.
Abbreviations: QIs, quality indicators; MDS, minimum dataset; CR, cardiac rehabilitation.

the basis for the preliminary survey of CR clinicians across NSW which made up Phase II.

Phase II

Of the 205 CR clinicians surveyed, 84 (41%) responded; primarily registered nurses (84%), with the remainder being physiotherapists, exercise physiologists, and occupational therapists. Cardiac rehabilitation service locations represented rural (37%), metropolitan (27%), regional (32%) and remote areas (4%). The most common CR delivery settings were inpatient and/or out-patient at 64%, followed by community settings (55%), telephone services (26%) and ≤5% in general practice settings including Aboriginal health settings. The indicators rated most often as important for monitoring CR

performance were screening of psychological profile including depression (96%), assessment of risk factors (96%), assessment of medication prescription (95%), assessment of smoking status (92%), symptom self-management plan (92%), early communication with a GP (88%), assessment for behaviour change (84%), and assessment of functional capacity (84%). CR clinicians collected at least some of this data on a monthly (13–18%), 6-monthly (5–10%) or annual basis (6-15%); the majority (~60%) were not collecting any. For those collecting QI data, this was conducted manually by the majority (52%) and electronically by one-third (30%). The majority (83%) reported that the data would be useful to improve or change their services, 75% felt that data would be useful for benchmarking and 61% perceived that it could be used to help manage their service more effectively. Furthermore, CR clinicians identified that quarterly collection of six QIs would be the most feasible option.

The top six QIs were selected based on the survey participant ratings (Figure 2). Two KPIs (three KPIs merged to two) from the NSW MoH were added (CR wait time and completion) and two QIs were added based on a broader literature search of international registries and audits, evidence that linked QIs to patient outcomes, and with the expert consensus of the multi-disciplinary panel. The two additional QIs included principal referral diagnosis and interventions/complications and assessment of adiposity, for a total of 10 QIs. Essential patient demographics including age, gender, ethnicity and aboriginality were included.

Phase III

Pilot testing of the 10 selected QIs (Figure 2) demonstrated that the QIs performed on the majority (≥80%) of patients were principal referral diagnosis, intervention and/or complication, CR wait time, assessment of prescription of ACS and/or CHF medications pre and post CR, assessment of depression and referral, assessment of smoking and support, symptom management education, and CR program completion (Table 1). Performance for QI prescription of ACS and/or CHF medications according to guidelines occurred on almost all participants (97.86%) at CR commencement, which reduced (65.51%) at CR completion. Two QIs: assessment of adiposity and exercise capacity (6-minute walk test and metabolic equivalent test) were performed in ≤50% of the patients. Feedback from participants resulted in minor revisions including addition of another QI (diabetes diagnosis) resulting in a total of 11 QIs for the MDS for CR outcomes across NSW. These minor revisions and the definitions of the final QIs were updated in the data dictionary for future use.

Discussion

In this study, 11 QIs for CR were identified and determined suitable for MDS in Australia. These core QIs include: (1a) principal referral diagnosis, (1b) intervention and/or complication, (2) cardiac rehabilitation wait time, (3) assessment of adiposity pre and post CR, (4a) assessment of prescription of ACS and/or CHF medications pre (4b) and post CR, (5) assessment of exercise capacity pre and post CR, (6) diabetes diagnosis, (7a) assessment of depression, (7b) referral of patients screened positive, (8a) assessment of smoking, (8b) referral/counselling for smoking, (9) symptom management education, (10) CR program completion, and (11) continuity of care — referral and/or follow-up.

The study results provide an important foundation for routine collection of data to promote the quality of CR, an opportunity to participate in international benchmarking for CR and refined indicators to be included in the electronic medical record. These core QIs are relatively consistent with international reports on CR outcome QIs. The indicator most constantly included in several international CR registries and audits is the assessment of exercise capacity pre and post CR [18–20,25]. This is not surprising given that exercise training is a core component of CR [22,27]. In addition, CR program completion, CR wait time, assessment of smoking, and continuity of care that involves communication to health care providers were also relatively consistent, although precise wordings differed [18–20,25]. Other QIs such as assessment of adiposity, diabetes diagnosis and assessment of depression were comparable to the performance measures for CR and secondary prevention of the USA, which addresses a comprehensive individualised patient cardiovascular risk factor assessment and evaluation [24,25]. The uniform collection of data across multiple sites and nations contributes substantially to the success of registries and audits and allows universal benchmarking through the development of KPIs that are internationally relevant [26].

