STUDY PROTOCOL

REVISED ReStOre@Home: Feasibility study of a virtually delivered 12-week multidisciplinary rehabilitation programme for survivors of upper gastrointestinal (UGI) cancer - study protocol [version 2; peer review: 2 approved]

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Abstract

Background: Exercise rehabilitation programmes, traditionally involving supervised exercise sessions, have had to rapidly adapt to virtual delivery in response to the coronavirus disease 2019 (COVID-19) pandemic to minimise patient contacts. In the absence of an effective vaccine, the pandemic is likely to persist in the medium term and during this time it is important that the feasibility and effectiveness of remote solutions is considered. We have previously established the feasibility of the Rehabilitation Strategies following Oesophago-gastric Cancer (ReStOre) intervention - a face to face multidisciplinary rehabilitation programme for upper gastrointestinal (UGI) cancer survivors. This study will examine the feasibility of a virtually delivered 12-week multi-component ReStOre@Home programme.

Methods: This single arm feasibility study will recruit 12 patients who have completed curative treatment for oesophago-gastric cancer. Participants will complete the 12-week ReStOre@Home programme consisting of exercise (aerobic and resistance training), 1:1 dietary

Open Peer Review

Reviewer Status ✓ ✓

	Invited Reviewers	
	1	**2**
version 2 (revision) 04 May 2021	✓ report	✓ report
version 1 25 Nov 2020	? report	? report

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counselling and group education sessions through virtual delivery. Underpinned by the Medical Research Council (MRC) Framework, feasibility will be determined by recruitment rates, adherence, retention, incidents, and acceptability. Acceptability will be assessed qualitatively through post-intervention interview and the Telehealth Usability Questionnaire. Secondary outcomes will be assessed pre and post-intervention and will include measures of physical performance (cardiopulmonary exercise test, short physical performance battery, hand grip strength, Godin Leisure Time Questionnaire, and body composition), health related quality of life (European Organisation for Research and Treatment of Cancer Core Quality of Life Questionnaire (EORTC-QLQ-C30) and oesophago-gastric cancer specific subscale (EORTC-QLQ-OG25), fatigue (Multidimensional Fatigue Inventory (MFI-20), and venous blood samples will be collected for the UGI Cancer Survivorship Biobank.
Discussion: The ReStOre@Home feasibility study will provide important data regarding the amenability of a multidisciplinary programme designed for UGI cancer survivors to virtual delivery.
Trial registration: ClinicalTrials.gov NCT04603339 (26/10/2020)

Keywords
Virtual delivery, multidisciplinary rehabilitation, upper gastrointestinal cancer, exercise, diet, education

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Any reports and responses or comments on the article can be found at the end of the article.

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Author roles: O'Neill L: Conceptualization, Methodology, Project Administration, Writing – Original Draft Preparation; **Guinan E**: Conceptualization, Funding Acquisition, Methodology, Writing – Review & Editing; **Brennan L**: Investigation, Methodology, Project Administration, Writing – Review & Editing; **Doyle SL**: Funding Acquisition, Methodology, Writing – Review & Editing; **O'Connor L**: Methodology, Project Administration, Writing – Review & Editing; **Sheill G**: Conceptualization, Methodology, Project Administration, Writing – Review & Editing; **Smyth E**: Investigation, Project Administration, Writing – Review & Editing; **Fairman CM**: Methodology, Writing – Review & Editing; **Segurado R**: Funding Acquisition, Methodology, Resources, Writing – Review & Editing; **Connolly D**: Conceptualization, Funding Acquisition, Methodology, Writing – Review & Editing; **O'Sullivan J**: Conceptualization, Funding Acquisition, Methodology, Writing – Review & Editing; **Reynolds JV**: Conceptualization, Funding Acquisition, Methodology, Supervision, Writing – Review & Editing; **Hussey J**: Conceptualization, Funding Acquisition, Methodology, Supervision, Visualization, Writing – Review & Editing

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REVISED **Amendments from Version 1**

In response to peer report 1 the following changes have been made to the manuscript:

1. The statement on page 9 regarding sample size has been removed.

2. In the outcomes section, a statement has been made emphasising that secondary outcomes are just exploratory in nature. Details of cut-points in determining feasibility are also included.

