ISRCTN53557203 https://doi.org/10.1186/ISRCTN53557203

Home-based resistance exercise training in chronic kidney disease

Submission date
02/03/2020

Recruitment status
Stopped

Registration date
05/03/2020

Overall study status
Stopped

Last Edited
15/12/2022

Condition category
Urological and Genital Diseases

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

Plain English summary of protocol

Background and study aims
Chronic kidney disease (CKD) is defined as loss of kidney function for longer than 3 months. CKD has multiple health implications including low levels of physical activity, poor physical functioning and accelerated rate of muscle loss. Patients with CKD may experience tiredness, muscle pain or cramps among other symptoms. The ability to perform activities of daily living (ADLs) is therefore reduced and patients with CKD experience decreased quality of life.
Resistance exercise training improves muscular strength and endurance. This type of exercise can improve muscle quality and power. Having better quality muscle also contributes to better blood sugar regulation, improved immune function and decreased blood pressure. These are important health benefits for CKD patients. More importantly, these are modifiable risk factors, which can be targeted by research interventions.
Supervised exercise training interventions are effective in this population. However, these interventions require trained professionals, equipment and facilities alongside other enabling factors. Furthermore, time and travel arrangements have been shown to stop patients from attending supervised exercise programmes. Home-based exercises are cost-effective and do not face these barriers. However, the research around home-based resistance training is not well defined. There is a need for a well-developed home-based resistance training intervention in patients with CKD.
This study aims to develop an effective progressive home-based resistance exercise training in patients with CKD. The study will investigate the feasibility of a home-based resistance exercise training among CKD patients. It will also explore the possible benefits of this type of exercise on physical function, strength and quality of life.

Who can participate?
Adults aged 18 or over with non-dialysis chronic kidney disease

What does the study involve?
The study is divided into four parts (Part A, B, C and D). Patients can choose which parts they participate in. In part A, 200 patients will be recruited to fill in questionnaires designed to measure physical function, muscle loss, and other lifestyle determinants associated with CKD. Part B will involve an interview where a trained researcher will ask questions about the patients' perceptions of their own strength, and their understanding of exercise and strength. Part C

comprises the development of the intervention. This part will include 7-9 patients undergoing a 2-week home-based resistance training programme. These patients will be asked to provide detailed feedback (via interviews) on their experience about the short intervention. Part D will include the final phase with 40 patients undergoing at least an 8-week home-based resistance exercise training programme.

What are the possible benefits and risks of participating?
There are no direct benefits expected for taking part in this study. However, participants may benefit from an improvement in their strength and physical function. There is a minimal risk of injury during study visits. The main disadvantage of taking part in this study is the time commitments involved in filling in the questionnaires found in part A as well as other study visits to the hospital (Part B, C, and D).

Where is the study run from?
Leicester General Hospital (UK)

When is the study starting and how long is it expected to run for?
February 2017 to June 2023

Who is funding the study?
Leicester Biomedical Research Centre (UK)

Who is the main contact?
1. Dr Tom Wilkinson
tjw26@le.ac.uk
2. Prof Alice Smith
alice.smith@leicester.ac.uk

Contact information

Type(s)
Scientific

Contact name
Dr Alice Smith

ORCID ID
https://orcid.org/0000-0002-9234-9060

Contact details
Department of Health Sciences
University of Leicester
Leicester
United Kingdom
LE1 7RH
+44 (0)1162584346
aa50@le.ac.uk

Type(s)
Scientific

Contact name
Dr Thomas J Wilkinson

ORCID ID
https://orcid.org/0000-0002-7855-7752

Contact details
Department of Health Sciences
University of Leicester
Leicester
United Kingdom
LE1 7RH
+44 (0)116 258 4346
tjw26@le.ac.uk

Additional identifiers

Integrated Research Application System (IRAS)
273437

Central Portfolio Management System (CPMS)
44662

Study information

Scientific Title
Home-based progressive resistance exercise training in patients with non-dialysis chronic kidney disease: a randomised delayed-start trial (REPS-KD)

Acronym
REPS-KD

Study objectives
The study concerns the development and feasibility testing of a home-based resistance exercise intervention for people with kidney disease and there are four separate parts to the study:
A: a cross-sectional observational survey of sarcopenia in kidney patients
B: a qualitative exploration of kidney patient sarcopenia experiences and perspectives of resistance training
C: iterative intervention development phase
D: randomised delayed-start feasibility trial

