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A feasibility study of using a novel lifestyle change programme (Super Rehab) to reverse coronary artery disease

Submission date
17/01/2022

Recruitment status
No longer recruiting

Registration date
26/01/2022

Overall study status
Completed

Last Edited
16/09/2026

Condition category
Circulatory System

[X] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[_] Results
[_] Individual participant data
[X] Record updated in last year

Plain English summary of protocol

Background and study aims
Coronary artery disease (CAD) remains a leading cause of premature death and millions suffer from its symptoms. Many individuals with CAD also have metabolic syndrome (MetS), which increases their risk of poor outcomes (e.g. heart attacks and premature death). MetS is diagnosed with combinations of abdominal obesity, high blood pressure, unhealthy blood sugar or cholesterol levels. Current treatments focus on medications and invasive operations to improve the heart's blood flow, which carry risk and a notable expense for the NHS. Supported lifestyle intervention programmes (focusing on exercise and diet) can improve an individual's cardiovascular health, quality of life, and reduce their number of medications. However, there is a lack of definitive research showing that lifestyle interventions can reverse the "furring-up" in arteries, and this evidence would help make them available in the NHS.

This feasibility study will assess whether it is possible to integrate a novel intensive lifestyle intervention ("Super Rehab") into the care of high-priority patients with CAD and MetS. Super Rehab incorporates evidence-based lifestyle intervention research, targeting additional benefits from high-intensity exercise, modified dietary advice and novel behavioural techniques. It involves initially 10-weeks of 1:1 supervised high-intensity exercise sessions and dietary change via frequent meetings with a nutritional advisor. Supervision then tapers over a 12-month period to help participants maintain lifestyle change.

This study will determine whether participants like and manage the intervention, gauge how well they maintain lifestyle changes as supervision levels reduce, and test the procedures involved in the study to ensure a robust future, larger trial that will test how effective Super Rehab is.

Who can participate?
Patients aged 18 – 75 years with stable coronary artery disease and metabolic syndrome.

What does the study involve?
Participants will be randomised to either Super Rehab or continue usual care only, and asked to

complete questionnaires and have physical and imaging tests on health, fitness and their coronary arteries at the beginning, middle and end of the study. Results will inform a subsequent larger study of this intervention across multiple sites to conclusively measure the impact on CAD, providing the evidence to impact on healthcare practices.

What are the possible benefits and risks of participating?
Participation in the Super Rehab arm of the study may improve the health of participants, as well as providing them with information on whether the Super Rehab lifestyle intervention is more or less beneficial to them compared to standard, passive clinic advice involved in usual care, including its impact on their heart health and fitness. Control arm patients will be provided with the patient booklet and introductory sessions to Super Rehab at the end of the study, which may offer some educational benefits.

The risks involved in participating in this study are considered low. Relevant to participants in the Super Rehab arm, all forms of physical activity increase risk transiently but this is minimised in this study by upfront screening, close supervision, and following well studied exercise protocols for patients with these conditions, whilst longer term risk is reduced by taking part in exercise. Outcome assessment tests are all used routinely in routine care for this population. Additionally, participants may choose to withdraw from the study at any point.

For all potential participants, screening that will be undertaken before involvement in the study will include a Cardiologist assessment of coronary arteries (via CT), the heart's structure and function, and a supervised cardiopulmonary exercise test, which will all ensure that only participants considered safe to partake in high-intensity exercise sessions are recruited to the study.

Where is the study run from?
Royal United Hospitals Bath NHS Foundation Trust (UK)

When is the study starting and how long is it expected to run for?
September 2020 to September 2024

Who is funding the study?
NIHR Research for Patient Benefit programme, with some additional funding for an extra scan being provided by the Forever Friends Appeal (UK)

Who is the main contact?
Dr John Graby, john.graby@nhs.net

Contact information

Type(s)
Principal investigator

Contact name
Dr Jonathan Rodrigues

ORCID ID
https://orcid.org/0000-0003-2744-3509

Contact details

Department of Radiology
Royal United Hospitals Bath NHS Foundation Trust
Combe Park
Bath
United Kingdom
BA1 3NG
+44 1225 821174
j.rodrigues1@nhs.net