3. The interview guide has been updated to include questions on self-efficacy and how the pandemic has impacted on participants physical and mental well-being.

4. In the recruitment section the following statement has been added 'Recruitment for ReStOre@Home will not occur at the same time as recruitment for the main ReStOre RCT."

5. The following statements have been added to the participant section;

"'If there are any findings at assessment which indicate that a person is unsafe to exercise, they will not proceed with the intervention phase of the study."

"To ensure the schedule is acceptable to each participant, group sessions will be planned for the same time each week and 1:1 sessions will be scheduled at times chosen by participants."

"In advance of the assessment as much information as possible will be collected via telephone interview e.g. background medical history, dietary interview and questionnaires will be provided in advance to minimise face to face contact."

Specifically, in response to peer report 2, the following changes have been made to the manuscript:

1. The following statement has been added to the intervention section of the manuscript. ""Group education sessions will last a maximum of one hour; check-in meetings and group resistance training will last approximately 30 minutes'

2. As per peer report 1 a statement was made highlighting secondary outcomes are exploratory in nature only.

An updated version of the interview guide is included in the extended data.

Any further responses from the reviewers can be found at the end of the article

Introduction

We have previously established the safety, feasibility and initial efficacy of multidisciplinary rehabilitation in oesophagogastric cancer survivorship, an understudied cohort of cancer survivors with significant nutritional, functional, and quality of life needs[1–3]. The ReStOre (Rehabilitation Strategies following Oesophago-gastric Cancer) feasibility study[4,5] and pilot randomised controlled trial (RCT)[6,7] demonstrated that a 12-week programme of supervised and homebased exercise, 1:1 dietary counselling, and health education could result in clinically significant improvements in cardiorespiratory fitness and physical and mental well-being without compromise to body composition in this nutritionally vulnerable cohort. Thus the ReStOre RCT is the first evidence-based model of rehabilitation in UGI cancer survivorship. The ReStOre II (Rehabilitation Strategies following Oesophagogastric and Hepatopancreaticobiliary Cancer) RCT now plans to further examine the effectiveness of the ReStOre programme by RCT in a larger cohort of upper-gastrointestinal (UGI) cancer survivors[8]. However, due to the coronavirus disease 2019 (COVID-19) pandemic plans to commence recruitment to the ReStOre II RCT have been delayed until public health advice facilitates implementation of such activities.

The COVID-19 pandemic has changed all our lives and how we go about our activities of daily living, including how we exercise. Rehabilitation including exercise therapy is an important part of recovery from cancer[9], and efforts to continue these interventions are a priority despite COVID-19[10]. However, delivery of rehabilitative programmes has been greatly inhibited due to the pandemic. Current barriers to the implementation of cancer rehabilitation in Ireland and internationally include the need for vulnerable cohorts to cocoon, a reluctance amongst high risk cohorts to attend appointments in healthcare environments due to infection control fears, the need for physical distancing, public health recommendations to minimise use of public transport, and rolling restrictions[11]. As a means of overcoming these barriers, remote delivery is an attractive alternative mode of providing much needed rehabilitative services to cancer survivors within the safety of their own homes[12]. In recent years, the feasibility and efficacy of delivering rehabilitation virtually to patients living with and beyond cancer has been increasingly explored in exercise oncology research. Whilst initial results of trials are largely supportive of virtual delivery[13,14], little is known regarding the feasibility of delivering multidisciplinary rehabilitation virtually to survivors of UGI cancers. Whilst video-conferencing provides an ideal vehicle for delivery of established rehabilitation programmes at this time, successful transition to a virtual model needs to be multidimensional, delivering all the essential components of the planned rehabilitative intervention including group exercise sessions, 1:1 dietary consultations, group education sessions and opportunity for group discussion. These contrasting modes of participant engagement and interaction requires rigorous evaluation to establish effectiveness and comparability to face-to-face models of care. Moreover, face to face programmes in cancer survivorship are advocated for their innate social value, whereby participants benefit hugely from the peer support gained from meeting and engaging with other cancer survivors, validating their role as experts in their condition[7]. However, it is unknown if such social benefits may translate to a virtually delivered programme.