It is hypothesised that the Part D study design is feasible for efficacy testing of the novel home-based resistance exercise intervention for kidney patients developed in Parts A-C

Ethics approval required
Old ethics approval format

Ethics approval(s)

Approved 14/04/2020, NRES Committee East Midlands Nottingham 1 (The Old Chapel, Royal Standard Place, Nottingham, NG1 6FS, UK; +44 (0)2071048036; NRESCommittee.EastMidlands-Nottingham1@nhs.net), ref: 20/EM/0029

Primary study design
Interventional

Study design
Randomised; Both; Design type: Treatment, Prevention, Education or Self-Management, Psychological & Behavioural, Complex Intervention, Physical, Rehabilitation, Qualitative

Study type(s)
Treatment

Health condition(s) or problem(s) studied
Chronic kidney disease

Interventions
Study design overview
This study is divided into four parts (A, B, C, and D). The researchers aim to recruit a large number of people with kidney disease into Part A (survey) to provide a diverse cross-sectional sample of kidney disease patients and the prevalence and impact of sarcopenia using self-reported measures. Using informal semi-structured interviews, Part B will involve a greater in-depth exploration of the experiences towards sarcopenia and the potential role of home-based resistance training in patients with kidney disease. In Part C (intervention development), the researchers will recruit a small number of individuals with kidney disease to undergo some iterative testing of a home-based resistance exercise intervention. This will primarily test and optimise the 'exercise prescription' session that will take place before the intervention itself. This will include testing of some potential exercises and how patients are able to complete them. This developmental aspect will continue until the intervention is ready for testing and will ensure the final intervention has the greatest chance of succeeding. In Part D (exercise intervention), we will test the feasibility of a home-based progressive resistance exercise training in patients with kidney disease. Participants can complete any of the four parts of the study, or end their involvement after taking part in just one.

Part A
Part A will involve a cross-sectional observational design. Participants will be asked to complete a brief survey that will assess self-reported sarcopenia status in CKD. The researchers aim to recruit at least n=200 participants into Part A. This may be extended at a later stage if required. Patients will be recruited from several sites across England.

The survey will be comprised of the following:
- Self-reported demographics – to assess basic information such as age, sex, ethnicity
- 12-Item Short Form Health Survey (SF-12) – to measure physical function
- Patient Activation Measure (PAM) – to measure a patient's ability and confidence to self-manage their condition
- Kidney Symptom Questionnaire (KSQ) – to measure symptoms
- SARC-F questionnaire – to assess sarcopenia

- Sarcopenia and Quality Of Life (SarQoL) questionnaire – to assess how sarcopenia affects quality of life
- General Practice Physical Activity Questionnaire (GPPAQ) – to assess physical activity levels

When the participant consents to take part in Part A, the researcher will access their medical records and extract information to allow for associations to be made with outcome measures and to account for confounding variables.

Part B
The aim of Part B is to explore attitudes towards sarcopenia and the role of home-based resistance exercise training in CKD. The researchers aim to recruit at least 15 patients into this part of the trial. Informal semi-structured interviews will be held with a researcher trained in qualitative methodology. Individual interviews will last between ~30 to 60 minutes. Interviews will take place in a private area where other interviews are regularly conducted by our group. For those unable to attend a face-to-face interview, interviews may also be performed via telephone using a secure recording device as used currently in other studies by our group. Interviews may be conducted in a patient's own home if appropriate. All interviews will be digitally recorded, professionally transcribed verbatim, and anonymised. All travel and parking expenses will be reimbursed for any study visits.

Patients recruited into the interventional components of this study (Part C and D) may be interviewed on at least two occasions – before and after the intervention (or after any iterative cycle they experience). In these patients, alongside exploration of their attitudes towards sarcopenia and the impact these have on their lives, the topic of the interview will include their expectations on the home-based resistance exercise training intervention.

Part C
The aim of Part C is to develop the home-based progressive resistance training intervention that will ultimately be tested in Part D. An initial draft of the intervention will be based on evidence gathered from existing literature and experience, an ongoing scoping review being conducted by the study team, findings from Part A and B of the study, feedback from the study PPI group. After the researchers have this initial draft intervention, they will ask 5-6 patients to undergo 'mock' components of the intervention before giving feedback. Using this feedback, they will refine the intervention again before it goes another 'round' of testing. They expect that after 2-4 iterative rounds that the intervention will be ready for testing. As such, they anticipate that patients may need to attend the research team on several occasions during this phase, however, feedback can also be provided by telephone or email if necessary. The researchers have previously used this form of iterative development in a previous home-based exercise trial.