Type(s)
Scientific

Contact name
Dr John Graby

ORCID ID
https://orcid.org/0000-0002-8753-1343

Contact details
Department of Radiology
Royal United Hospitals Bath NHS Foundation Trust
Combe Park
Bath
United Kingdom
BA1 3NG
+44 1225 82 1534
john.graby@nhs.net

Type(s)
Scientific

Contact name
Dr Ali Khavandi

ORCID ID
https://orcid.org/0000-0001-6374-3782

Contact details
Department of Radiology
Royal United Hospitals Bath NHS Foundation Trust
Combe Park
Bath
United Kingdom
BA1 3NG
+44 1225 82 1534
ali.khavandi@nhs.net

Type(s)
Scientific

Contact name

Prof Dylan Thompson

ORCID ID
https://orcid.org/0000-0002-6312-1518

Contact details
Department for Health, 1 West
University of Bath
Claverton Down
Bath
United Kingdom
BA2 7AY
+44 1225383177
spsdt@bath.ac.uk

Type(s)
Scientific

Contact name
Prof Fiona Gillison

ORCID ID
https://orcid.org/0000-0002-6461-7638

Contact details
Department for Health, 1 West
University of Bath
Claverton Down
Bath
United Kingdom
BA2 7AY
+44 1225384387
sppfbg@bath.ac.uk

Additional identifiers

ClinicalTrials.gov (NCT)
NCT05563584

Integrated Research Application System (IRAS)
287383

Central Portfolio Management System (CPMS)
51083

National Institute for Health and Care Research (NIHR)
202811

Study information

Scientific Title
“Super Rehab”: Can we achieve coronary artery disease regression? (a feasibility study)

Acronym
Super Rehab

Study objectives
An intensified and personalised healthcare-delivered lifestyle intervention (Super Rehab) will improve symptoms and cause coronary artery disease regression, reducing the risk of myocardial infarction and death. As a first step to a multi-centre randomised controlled trial (RCT) to establish efficacy, this feasibility study will test the components and acceptability of the intervention and trial procedures, alongside preliminary data on change in coronary plaque to guide the powering of the subsequent RCT.

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 14/12/2021, South West - Frenchay Research Ethics Committee (Level 3, Block B, Whitefriars, Lewins Mead, Bristol, BS1 2NT, UK; +44 207 104 8379; frenchay.rec@hra.nhs.uk), ref: 21/SW/0153

Primary study design
Interventional

Study design
Interventional randomized feasibility study

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Coronary artery disease

Interventions
Randomisation:
Participants will be block randomised 1:1 after completion of all baseline assessments by an independent member of the host Research and Development department, who will have no other participation in the study using a web-based platform (Sealed Envelope). Participants will be randomised to either Usual Care (control arm) or Super Rehab with usual care (intervention arm), and stratified for sex. The control arm contributes to a robust assessment of feasibility (e. g. consent and attrition rates) and a comparator for the preliminary data on changes in coronary plaque.

Usual Care (control arm):
At baseline screening all participants will have usual care instituted if not already in place. In line with UK and European guidance, this will consist of aspirin 75 mg once daily and a statin (highest tolerated dose), unless contraindications to either.

Updated 16/09/2026: At baseline screening all participants will have usual care instituted if not already in place. In line with UK and European guidance this will consist of a statin and consideration of aspirin at the treating clinician's discretion, unless contraindications to either.

Contraindications will be recorded if present. Routine lifestyle advice will be provided verbally to all, in line with current standard care. Specifically this will be in line with NICE guidance, recommending regular exercise, encouraging a healthy, balanced diet, weight loss, reducing alcohol consumption and smoking cessation where necessary. General Practitioners will be provided with a study information sheet and advised to continue optimising management for each patient's comorbidities as they normally would (e.g., adjust medications/doses for hypertension or diabetes), in line with national guidance.

