The provision and delivery of exercise-based cardiac rehabilitation in Australia: concordant with best research evidence?

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Thesis summary

Background— Exercise-based cardiac rehabilitation provides an organised pathway to deliver secondary prevention therapies to patients with diagnosed coronary heart disease. However, despite considerable evidence about the effectiveness of this intervention, its uptake in practice remains suboptimal, and recurrent cardiac events and deaths represent a significant national burden of disease. A need therefore exists to examine the reasons for this evidence-practice gap, and identify and understand the nature of potential barriers to evidence translation.

Aims— Broadly, this thesis aimed to establish whether the prescription and delivery of exercise training in Australian cardiac rehabilitation programs is congruent with the best available research evidence. It also sought to develop recommendations to address potential barriers to evidence-based practice, and improve the service delivery of cardiac rehabilitation nationwide.

Methods— Five interrelated studies were conducted using a variety of research methods. Firstly, a quantitative analysis using a standardised template examined the completeness of descriptions of exercise-based interventions in randomised controlled trials of participants with coronary heart disease. This was followed by a systematic review, meta-analysis, and meta-regression exploring the effects of exercise-based cardiac rehabilitation on clinical outcomes, with specific examination of individual exercise training components. The third study comprised an exploration of the publication characteristics, methodological quality, and clinical usefulness of guidance publications providing recommendations for exercise, cardiac rehabilitation, or physical activity in practice. Following on from this work, a comparative study conducted within a subgroup of these publications examined the similarities and differences in specific recommendations for exercise training components nationally and internationally. Finally, using knowledge gained in previous studies, a questionnaire was developed, and a national cross-sectional survey conducted, which documented the delivery of exercise training in cardiac rehabilitation within Australia.

Results— The initial study found substantial deficiencies in the reporting of exercise interventions, with all individual components required for replication available in only 15% of published sources. While some further detail about interventions could be obtained by directly contacting trial authors, this process was arduous, time-consuming, and unable to complete all descriptions. The subsequent meta-regression highlighted an expanding range of exercise-
based interventions (n=72) which differed markedly in terms of characteristics and the ‘dose’ of exercise training provided. Nevertheless, it also found little differential effect of these varying types and ‘doses’ of exercise training, particularly on mortality outcomes. Rather, it appears that high adherence levels to the exercise as prescribed are of greater consequence in predicting subsequent mortality. The third study revealed an expanding and readily accessible ‘guideline market’ (n=54), including a variety of guidance publication types. There was however substantial variation in the quality and usefulness of these publications, and overlap in documents produced within the same region. Analysis of a subset of these publications found a large degree of comparability in the specific recommendations for exercise training in publications produced within the same region, and for many intervention components across international publications. Notably however, guidance from Australia, New Zealand and the U.K tended to recommend less intensive, less frequent, and shorter duration programs than the U.S.A, Canada and Europe. Finally, the nationwide survey found much of Australia’s cardiac rehabilitation service to remain within traditional models of care. Despite some advances in providing flexible and accessible programs, most frequently low-to-moderate intensity exercise was delivered at outpatient centres by nurses and physiotherapists, 1-2 times per week for 60 minutes over 7 weeks.

Conclusions and Implications—The results of these studies highlight that poor reporting of exercise interventions, along with the volume and complexity of exercise training observed within trials, presents a considerable challenge for translation of evidence into practice and clinical guidance. Fortunately, these barriers to evidence-based practice are largely remediable. Additionally, the hypothesised suboptimal treatment gaps between the research evidence, clinical guidance, and clinical practice were found to be generally minor in nature. Nevertheless, the findings of this thesis did lead to several recommendations to overcome these barriers and improve service delivery: (i) better research reporting in exercise-based cardiac rehabilitation, particularly for intervention descriptions; (ii) a continued impetus to deliver flexible and diverse models of care in practice; (iii) consideration of a globally endorsed and regularly updated cardiac rehabilitation guideline; (iv) improvement in the synthesis, accessibility, methodological quality, and transparency of all relevant clinical guidance documents; (v) updated and detailed Australian guidance for the use of exercise training in
cardiac rehabilitation; and (vi) at a minimum, the maintenance of current exercise-based cardiac rehabilitation service delivery levels within Australia.