The main components to be tested in Part C will be:
Exercise prescription session - In the main intervention trial (Part D), this will occur after consent and baseline outcome measures in Visit 1. The aim of this session is to discuss with the patient the aims of the exercise intervention, prescribe appropriate exercises based on their goals, health status, and limitations, set them an appropriate exercise intensity to start with and to show them the correct form for the exercises chosen. The aim of this session is to individualise the exercise intervention as much as possible.

Exercise intervention - Whilst the exact exercise intervention that patients will perform during the main trial (Part D) will be largely determined by the results of this iterative development stage and the individual's goals, health status, and limitations, the intervention will have some

core components to ensure its fidelity. However, during this development phase (Part C), exercise types, intensities, volumes, and frequency may also be refined following the finding of new or existing literature in this area.

Exercise handbook and diary - Along with refining the intervention itself, Part C will aim to produce supporting resources that will be provided to patients in Part D. These will include a patient exercise handbook and an exercise diary. However, the exact resources developed may depend on patient feedback and involvement.

NOTE: The researchers have not included detailed information on these components in the current application as they are unknown at time and subject to change during Part B and C. Following the development of the intervention protocol (e.g., type of exercises, frequency, volume), the creation of the supporting resources (exercise handbook and diary) that will be provided to patients in Part D, and any other changes to the protocol as a result of this Part C development phase, a substantial amendment will be submitted before commencement of Part D.

Part D
With the ultimate goal of conducting a future large multi-centre randomised control trial (RCT), a study will be conducted to test the study design and whether performing home-based progressive resistance exercise training feasible in patients with CKD.

Using a delayed-start design, participants will be randomised to receive either the home-based exercise intervention (HOME-EX group) for the both of 8-week phases (Phase I and Phase II), or to receive the exercise intervention in Phase II, weeks 8–16, only (DELAY-EX group). Given the well-established benefits of exercise in this population (albeit the effects of home-based resistance training in this group are unknown) it would be unethical to completely deny patients an exercise-based intervention as part of a traditional RCT (i.e. standard control group). This proposed study design addresses these ethical concerns as all participants will eventually receive the potentially beneficial exercise intervention, while a control group is maintained in the initial phase (Phase I). The two phases are also designed to capture any benefit of the exercise intervention at the end of the first phase, and also any sustained benefit by the end of the study. This study design has been successfully utilised in investigating the effects of exercise patients with Parkinson's disease.

As a feasibility study, a formal sample size calculation is not required. However, n=20 patients will be recruited into each arm (n=40 in total).

Outcome assessment measures will take place at baseline (Visit 2), after Phase I (Visit 3), and after Phase II (Visit 4).

Visit 1 – Patients will attend the hospital for informed consent and familiarisation of outcome measures (described below)
Visit 2 – Assessment of baseline outcome measures and randomisation into an intervention group (HOME-EX or DELAY-EX). Those in the HOME-EX will receive the exercise prescription session where they will be given the programme resources (developed in Part C).
Phase I - 8-week home exercise period (for those in HOME-EX) or control (no change to lifestyle) period (DELAY-EX)
Visit 3 – End of Phase 1 outcome measures. The DELAY-EX group will receive the exercise prescription session where they will be given the programme resources (developed in Part C).
Phase II - 8-week home exercise period for both groups
Visit 4 – End of Phase II outcome measures.

END OF PATIENT INVOLVEMENT
A summary of the outcome measures that will be assessed can be found below:

Feasibility outcomes
- Recruitment rate – time to recruit patients
- Acceptability of randomisation and assessment procedure – how patients feel about the different groups and assessments (assessed in post-trial interviews)
- Adherence to exercise intervention – this includes exercise sessions completed
- Attrition rate – dropouts in the study
- Number of missing data
- Safety – do patients report any injuries as a result of the exercise?
- Patient experience - assessed in post-trial interviews

Secondary outcomes
Familiarisation of objective physical performance measures will be performed to reduce learning effects and improve the accuracy of the assessments. Familiarisations involve an explanation of the test by the researcher, followed by the patient practising the tests described below. To minimise burden, all outcome assessments at each time point will be attempted to be completed during one visit; however, outcomes may be performed across several visits (within a reasonable timeframe) owing to the participant's needs and availability. We anticipate that each outcome measure assessment visit will take ~60-90 minutes. Travel and parking expenses will be reimbursed for all study visits.

