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Editorial

Cardiac conditions

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This Editorial introduces another of *Journal of Physiotherapy's* article collections.^{1,2} These are collections of papers on a particular topic, published in the *Journal of Physiotherapy* within the past decade and compiled to: facilitate access to important recent findings on the topic; highlight trends in research designs, methods, populations and interventions; and suggest avenues for further research. The studies in this article collection relate to physiotherapy management of cardiac conditions.

In 2011, there was a call for physiotherapists to become more engaged in cardiology research.³ The Editorial highlighted issues including the lack of research in this area being led by physiotherapists, despite their extensive training in prevention and management of risk factors for coronary disease. Much important research into physiotherapy for people with heart conditions has been published since then. This article collection focuses on aspects of cardiac rehabilitation from both centre-based and home-based perspectives, as well as reviewing progress in perioperative care, complementing the Editorial on perioperative physiotherapy published in 2022.⁴ The important advances that have subsequently been published in *Journal of Physiotherapy* are summarised below and collated as free full-text articles in the online article collection. Importantly, each paper has clear implications for clinical physiotherapists, which are identifiable in the paper's 'What this study adds' summary box.

Centre-based cardiac rehabilitation

Clinical guidelines on the management of the most prevalent heart conditions consistently endorse cardiac rehabilitation as an efficient and secure strategy, with exercise identified as a central element.^{5,6} Exercise training has a direct benefit on reducing risk factors for atherosclerotic disease and also improving heart and coronary vasculature.⁶ Therefore, it is crucial to advance physiotherapists' knowledge on the effects of different modalities of exercise. The first and second articles in this collection address investigations around the effects of different modalities of exercise-based programs for patients with coronary heart disease and heart failure.

In 2010, Hwang and colleagues⁷ performed a systematic review to evaluate whether resistance training, alone or as an adjunct to aerobic training, could improve cardiac function, exercise capacity and quality of life in patients with chronic heart failure. Results from eight trials involving 241 participants revealed that resistance training increased the 6-minute walk distance (6MWD) by an average of 52 m (95% CI 19 to 85) in comparison with no training. However, when resistance training was provided either alone or as an addition to aerobic training, no other benefits were seen on cardiac function, peak oxygen consumption or quality of life.

A common concern when addressing exercise therapy for patients with cardiovascular diseases is the high prevalence of morbidities such as overweight, obesity and arthritis.⁸ These factors can limit the

execution of aerobic and resistance exercise, which are commonly performed on treadmills, cycle ergometers and weight machine equipment. Therefore, water-based exercises can be offered as an alternative, where the effects of buoyancy reduce the weight-bearing load on the lower limbs and spine.⁹

Scheer et al¹⁰ conducted a randomised controlled trial, published in 2021, investigating the effects of 12 weeks of water-based circuit training exercise on aerobic capacity, strength and body composition of patients with stable coronary heart disease. The results were compared with those of a group that performed aerobic and strengthening exercises at a cardiac rehabilitation outpatient gym. Water-based exercises presented very similar improvements in VO₂peak compared with the traditional program. The mean difference between groups was 0.2 ml/kg/min (95% CI -1.5 to 1.9). Additionally, both exercise modalities also showed similar gains in muscle strength and comparable reductions in total body fat.¹⁰

Home-based cardiac rehabilitation

Despite the well-known benefits of exercise-based cardiac rehabilitation, these programs are not currently being used to their full potential. The rates of patients undergoing rehabilitation vary from <20% for heart failure to 40% in those with coronary heart disease.^{11,12} Therefore, strategies are needed to reduce barriers and widen access to cardiac rehabilitation programs, such as home-based exercises.¹³

One of the first randomised controlled trials to compare a home-based video telerehabilitation program with a conventional centre-based program for patients with chronic heart failure was carried out in 2017 by Hwang et al.⁷ After 12 weeks of intervention, no significant between-group differences were observed in 6MWD (MD 15 m, 95% CI -28 to 59). In addition, the home-based telerehabilitation group had significantly higher attendance rates when compared with the centre-based group, with a between-group mean difference of six sessions (95% CI 2 to 9).⁷

Chien et al also reported improvements in 6MWD (MD 21 m, 95% CI 7 to 36) and quality of life by providing home-based exercises associated with a daily activity log and telephone monitoring every 1 to 2 weeks when compared with a control group that did not exercise.¹⁴

Another study investigating the effects of home-based training was performed by Jones et al in 2010.¹⁵ In this randomised trial, patients with stage I or II hypertension performed slow deep breathing at home, either unloaded or breathing against a load of 20 cmH₂O provided by a threshold-loaded breathing device for 8 weeks. Both training groups showed significant reductions in systolic and diastolic blood pressure. Additionally, adding an inspiratory load enhanced the decrease in systolic blood pressure, with a between-group difference of -5.3 mmHg (95% CI -1.0 to -9.6).