While there is some standardisation in QIs internationally the number and type of QIs collected varies considerably. The British Association for Cardiovascular Prevention and Rehabilitation (BACPR) identified six standards for cardiovascular prevention and rehabilitation, which formed the basis for the now annual National Audit of Cardiac Rehabilitation (NACR) [27]. Whereas in the USA, the American Association of Cardiovascular and Pulmonary Rehabilitation (AACVPR)/American College of Cardiology (ACC)/American Heart Association (AHA) provided comprehensive sets of performance measures focussed mainly on CR referral, structure-based measurements, and specific individualised patient assessments [19,25] and have provided the revisions of these performance measures in their recent report [28]. Similarly, the Canadian Cardiovascular Society (CCS) developed an exhaustive list of CR QIs, which was then reduced to the absolute essential *Top 5* QIs, and includes: in-patient referral, CR wait time, patient self-management education, increase in exercise capacity, and emergency response [18]. In Asia, a Japanese team proposed 13 QIs in the field of CR but confined these to acute coronary syndrome patients [20].

These variations in the number and type of CR QIs are likely driven by national differences in funding health systems, and governance of CR services and contextual influences. For instance, in Australia most CR programs (82%) are funded and delivered as outpatient facilities of hospitals

Table 1 QI definitions and pilot study performance.

QIs	Type of Measure	Indicators	Definition	Performance Scores (2016 Pilot)
1a	Process	Principal referral diagnosis	The most recent diagnosis preceding referral to cardiac rehabilitation	100%
1b	Process	Intervention and/or complication	Principal diagnosis prior to cardiac rehabilitation	82%
2	Outcome	CR wait time	Days from hospital discharge/referral to commencement of CR service	99%
3	Outcome	Assessment of adiposity pre and post CR	Change of waist circumference (in cm) pre to post CR	49%
4a	Process	Assessment of prescription of ACS and/or CHF medication pre and post CR	Prescription of: a. Anti-platelet b. Beta blocker c. ACE-I/ARB d. Statin/lipid lowering medication	97.86%
4b	Process	Or post CR	e. Sub-lingual nitrate	65.51%
5	Outcome	Assessment of exercise capacity pre and post CR	Change in exercise capacity pre to post CR: a. Change in METs for EST (numerical) OR b. Change in metres for 6MWT (numerical)	47.10%
6a	Process	Assessment of depression	Assessment of depression during the CR program	85%
6b	Outcome	Referral of patients screened positive	Referral to mental health management of cases screened positive for depression	85%
7a	Process	Assessment of smoking	Assessment of smoking status	100%
7b	Outcome	Referral/counselling for smoking	Referral to and/or given smoking cessation advice/counselling of past or recent smokers	92%
8	Process	Symptom management education	Symptom management education either individually or within a group prior to CR discharge	94%
9	Outcome	CR program completion	Completion of the CR program and reason if did not complete	99%
10	Process	Continuity of care – referral and/or follow-up	Referral to: a. GP b. Specialist/Cardiologist c. Follow-up with CR d. Phase 3 CR or equivalent	73%

Abbreviations: ACE-I, angiotensin-converting enzyme inhibitor; ACS, acute coronary syndrome; ARB, angiotensin receptor blocker; CHF, chronic heart failure; CR, cardiac rehabilitation; EST, exercise stress test; GP, general practitioner; MET, metabolic equivalent of task; QI, quality indicator; 6MWT, 6-minute walk test.

[4,29], which then determines the number and type of CR sessions offered, in this case, typically one to two per week for 6 to 8 weeks [30]. While CR staffing varies, most Australian programs are coordinated by nurses and to a lesser extent, physiotherapists, with contributions by a multidisciplinary team of dieticians, pharmacists, psychologists and/or social workers. This model of practice is in contrast to US practice, where funding is based on an individual's insurance provider [28].

An important consideration regarding the number and type of QIs collected is the capacity for registers to be maintained over time. The more QIs collected, the greater burden

of data collection and entry for clinicians with the associated costs of maintaining the registry and providing feedback on performance. This may ultimately impact the sustainability. For instance, monitoring of performance often only focusses on a selection of key QIs such as attendance and completion, raising questions about overall cost:benefit ratios. NACR, the longest running audit of CR, depends for its maintenance on substantial funding from the British Heart Foundation. These costs are currently driving reconsideration of the appropriate number of QIs by the BACPR [27,31].