Anthropometry - Height, weight, BMI, and waist and hip circumference will be measured in a private research area.

Clinical parameters/blood sample - 30 ml (~2 tablespoons) of venous blood will be collected by a trained researcher. A further 10 ml sample will be taken to be analysed by University Hospitals of Leicester (UHL) pathology lab for markers of renal disease and co-morbidities (full blood count including renal profile, blood lipids, iron status, plus metabolic, oxidative stress, pro/anti-inflammatory status markers). These will provide routine markers as well as additional requested markers of iron status and lipid profile. As these are not part of routine care, results will be checked by the patient consultant for any clinically significant abnormalities. Resting heart rate and blood pressure will be assessed using a standard sphygmomanometer device.

Muscle measures - Muscle and fat mass will be measured using a free-standing bioelectrical impedance analysis (BIA) monitor or the portable Fresenius Body Composition Monitor (BCM). For the BIA, patients will stand on the monitor platform in bare feet and grip the handles firmly while the monitor takes the measurement. For the BCM, the patient will lie comfortably on a couch and small sticky electrodes will be attached to a hand and a foot. We will use ultrasound to assess muscle size and quality of the leg. For this scan, the patient is asked to lie or sit on a hospital bed. A small amount of gel is applied to the ultrasound probe and several 'photographs' (or images) of the muscles and tendons are taken. A myotonometery device will be used to assess internal muscle properties such as tone and stiffness. This will be performed at the same time as the ultrasound whilst the patient is lying down. The device is applied to the skin in the same place as the ultrasound scan. It has a small non-sharp point at the end that 'taps' the skin several times very quickly in less than half a second. The device records the feedback of these 'taps' from the muscle.

Physical and muscle function – The researchers will assess physical and muscle function using several different tests. The time taken for the patient to walk 4m will be recorded as a measure

of gait speed. Handgrip strength will be assessed by asking patients to squeeze as hard as they can on a handheld device. Lower limb strength will be assessed using a Biodex dynamometer. For this test, patients will be seated, wearing a harness, in a chair. The ankle will be strapped to the arm of the machine and the knee will be bent at 90 degrees. Strength will be assessed isometrically (static) and isokinetically (when the leg can move). Balance will be assessed by asking patients to stand on a force plate and remain standing for 30 seconds. Functional ability will also be tested by asking patients to rise and sit back down as many times as possible from a chair in 60 seconds whilst keeping their hands across their chest. The patient's ability to get up from a chair, walk 3m around a cone, and return to seated position will also be assessed.

Physical activity – to assess physical activity, patients will wear a wrist-worn special watch that measures how much they move around in the day and night; a bit like a 'Fitbit' or similar device. Patients will be asked to wear the watch on their wrist for 7 days. It will be given to them when they come in for assessment visits and they can either post it back (via pre-paid envelope provided) or bring it back at the next visit. The watch is waterproof so patients can shower and bathe in it.

Diet questionnaire - Patient's will fill in the UK Diabetes and Diet Questionnaire to assess diet status.

Intervention Type
Other

Primary outcome(s)
PART A
Measured at baseline, mid-intervention (8 weeks), and post-intervention (16 weeks):
1. Perceptions of health measured using the 12-item Short Form Health Survey (SF-12)
2. Knowledge, skills and confidence in one's ability to manage own health measured using the Patient Activation Measure (PAM)
3. Perceived kidney symptoms measured using the Kidney Symptom Questionnaire (KSQ)
4. Perceived strength and mobility measured using the SARC-F questionnaire
5. Muscle problems and its effect on everyday life measured by Sarcopenia and Quality of Life (SarQoL)
6. Subjective physical activity levels measured by the GP Physical Activity Questionnaire (GPPAQ)

PART B
Experience, understanding and attitudes towards strength and home-based exercise training and perceptions of the participant's own health and strength, assessed using semi-structured interviews at a single timepoint

PART C
Participant feedback on the intervention collected via interviews after the end of the 2-week trial home-based exercise intervention

PART D
Primary feasibility outcome measures:
1. Recruitment rate and time taken to recruit, measured monthly. The number of eligible patients and the number of patients consented are recorded
2. Acceptability of randomisation and assessment procedure determined by comparison of final group characteristics. In addition, loss to follow up is measured and patients' views from interviews are analysed
3. Adherence assessed by counting the number of exercise sessions completed per week.