In the studies discussed above, the 6MWD was one of the most investigated outcomes and is considered an independent predictor of mortality and cardiovascular hospitalisation in people with heart failure.¹⁶ Wegrzynowska-Teodorczyk performed a prospective observational study and showed that participants with a 6MWD \leq 468 m had a mortality hazard ratio of 3.22 (95% CI 1.17 to 8.86) at 1 year and 2.18 (95% CI 1.18 to 4.03) at 3 years of follow-up.¹⁶ Therefore, it is important to highlight that the 6-minute walk test should be considered an important component of the complex evaluation of the cardiac patient due to its prognostic value.

Cardiac surgery

Preoperative and postoperative cardiac rehabilitation have become an essential part of care for patients undergoing cardiac surgery procedures. Such programs can reduce mortality, improve physical performance and increase quality of life.^{6,17} Physiotherapists have an important role in assessing and providing different elements of these programs, including education, inspiratory muscle training and exercise training.⁴

Preoperative care was investigated by Snowdon and colleagues in a systematic review published in 2014.¹⁸ The review primarily aimed to analyse whether preoperative intervention in patients undergoing cardiac surgery could reduce pulmonary complications and shorten length of intensive care unit or hospital stay.¹⁸ Their review included a meta-analysis of data from six trials involving 661 participants; it indicated a worthwhile reduction in the relative risk of developing postoperative pulmonary complications with preoperative interventions (RR 0.39, 95% CI 0.23 to 0.66). Additionally, preoperative intervention reduced the time to extubation by a pooled mean difference of 0.14 days (95% CI 0.01 to 0.26). The effect on length of intensive care unit stay was unclear (MD -0.15 days, 95% CI -0.37 to 0.08), as was the effect on length of hospital stay (MD -0.55 days, 95% CI -1.32 to 0.23), except among older participants aged > 63 years (MD -1.32 days, 95% CI -2.36 to -0.28).¹⁸ Finally, when evidence for specific preoperative therapies was taken into account, inspiratory muscle training promoted significant reductions in postoperative pulmonary complications (RR 0.42, 95% CI 0.21 to 0.82) and reduced hospital stay (MD -2.1 days, 95% CI -3.41 to -0.76).

Significant morbidity and mortality are linked to major surgical procedures, including cardiac surgery. One common surgical procedure that physiotherapists often manage in postoperative care is median sternotomy.¹⁹ A common concern among physiotherapists and other healthcare providers is whether or not to restrict upper limb and trunk movements after median sternotomy, due to the conflicting evidence that is available.²⁰

The SMART trial explored the effects of an intervention that included less restrictive use of the upper limbs and trunk for patients who had undergone cardiac surgery via median sternotomy. The experimental group was encouraged to use their arms during transfers and other tasks, in addition to perform upper limb exercise three times daily within the limits of pain and discomfort. The control group was instructed with usual precautions, including to restrict use of the upper limbs for 4 to 6 weeks after surgery.²⁰ After 12 weeks of follow-up, there were negligible between-group differences in the

improvements in physical function as measured by the Short Physical Performance Battery (MD 0.4 points on a 0-to-12 scale, 95% CI -0.9 to 1.6).²⁰ Secondary outcomes including pain and kinesiophobia also did not show important between-group differences. The study also showed that implementation of the modified sternal precautions did not cause harm or adverse events. Consequently, the authors concluded that until further research is performed, modified sternal precautions might be an equally appropriate option.²⁰

Future directions

This article collection indicated several beneficial physiotherapy interventions at various phases of cardiac surgery and rehabilitation. Although most studies presented a variety or combination of strategies that can be provided, exercise training can be identified as the cornerstone of the interventions for heart conditions. While the role of physiotherapy interventions for cardiac populations is well established, several studies have highlighted the need for further investigations in this area. These main aspects for further research include: addressing the effects of rehabilitation programs on subgroups of patients with heart failure, especially females and more severe cases of the disease; determining the applicability of tele-rehabilitation in rural and remote locations with variable internet service; and establishing the effectiveness of preoperative exercise training on cost-effectiveness, pulmonary complications, length of hospitalisation and time to extubation after cardiac surgery.

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