Cardiac rehabilitation referral and participation rates are ubiquitous in international performance measurement in CR [18–20,25]. However, in Australia and specifically in NSW, the lack of a unified data linkage system through electronic medical records (eMR) [15], makes the collection of these data problematic. Linking the electronic health database to CR has also been identified as the performance measure in the recent report by American Heart Association [28]. Without a denominator for the total number of eligible or suitable patients for CR, it is impossible to calculate current referral and participation rates accurately. The absence of a national or state-wide reporting system or registry for CVD patient treatments and outcomes is another constraint [26,32].

Further considerations for CR QI selection include the need to consider contemporary evidence, particularly in relation to performance monitoring. Indeed, a recent systematic review challenges the efficacy of exercise based CR for reducing mortality and hospitalisation outcomes [33]. Despite several criticisms of the review, including over simplification of the complex intervention that is CR, failure to determine exercise participation, frequency, dose and follow-up period, the review makes an important contribution to the evidence on CR. Notably the generation of CR evidence is frequent and dynamic, underscoring the importance of ongoing evidence monitoring and horizon scanning.

In many respects, the methodological approaches to developing a MDS of QIs for CR for Australia reported in this paper are consistent with the approaches used in Japan and Canada, and provide a useful framework for the development of other QIs [18,20]. Expert consensus, which may include a modified Delphi technique in conjunction with environmental scan and pilot testing, was used by all three nations. Cardiac rehabilitation is a complex topic and the Delphi technique enabled consensus to be reached between very diverse stakeholders across NSW. Clinicians, policy makers and expert opinion leaders from NHFA NSW, ACI-CN, ACRA NSW/ACT and the NSW Therapeutic Advisory Group were able to provide opinions and advice using this method, when time and distance make it difficult to achieve face-to-face meetings [34]. Secondly, this approach provided opportunity and ownership to the stakeholders to be part of decision-making [35] for the CR MDS at the state level, which they would lead in their respective LHDs and sites. This technique allows feedback to be provided anonymously, with less concern for unpopular views being devalued allowing disagreement. In this way, QIs may be developed that reflect local requirements and promote implementation in practice. However, this methodology may not provide the opportunity for participants to see the bigger picture of the problem under study [36]. Secondly the Delphi technique may demand further exploration of individual's views that are outliers and require additional resources.

Limitations

The generalisability and adaptability of each QI in this study must be reviewed and examined before application to account for differences in practice settings and contexts. This is a crucial consideration in evidence-based clinical decision-making in different locations [37]. For instance, this study was carried out in one state and it is possible that some environmental variation in practice sites may be observed in other Australian states with different governance, local policies, and CR leadership structures. In addition, the hospital reutilisation factors such as re-hospitalisation could not be considered due to lack of data linkage between CR and the hospital databases.

Way Forward

The next steps for development and validation of the identified CR MDS include repeating the audit of the final 11 QIs with more sites and patient enrolments both within the state of NSW and in other states as well as private settings. These activities will provide insight into the feasibility and reliability across various settings as well as the effects of repeated assessment. Routine data collection through more automated processes such as data linkage is the ultimate goal, however, as noted previously this is constrained by lack of data points in the electronic health record. Meanwhile, ease of data entry will be promoted by using electronic data systems.

The evidence related to CR outcomes is a dynamic field, with studies being frequently reported. Importantly, monitoring of performance over time must be undertaken in relation to contemporary evidence.

Conclusion

In this paper, we have described the formation of QIs for cardiac rehabilitation, using a modified Delphi approach, in NSW, Australia. Consensus from multiple health disciplines and academics and pilot testing resulted in the development of 11 QIs forming a MDS. This provides a robust platform to provide data to evaluate quality outcomes for CR thus offering opportunities to improve provision of care and to further build an evidence base for the effectiveness of CR. We suggest that expanding this MDS across all states in Australia is a logical next step in unifying CR quality indicators in Australia.

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Disclosures

There are no financial or non-financial conflicts of interest to disclose.

Authors' Contribution

Conceived the study, contributed to the study design, conducted data collection, data analysis, drafted and revised the manuscript (RZ, CF, RG).

Contributed to the study design, assisted in data analysis, drafted and revised the manuscript, provided critical feedback on the manuscript drafts (DC, LL, SR).

Contributed to the study design, assisted in data analysis, provided critical feedback on the manuscript drafts (DM, KW, AB, SB, BC).

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