To this end, the COVID-19 pandemic presents an excellent opportunity to discover more about the potential of the virtual delivery of multidisciplinary rehabilitation to UGI cancer survivors. Although complex to implement given the multicomponent nature of the programme, consultation with public and patient involvement (PPI) representatives indicates investigation of delivery of this programme virtually would be thoroughly welcomed by this patient cohort as the pandemic persists. Accordingly, we will explore this issue through the implementation of a sub-study to the planned ReStOre II RCT entitled 'ReStOre@Home' which will be underpinned by the Medical Research Council (MRC) Framework for evaluating complex interventions[15].

Study aims

The overall aim of this work is to examine the feasibility of implementing a 12-week multidisciplinary rehabilitation programme consisting of aerobic and resistance exercise, dietary counselling, and education sessions delivered virtually via video-conferencing for survivors of UGI cancer.

Feasibility will be determined by the following outcomes;

i) Recruitment rate

ii) Adherence rate

iii) Acceptability of the programme

iv) Retention

v) Incidents

Secondary aims are:

- To examine the effect of the ReStOre@Home programme on physical functioning.
- To explore the effect of the ReStOre@Home programme on dietary quality and nutritional status.
- To examine the effects of the ReStOre@Home programme on patient reported outcomes including HRQOL, and fatigue.

Methods

Study design

ReStOre@Home will be implemented as a single arm, feasibility study. This feasibility work will be part of a series of work to complete a process evaluation of ReStOre@Home underpinned by the MRC framework for evaluating complex interventions[16]. Table 1 describes the feasibility/piloting phase of the MRC Framework alongside the activities involved in this process evaluation[15]. Ethical approval has been granted from the Tallaght University Hospital (TUH)/ St James's Hospital (SJH) Ethics Committee. Any amendment to the protocol which may impact on the conduct of the study will be submitted as an amendment for approval to the ethics committees. The study will be performed according to the Declaration of Helsinki. The flow of participants through the study is depicted in Figure 1.

Study participants

ReStOre@Home will recruit 12 patients with a histological confirmed diagnosis of cancer of the oesophagus or stomach who have undergone surgery with curative intent. Participants must meet the following eligibility criteria:

- be ≥ three months post oesophagectomy, total gastrectomy
- with or without neo-adjuvant/adjuvant chemo/chemoradiotherapy with curative intent
- adjuvant therapy must be completed
- access to home broadband
- medical clearance to participate

Exclusion criteria are; ongoing serious post-operative morbidity, and evidence of active or recurrent disease. In addition those with any serious co-morbidity that would impact on exercise participation will be excluded including those with; uncontrolled hypertension (resting systolic blood pressure >180mmHg and/or diastolic >100mmHg), recent serious cardiovascular events (within 12 months) including, but not limited to cerebrovascular accident, and myocardial infarction, unstable cardiac, renal, lung, liver or other severe chronic disease, uncontrolled atrial fibrillation, and left ventricular function <50%.

Table 1. Mapping activities to Medical Research Council (MRC) Framework.

2 Assessing feasibility and piloting methods			
2.1	Testing procedures for acceptability, compliance, and intervention delivery	i.	Testing procedures and intervention prescription previously determined feasible in pilot RCT work.
		ii.	Potential acceptability of telehealth intervention discussed with PPI representatives.
		iii.	Assess feasibility of delivering intervention via telehealth in terms of recruitment, retention, and usability through a pilot with 12 participants.
		iv.	Assess acceptability through qualitative interviews.
2.2	Estimating recruitment and retention	i.	Recruitment from a single, national cancer centre.
		ii.	Review of literature and engagement with trial methodology groups e.g. Health Research Board Trial Methodology Research Network (HRB-TMR) and MRC-NIHR Trials Methodology Research Partnership (TMRP) symposia and working groups to determine best practice for ongoing retention of participants.
2.3	Determining sample size	i.	Feasibility results may be used to inform sample size calculation of a future controlled trial.

