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[Intervention Review]

# Exercise-based cardiac rehabilitation for adult patients with an implantable cardioverter defibrillator

Kim M Nielsen<sup>1</sup>, Ann-Dorthe Zwisler<sup>1</sup>, Rod S Taylor<sup>2</sup>, Jesper H Svendsen<sup>1</sup>, Jane Lindschou<sup>3</sup>, Lindsey Anderson<sup>2</sup>, Janus C Jakobsen<sup>4,5</sup>, Selina K Berg<sup>1</sup>

<sup>1</sup>Department of Cardiology, The Heart Centre, Copenhagen University Hospital, Rigshospitalet, Copenhagen, Denmark. <sup>2</sup>Institute of Health Research, University of Exeter Medical School, Exeter, UK. <sup>3</sup>Copenhagen Trial Unit, Centre for Clinical Intervention Research, Department 7812, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark. <sup>4</sup>Cochrane Hepato-Biliary Group, Copenhagen Trial Unit, Centre for Clinical Intervention Research, Department 7812, Rigshospitalet, Copenhagen University Hospital, Copenhagen, Denmark. <sup>5</sup>Department of Cardiology, Holbaek Hospital, Holbaek, Denmark

Contact address: Kim M Nielsen, Department of Cardiology, The Heart Centre, Copenhagen University Hospital, Rigshospitalet, Blegdamsvej 9, Copenhagen, 2100, Denmark. [kim.mechta.nielsen@regionh.dk](mailto:kim.mechta.nielsen@regionh.dk).

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## ABSTRACT

### Background

An effective way of preventing sudden cardiac death is the use of an implantable cardioverter defibrillator (ICD). In spite of the potential mortality benefits of receiving an ICD device, psychological problems experienced by patients after receiving an ICD may negatively impact their health-related quality of life, and lead to increased readmission to hospital and healthcare needs, loss of productivity and employment earnings, and increased morbidity and mortality. Evidence from other heart conditions suggests that cardiac rehabilitation should consist of both exercise training and psychoeducational interventions; such rehabilitation may benefit patients with an ICD. Prior systematic reviews of cardiac rehabilitation have excluded participants with an ICD. A systematic review was therefore conducted to assess the evidence for the use of exercise-based intervention programmes following implantation of an ICD.

### Objectives

To assess the benefits and harms of exercise-based cardiac rehabilitation programmes (exercise-based interventions alone or in combination with psychoeducational components) compared with control (group of no intervention, treatment as usual or another rehabilitation programme with no physical exercise element) in adults with an ICD.

### Search methods

We searched CENTRAL, MEDLINE, Embase and four other databases on 30 August 2018 and three trials registers on 14 November 2017. We also undertook reference checking, citation searching and contacted study authors for missing data.

### Selection criteria

We included randomised controlled trials (RCTs) if they investigated exercise-based cardiac rehabilitation interventions compared with no intervention, treatment as usual or another rehabilitation programme. The trial participants were adults (aged 18 years or older), who had been treated with an ICD regardless of type or indication.

## Data collection and analysis

Two review authors independently extracted data and assessed risk of bias. The primary outcomes were all-cause mortality, serious adverse events and health-related quality of life. The secondary outcomes were exercise capacity, antitachycardia pacing, shock, non-serious adverse events, employment or loss of employment and costs and cost-effectiveness. Risk of systematic errors (bias) was assessed by evaluation of predefined bias risk domains. Clinical and statistical heterogeneity were assessed. Meta-analyses were undertaken using both fixed-effect and random-effects models. We used the GRADE approach to assess the quality of evidence.

## Main results

We identified eight trials published from 2004 to 2017 randomising a total of 1730 participants, with mean intervention duration of 12 weeks. All eight trials were judged to be at overall high risk of bias and effect estimates are reported at the end of the intervention with a follow-up range of eight to 24 weeks.