Super Rehab (intervention arm):
Super Rehab is an intensified health-care delivered lifestyle intervention incorporating the latest evidence for exercise, nutrition and behavioural change techniques. The programme will be explicitly introduced to each participant by their Cardiologist to ensure that the programme is presented as a meaningful intervention, with the Cardiologist leading a multidisciplinary team including exercise trainers and dieticians, who are collectively working to improve patient's heart disease. The Cardiologist will introduce the concepts involved in the nutritional advice to the participant in the introductory session, provide advice and oversight to both the dietician and exercise trainers throughout, and conduct further patient review at the end of each intervention phase.
Super Rehab has three phases: (1) induction (an intensified 10-week phase), (2) consolidation and (3) maintenance, with the total programme lasting 12 months. Phase 1 represents an intensified high-frequency support section, with phases 2 and 3 representing a gradual tapering of this direct support whilst monitoring and encouraging lifestyle change adherence.

Super Rehab will incorporate two components: (i) Exercise - supervised exercise classes 1:1 with a personal trainer using high-intensity interval training (HIIT) and lower intensity independent exercise, and (ii) Diet - 1:1 sessions with a dietician that will focus on supporting dietary education and change, as well as emphasise advice on smoking cessation and alcohol consumption. Dietary sessions will be supported by participant completed photographic diet diaries, and body metrics (abdominal waist circumference and BMI) will be tracked to enable goal-setting and feedback to encourage adherence. The HIIT sessions will be based on the widely used and validated Norwegian 4x4 model for HIIT, used in both CAD and metabolic syndrome populations. All prescribed home exercise sessions will be no more than patients are advised to do routinely when seen in clinic at baseline, or after they have robustly adapted to higher intensity exercise in the final phase of Super Rehab. Examples of recommended independent exercise sessions include brisk walking, or for higher-intensity hill walking or light jogging. Participants will be provided with a smart-watch and chest strap to track their heart rate, which will support their direct monitoring of exercise intensity and also record their data to help assess adherence to study protocol.

Outcome Assessments:
Participants in both arms of the study will be asked to complete questionnaires, have blood tests, anthpometric measurements, blood pressure and nutritional assessments, imaging tests (CT coronary angiography, echocardiogram, DEXA), and fitness and physical activity tests (cardiopulmonary exercise test, physical activity monitor) at the beginning, middle and end of the study. Participants and practitioners delivering Super Rehab will also be invited to participate in interviews at the end of each Super Rehab phase and at the end of study participation.

Intervention Type
Behavioural

Primary outcome(s)
1. Recruitment rates, measured as the proportion of eligible patients who accept invitation to participate in the study, at baseline
2. Retention rates, measured as the proportion of enrolled individuals who successfully complete the end-point assessments of the study at 15 months
3. Adherence rates, measured as the proportion of offered sessions completed for participants in the intervention group
4. Acceptability of the intervention, study design and outcome measures as well as participants' and clinicians' experiences of Super Rehab and its training resources, measured with interviews at the end of each of the 3 phases of the intervention and study completion

Key secondary outcome(s)
1. To evaluate data collection procedures and outcome measures (clinical, intervention and health economic parameters), measured for each time-point of data collection (baseline, 6 months, 12 months and 15 months from study entry).
2. To pilot the use of routinely available clinical data (body mass index and HbA1c) for identifying patients with metabolic syndrome (as per the international consensus definition), assessed at baseline.
3. To obtain preliminary data for changes in coronary artery disease (measured by the peri-coronary fat attenuation index on CT coronary angiography) to inform power calculations for a subsequent randomised controlled trial, measured at 6 and 12 month time-points.
4. To work with the Patient Advisory Group to establish the key characteristics required in intervention delivery, including sites, continuously through the study.

Completion date
30/09/2024

Eligibility

Key inclusion criteria
Current inclusion criteria as of 13/10/2022:

1. 18 - 75 years of age
2. Confirmed coronary artery disease on CT coronary angiography, with at least one coronary artery with plaque affecting ≥25% of the lumen, and evidence of coronary inflammation (defined by an abnormal fat attenuation index (FAI) of > -70.1HU or with FAI score [relative to age and sex matched patients] ≥ 75th percentile in the left anterior coronary or right coronary artery or with FAI score ≥ 90th percentile in the circumflex artery)
3. Have Metabolic Syndrome, defined as meeting any 3 of the following within 6 months of their cardiac CT: high abdominal waist circumference (≥94cm males, ≥80cm females), hypertension (≥130/85mmHg or on treatment), raised fasting glucose or HbA1c (glucose ≥5.6mmol/L, HbA1c ≥42mmol/L or on diabetic treatment), low HDL (≤1mmol/L males, <1.3mmol/L females), and high triglycerides (>1.7mmol/L)
4. Able and willing to safely comply with all study procedures
5. Able to provide written informed consent for participation whilst acknowledging their freedom to withdraw at any point during the study