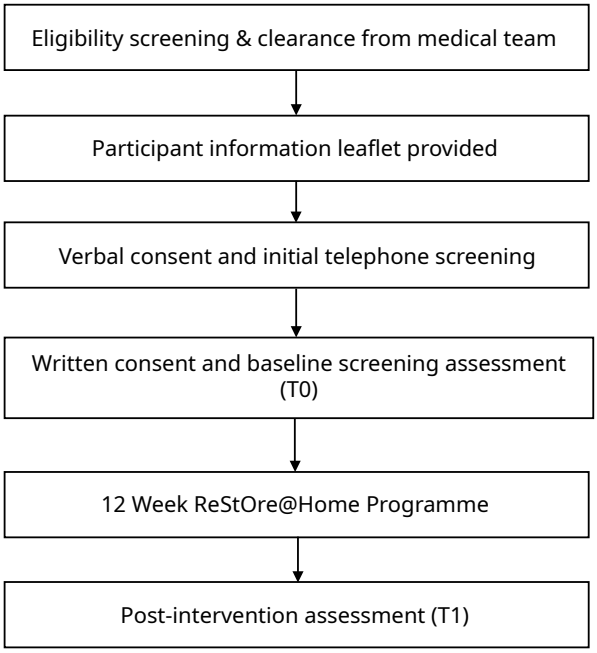

Figure 1. Study design.

Participants will be recruited from one hospital site, SJH Dublin, the National Centre for Oesophago-gastric Cancer in Ireland. Recruitment for ReStOre@Home will not occur at the same time as recruitment for the main ReStOre RCT. Participants will be identified at post-operative clinics and through institutional databases by their clinical team. Eligibility screening will be completed by the clinical team in conjunction with the research team at SJH. All participants will require medical clearance prior to enrolment. Participants will continue with all routine care as planned during their participation in the study. Potentially eligible patients will be informed about the study by a member of the research team in person or via telephone and will receive a participant information leaflet. Following a reflection period of 1 week, a researcher will telephone the patient to confirm their interest in participation.

As a consequence of the ongoing COVID-19 pandemic those interested in participating will be required to give initial consent verbally over telephone. Researchers will then schedule a baseline assessment which will be conducted in the Wellcome Trust-Health Research Board Clinical Research Facility (CRF) at SJH. In advance of the assessment as much information as possible will be collected via telephone interview e.g. background medical history, dietary interview and questionnaires will be provided in advance to minimise face to face contact. Written informed consent will be obtained during the baseline assessment (Extended data[17]). If there are any findings at assessment which indicate that a person is unsafe to exercise, they will not proceed with the intervention phase of the study.

Intervention

The ReStOre@Home intervention will be delivered virtually through a video-conferencing platform and will follow a modified version of our established protocol for the ReStOre II RCT[8], the feasibility of which has been previously determined[4,6]. The ReStOre@Home programme comprises of three elements: exercise training, individualised dietetic counselling, and multidisciplinary education. The intervention is summarised in Figure 2. Coordination of the multicomponent virtual intervention will be overseen by the project manager, a physiotherapist experienced in the delivery of multimodal interventions. All video-conferencing sessions including the group education and resistance training sessions, and individual goal setting and dietetic counselling sessions will follow a defined schedule which will be provided to participants at the start of the intervention. To ensure the schedule is acceptable to each participant, group sessions will be planned for the same time each week and 1:1 sessions will be scheduled at times chosen by participants. Group education sessions will last a maximum of one hour; check-in meetings and group resistance training will last approximately 30 minutes.