Keywords

cardiac rehabilitation; exercise; evidence-based practice; coronary heart disease; secondary prevention; exercise training; guidelines; clinical practice
Declaration by candidate

This thesis is submitted to Bond University in fulfilment of the requirements of the degree of Doctor of Philosophy (PhD). This thesis represents my own original work towards this research degree and contains no material that has previously been submitted for a degree or diploma at this University or any other institution, except where due acknowledgement is made.

Bridget Rose Abell
Declaration of author contributions

Bridget Abell is the sole author of Chapter 1 (General Introduction), Chapter 2 (Literature Review), Chapter 6 (Guidance Comparison), and Chapter 8 (General Discussion). The remaining chapters (listed below) are multi-authored publications on which Bridget Abell was the lead author, with all other contributors acknowledged below. The design, conception, and management of all studies; data collection and analysis; initial drafting and subsequent revisions of publications; as well as response to peer-reviewers was primarily driven by the PhD candidate. Co-authors generally provided assistance with study planning and design, interpretation of the data, and critical revision of the manuscript.

Co-authored publications


Statement of contributions

1. BA 75%, PG 10%, TH 15%  3. BA 75%, PG 10%, TH 15%
2. BA 65%, PG 10%, TB 15%, TH 10%  4. BA 70%, PG 15%, TH 15%
Research outputs arising from this thesis

Peer-reviewed publications


Peer-reviewed conference abstracts: oral presentations


- Abell BA, Glasziou P, Hoffmann TC. Exploring the evidence-practice gaps in exercise-based cardiac rehabilitation. Gold Coast Health and Medical Research Conference 2016: Gold Coast, Australia.

– Abell BA, Glasziou P, Hoffmann TC. How is exercise currently being delivered in Australian cardiac rehabilitation services? A snapshot of nationwide practice. Australian Cardiovascular Health and Rehabilitation Association Conference 2015: Melbourne, Australia.

– Abell BA, Glasziou P, Hoffmann TC. International guidance for prescribing exercise in cardiac rehabilitation: complementary or contradictory? Australian Cardiovascular Health and Rehabilitation Association Conference 2015: Melbourne, Australia. (moderated 5-minute poster presentation)

– Abell BA, Glasziou P, Hoffmann TC. Reporting and replicating cardiac rehabilitation trials: Do we know what the researchers actually did? Australian Cardiovascular Health and Rehabilitation Association Conference 2014: Sydney, Australia.

– Abell BA, Glasziou P, Hoffmann TC. Reducing mortality with exercise-based cardiac rehabilitation: Is it what patients do or how well they stick with it? Australian Cardiovascular Health and Rehabilitation Association Conference 2014: Sydney, Australia

**Peer-reviewed conference abstracts: posters**

– Abell BA, Glasziou P, Hoffmann TC. International guidance for prescribing exercise in cardiac rehabilitation: complementary or contradictory? American Association of Cardiovascular and Pulmonary Rehabilitation 30th Annual Meeting 2015: Washington DC, USA

– Abell BA, Glasziou P, Hoffmann TC. Reporting and replicating cardiac rehabilitation trials: Do we know what the researchers actually did? American Association of Cardiovascular and Pulmonary Rehabilitation 30th Annual Meeting 2015: Washington DC, USA

Other presentations

- Abell BA. Research, Reality and Rehabilitation: the heart of the matter. Three-Minute Thesis Competition 2014: Bond University (overall winner)
- Abell BA. Research, Reality and Rehabilitation: the heart of the matter. Three-Minute Thesis Trans-Tasman Final 2014: University of Western Australia
Ethics declaration

The research associated with Chapter 7 of this thesis received ethics approval from the Bond University Human Research Ethics Committee. Approval number RO1862.
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Abbreviations

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AGREE: Appraisal of Guidelines for Research and Evaluation
CABG: coronary artery bypass graft
CAD: coronary artery disease
CHD: coronary heart disease
CI: confidence interval
CONSORT: Consolidated Standards of Reporting Trials
CR: cardiac rehabilitation
CVD: cardiovascular disease
GrETT: graded exercise tolerance test
HIIT: high intensity interval training
HRR: heart rate reserve
HRmax: maximal heart rate
MET: metabolic equivalent
MI: myocardial infarction
PCI: percutaneous coronary intervention
RCT: randomised controlled trial
RPE: rating of perceived exertion
RR: relative risk
TIDieR: Template for Intervention Description and Replication
UK: United Kingdom
US/USA: United States of America
VO₂max: maximal oxygen consumption/maximal aerobic capacity
VO₂R: oxygen consumption reserve (also VO₂ reserve)