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Previous inclusion criteria:

1. 18 - 75 years of age
2. Confirmed coronary artery disease on CT coronary angiography, with at least one coronary artery with plaque affecting ≥25% of the lumen, and evidence of coronary inflammation, as defined by an abnormal fat attenuation index of >-70.1HU
3. Meet streamlined criteria for identification of metabolic syndrome, including a high body mass index of >28 kg/m2, and abnormal blood glucose control (defined as HbA1c >42 mmol/mol / >6%)
4. Able and willing to safely comply with all study procedures
5. Able to provide written informed consent for participation whilst acknowledging their freedom to withdraw at any point during the study

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Mixed

Lower age limit
18 Years

Upper age limit
75 Years

Sex
All

Total final enrolment
43

Key exclusion criteria
1. Prognostic coronary artery disease, defined as left main stem >50% stenosis, flow-limiting disease in the proximal left anterior descending artery, or at least moderate disease in ≥3 major epicardial vessels
2. Unstable angina
3. New York Heart Association class III/IV heart failure or severe left ventricular impairment
4. Significant cardiomyopathy (as assessed by a cardiologist, e.g. hypertrophic cardiomyopathy or arrhythmogenic right ventricular cardiomyopathy)
5. Severe heart valve disease
6. Severe hypertension (BP >180/120 mmHg) despite optimising anti-hypertensive therapy
7. Uncontrolled cardiac arrhythmia or higher degree heart block
8. History of aortic dissection
9. Recent acute pulmonary embolus, deep vein thrombosis, stroke or transient ischaemic attack
10. Severe autonomic or peripheral neuropathy
11. Acute systemic illness of fever
12. Significant acute or chronic renal failure

13. Pulmonary fibrosis or interstitial lung disease
14. Physically unable to participate in high-intensity exercise
15. A history of prior heart attack or coronary re-vascularisation (entitled to existing cardiac rehabilitation)
16. Severe coronary calcification precluding assessment of the coronary lumen on CT coronary angiography
17. A clinically significant ECG abnormality at the screening visit, which in the opinion of the investigators exposes the subject to risk by enrolling in the trial
18. Pregnant or breastfeeding
19. Participation in another intervention-based research study
20. Inability to fully understand the instructions provided during the study

Date of first enrolment
01/02/2022

Date of final enrolment
31/07/2023

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Royal United Hospital
Combe Park
Bath
England
BA1 3NG

Study participating centre
North Bristol NHS Trust
Southmead Hospital
Southmead Road
Westbury-on-trym
Bristol
England
BS10 5NB

Sponsor information

Organisation

Royal United Hospital Bath NHS Trust

ROR
https://ror.org/058x7dy48

Funder(s)

Funder type
Government

Funder Name
NIHR Central Commissioning Facility (CCF)

Funder Name
National Institute for Health Research

Alternative Name(s)
National Institute for Health Research, NIHR Research, NIHRresearch, NIHR - National Institute for Health Research, NIHR (The National Institute for Health and Care Research), NIHR

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Funder Name
Research for Patient Benefit Programme

Alternative Name(s)
NIHR Research for Patient Benefit Programme, Research for Patient Benefit (RfPB), The NIHR Research for Patient Benefit (RfPB), RfPB

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location

United Kingdom

Results and Publications

Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study will be available upon request from Dr Jonathan CL Rodrigues (j.rodrigues1@nhs.net).
The type of data that will be shared: Quantitative
Dates of availability: Undefined
Whether consent from participants was required and obtained: Consent has been given for "information obtained from this study to be used in future studies if important research questions can be answered using this data. I understand that it might not be possible to share details on the nature or findings of any future research with me directly."
Comments on data anonymization: All data is pseudo-anonymised.
Any ethical or legal restrictions: Requests for data on coronary flow and inflammation may require additional approval from study collaborators.

IPD sharing plan summary

Available on request

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Protocol article		12/12/2023	13/12/2023	Yes	No
HRA research summary			28/06/2023	No	No