determined through completed exercise diaries
4. The number of participant dropouts (attrition rate) is recorded
5. Quantity of missing data (e.g., questionnaire return rate, outcome measures not completed) monitored via the clinical research file
6. Safety monitored by self-reported injuries and adverse events throughout the trial
7. Patient experience explored through qualitative interviews at variable timepoints before, during and after the intervention

Key secondary outcome(s)
Measured at baseline, mid-intervention (8 weeks), and post-intervention (16 weeks):
1. Anthropometry measured using standard measurement of height, weight and hip and waist circumferences at baseline, mid intervention and post-intervention
2. Body composition measured using bioelectrical impedance analysis at baseline, mid-intervention, immediately post-intervention
3. Clinical parameters (co-morbidities, medication, blood test results) taken from medical notes at baseline, mid-intervention, immediately post-intervention
4. Blood samples for markers of immune function and inflammation and cardiometabolic risk factors taken via venepuncture at baseline, mid-intervention, immediately post-intervention
5. Muscle thickness and cross-sectional area measured via ultrasound imaging at baseline, mid-intervention, and immediately post-intervention
6. Muscle elasticity measured via myotonometery at baseline, mid intervention and immediately post-intervention
7. Physical function measured by the gait speed test, the sit-to-stand test, and timed up and go test at baseline, mid-intervention and immediately post-intervention
8. Isometric and isokinetic quadriceps strength measured using a fixed dynamometer at baseline, mid-intervention and immediately post-intervention
9. Handgrip strength measured using a handheld dynamometer at baseline, mid intervention and immediately post-intervention
10. Postural stability measured over a 30-second period on a force plate at baseline, mid-intervention, and post-intervention
11. Habitual physical activity measured using an accelerometer for 7 days prior to the intervention
12. Dietary behaviours measured by the UK Diabetes and Diet Questionnaire at baseline, mid-intervention and post-intervention

Completion date
30/06/2023

Reason abandoned (if study stopped)
Lack of staff/facilities/resources

Eligibility

Key inclusion criteria
Part A:
1. Patients with established kidney disease according to the National l Institute for Health and Care Excellence (NICE) guidelines (NICE, NICE CKD Guidelines) or identified using the IMPAKT tool [http://www.impakt.org.uk/HOME-459.html]
2. Aged > = 18 years

Part B:
1. Patients with established kidney disease according to the National l Institute for Health and Care Excellence (NICE) guidelines (NICE, NICE CKD Guidelines) or identified using the IMPAKT tool [http://www.impakt.org.uk/HOME-459.html]
2. Aged > = 18 years

Part C and D:
1. Patients with established kidney disease according to the National l Institute for Health and Care Excellence (NICE) guidelines (NICE, NICE CKD Guidelines) or identified using the IMPAKT tool [http://www.impakt.org.uk/HOME-459.html]
2. Aged > = 18 years

Participant type(s)
Patient

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Sex
All

Key exclusion criteria
Part A:
1. On a current modality of dialysis
2. Insufficient command of English or any other precluding factors that prevent ability to give informed consent or comply with protocol

Part B:
1. On a current modality of dialysis
2. Insufficient command of English or any other precluding factors that prevent ability to give informed consent or comply with protocol

Part C and D:
1. On a current modality of dialysis
2. Insufficient command of English or any other precluding factors that prevent ability to give informed consent or comply with protocol
3. Pregnancy
4. Any element of protocol considered by own clinician or General Practitioner (GP) to be contradicted or/and patients unfit to exercise due to any physical impairment, significant co-morbidity or any other reasons

Date of first enrolment
01/06/2020

Date of final enrolment

30/12/2022

Locations

Countries of recruitment
United Kingdom

England

Study participating centre
Leicester General Hospital
Gwendolen Road
Leicester
United Kingdom
LE5 4PW

Sponsor information

Organisation
University of Leicester

ROR
https://ror.org/04h699437

Funder(s)

Funder type
Government

Funder Name
NIHR Leicester Biomedical Research Centre

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated and/or analysed during the current study will be included in the subsequent results publication

IPD sharing plan summary
Other

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
HRA research summary			28/06/2023	No	No
Study website	Study website	11/11/2025	11/11/2025	No	Yes