Seven trials reported all-cause mortality, but deaths only occurred in one trial with no evidence of a difference between exercise-based cardiac rehabilitation and control (risk ratio (RR) 1.96, 95% confidence interval (CI) 0.18 to 21.26; participants = 196; trials = 1; quality of evidence: low). There was also no evidence of a difference in serious adverse events between exercise-based cardiac rehabilitation and control (RR 1.05, 95% CI 0.77 to 1.44; participants = 356; trials = 2; quality of evidence: low). Due to the variation in reporting of health-related quality of life outcomes, it was not possible to pool data. However, the five trials reporting health-related quality of life at the end of the intervention, each showed little or no evidence of a difference between exercise-based cardiac rehabilitation and control.

For secondary outcomes, there was evidence of a higher pooled exercise capacity (peak  $\text{VO}_2$ ) at the end of the intervention (mean difference (MD) 0.91 mL/kg/min, 95% CI 0.60 to 1.21; participants = 1485; trials = 7; quality of evidence: very low) favouring exercise-based cardiac rehabilitation, albeit there was evidence of substantial statistical heterogeneity ( $I^2 = 78\%$ ). There was no evidence of a difference in the risk of requiring antitachycardia pacing (RR 1.26, 95% CI 0.84 to 1.90; participants = 356; trials = 2; quality of evidence: moderate), appropriate shock (RR 0.56, 95% CI 0.20 to 1.58; participants = 428; studies = 3; quality of evidence: low) or inappropriate shock (RR 0.60, 95% CI 0.10 to 3.51; participants = 160; studies = 1; quality of evidence: moderate).

## Authors' conclusions

Due to a lack of evidence, we were unable to definitively assess the impact of exercise-based cardiac rehabilitation on all-cause mortality, serious adverse events and health-related quality of life in adults with an ICD. However, our findings do provide very low-quality evidence that patients following exercise-based cardiac rehabilitation experience a higher exercise capacity compared with the no exercise control. Further high-quality randomised trials are needed in order to assess the impact of exercise-based cardiac rehabilitation in this population on all-cause mortality, serious adverse events, health-related quality of life, antitachycardia pacing and shock.

## PLAIN LANGUAGE SUMMARY

### Exercise-based cardiac rehabilitation for adult patients with an implantable cardioverter defibrillator

#### Review question

We reviewed the benefits and harms of exercise-based cardiac rehabilitation programmes in adults who have been treated with an implantable cardioverter defibrillator from any cause.

#### Background

An implantable cardioverter defibrillator is a very effective device that prevents sudden cardiac death. This is done by the use of either antitachycardia pacing, high-voltage shock therapy, or both. In spite of the potential mortality benefits, patients may also experience a negative impact on their health-related quality of life, increased readmission to hospital and healthcare facilities, loss of productivity and employment earnings, and increased morbidity and mortality. Exercise-based cardiac rehabilitation may benefit patients with an implantable cardioverter defibrillator.

#### Study characteristics

We searched for randomised controlled trials (experiments in which participants are randomly allocated to an experimental intervention compared with a control intervention) that investigated exercise-based interventions compared with no exercise intervention control. We found eight trials published from 2004 to 2017 with a total of 1730 participants. Two trials did not report on funding and one trial reported funding from industry. The evidence is current to 30 August 2018.

**Key results**

The review showed no evidence of an impact on the risk of death, harmful side effects or having antitachycardia pacing or shock therapy when comparing the exercise intervention to the control. There was also little or no evidence of a difference on health-related quality of life. However, there was an improvement in exercise capacity in favour of the exercise group.

**Quality of the evidence**

The quality of the evidence ranged from moderate to very low for all outcomes. The number of events was low, it was possible for people in the trials to know to which intervention group they were randomised, the reporting of the results was not complete in some trials, and for some outcomes, the results varied across trials. These considerations limited our confidence in the overall results of the review.

**Conclusion**

Further adequately powered and well-conducted randomised trials are needed to assess the impact of exercise-based cardiac rehabilitation in adults with an implantable cardioverter defibrillator.