ReStOre@Home will aim to give participants a greater sense of self-efficacy over their recovery from UGI cancer, to give them the belief that they can safely return to physical activity following their cancer journey, and promote lasting healthy lifestyle changes. This aim is grounded in Social Cognitive Theory (SCT)[18,19] as it considers perceived self-efficacy as a key determinant of health behaviour change. Other core determinants of the model include; knowledge of health risks, outcome expectations, and perceived facilitators and impediments of behaviour[19]. The design of the ReStOre@Home programme incorporates each of these core determinants (Figure 3). Key to the programme is the goal to enhance self-efficacy amongst participants. This goal will be targeted through enhancing patient knowledge across the three components of the programme

Week	1	2	3	4	5	6	7	8	9	10	11	12
Independent walking sessions												
Video call check in meeting with physiotherapist												
Video call resistance training session												
Independent resistance training session												
Video call with dietitian												
Video call group education session												

Figure 2. Frequency of ReStOre@Home Sessions.

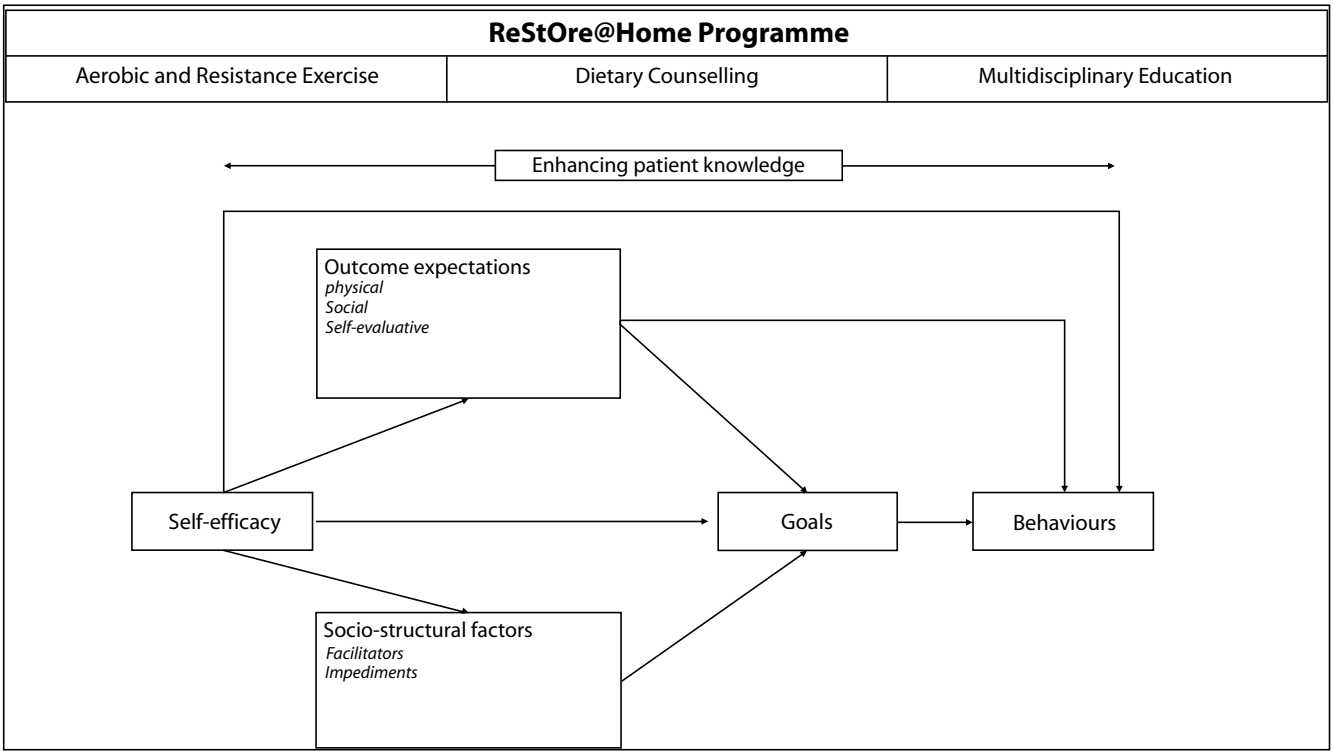

Figure 3. Social Cognitive Theory. *Figure 3 has been adapted with permission from Bandura A. Health promotion by social cognitive means. Health Educ Behav. 2004 Apr;31(2):143–64. doi: 10.1177/1090198104263660. PMID: 15090118*[19].

(exercise, dietary counselling, group education sessions), providing participants with education on the benefits of exercise, exercise safety, maintaining a stable body weight, and managing other symptoms such as fatigue. Outcome expectations will be derived through the setting of individualised exercise and dietary goals throughout the programme. The programme is also developed with perceived facilitators and impediments of physical activity in mind. Key facilitators of the programme will be the clear structure, and a motivated rehabilitation team. The multidisciplinary nature of the programme will also help address barriers to activity e.g. fear of weight loss, fatigue etc. to maximise adherence to the programme.

Aerobic and resistance exercise training. The exercise component will consist of a 12-week programme of aerobic and resistance programme. Unsupervised aerobic exercise in the form of walking will be prescribed as per the F.I.T.T (Frequency, intensity, type and time) principles outlined in the ReStOre II protocol[8], commencing at a low intensity (40–45% heart rate reserve (HRR)) and progressing to a moderate-vigorous intensity (65–85% HRR)[8]. During the ReStOre@Home Programme all walking sessions will be monitored by the participant's Polar Heart Rate Monitor (Polar M200) which will be provided. Participants will grant the research team access to their Polar Flow account to allow them to monitor their progress. The physiotherapist will organise a video-conference call check-in meeting with participants twice weekly for the first month, once weekly for the second month and once per fortnight for the final month of the programme. During this meeting the physiotherapist will perform a subjective assessment to check in on how the participant is feeling and will review with the participant how they are doing with the programme, explain their exercise prescription for the coming days/week, and set personal goals with the participant.

Resistance exercises will be performed as described in the ReStOre II RCT protocol[8]. Participants will complete two sessions of resistance training per week for the duration of the programme, targeting major muscle groups. Participants will commence resistance training at a low intensity (16 repetition max (RM), one set x 12 repetitions) and progress to a higher intensity of 7RM (4 sets x 6 repetitions). Supervised resistance training sessions will be held in small online groups (maximum of 6) with the study physiotherapist via video-conference call. As per the ReStOre II protocol[8] there will be a gradual transition from supervised to independent training as the programme progress. All participants will be provided with the equipment necessary to complete the programme at home including free weights, an aerobic step, resistance bands and a polar heart rate monitor. Participants will log details of all their exercise sessions in a logbook.

Dietary counselling. One-to-one dietetic sessions will be delivered via video-conference calls during week 1, week 2 and fortnightly thereafter, or more frequently if required. Dietetic sessions will be delivered by a registered dietitian. As per the ReStOre II RCT protocol[8] the target for participants undertaking the ReStOre@Home programme will be to optimise dietary intake, ensuring adequate energy and micronutrient status, in alignment with international guidelines for cancer survivors[20,21].

Multidisciplinary education sessions. Over the 12-week intervention participants will receive seven group education sessions via video-conference call which will be delivered by multidisciplinary team members including a doctor, dietitian, occupational therapist, and physiotherapist. Group size during the education component will be limited to six participants per session to optimise opportunities for peer to peer engagement. Education topics will include items of concern to UGI cancer survivors including; self-management, benefits of physical activity, and fatigue management.

Outcomes

The ReStOre@Home study outcomes are listed in Table 2. The main assessment battery will be performed at baseline (T0), and post-intervention (T1).

Primary outcome – feasibility. This study will focus on the feasibility/ piloting phase of the MRC framework for process evaluation[16]. Feasibility of the ReStOre@Home intervention will be described in terms of recruitment rates, adherence, retention, acceptability of the programme and incidents. Recruitment rate will be defined as the percentage of eligible study population whom consent to participation. In line with the ReStOre II trial protocol[8], adherence will be recorded according to a comprehensive battery of outcomes including number of completed sessions, permanent treatment discontinuation, treatment interruption, dose modification, early session termination, and pre-treatment intensity modification (Table 3), consistent with recommended practice for clinical exercise trials[22]. A number of sources will be used to calculate adherence including; participants polar heart rate data, participants logbook of exercise completed, and the physiotherapist's records of supervised sessions. Retention will be defined as the percentage of enrolled participants completing the post-intervention assessment. Acceptability of the intervention will be determined through the use of qualitative interviews and completion of the Telehealth Usability Questionnaire (TUQ)[23] post-intervention. Incidents will be recorded throughout the study period. Feasibility to proceed to a definitive trial of ReStOre@Home will be determined by considering all the above factors, and the specific achievement of the following criteria: ≥50% of eligible patients recruited; mean of ≥80% adherence to supervised exercise sessions and ≥70% adherence to unsupervised sessions; ≥83% attendance at T1 assessment.

Feasibility will be further examined using a qualitative approach, wherein the acceptability of delivering the programme virtually will be explored along with participant's perceptions of the impact of the ReStOre@Home programme on their physical and mental well-being. Data will be collected through semi-structured individual interviews immediately post-intervention (T1) by a researcher experienced in qualitative methods. Interviews will be held via telephone/video-conference call and will be recorded. The discussion guide (Extended data[17]) will explore recommendations for future delivery of the programme through telehealth and the impact of the programme on overall health and wellbeing. Interview recordings will be transcribed and analysed using thematic analysis[24].

Secondary outcomes. Secondary outcomes will investigate the preliminary efficacy of the ReStOre@Home intervention, by examining the impact of the intervention on physical functioning, dietary adequacy and nutritional status, health related quality of life, and fatigue. These outcomes are exploratory only as the sample size is not sufficient to demonstrate treatment effect. The feasibility of utilising these measures in this cohort was previously established in the ReStOre I feasibility study and pilot RCT[4,6]. Physical functioning will be examined using a suite of validated measures examining aerobic

Table 2. ReStOre@Home Study Outcomes.

Outcome	Instrument	Baseline	Post-intervention
		T0	T1
Primary outcome			
Feasibility	Recruitment rates		
	Adherence		
	Acceptability		
Secondary outcomes			
Aerobic Fitness	Cardiopulmonary Exercise Test	X	X
Functional performance	Short Physical Performance Battery (SPPB)	X	X
Muscle Strength	Hand grip strength (HGS)	X	X
	Leg Press 1-RM	X	X
Physical activity	Godin Leisure-Time Exercise Questionnaire	X	X
Body composition	Anthropometry	X	X
	Mid arm and waist circumference Bioimpedance Analysis	X X	X X
Dietary intake	Dietary interview	X	X
	Foodbook24	X	X
Nutrition-related symptoms	Gastrointestinal Symptom Rating Scale (GSRS)	X	X
	Simplified Nutritional Appetite Questionnaire (SNAQ)	X	X
Quality of Life	EORTC-QLQ-C30	X	X
Cancer specific quality of Life	EORTC-QLQ-OG25 (oesophago-gastric cancer)	X	X
Fatigue	Multidimensional Fatigue Inventory (MFI-20)	X	X
Qualitative approach	Semi –structured interviews		X
Other			
Sociodemographic details	Participant self-report	X	
Medical/Cancer history	Medical records	X	
Incidents	Reports of patients/research personnel	X	X
Satisfaction with Telehealth	Telehealth Usability Questionnaire (TUQ)		X
Biobank samples	Blood samples	X	X

fitness, functional performance, muscle strength, physical activity and body composition. Aerobic fitness will be determined by Cardiopulmonary Exercise Test (CPET). The CPET procedure will be performed as outlined in the ReStOre II protocol[8]. An antibacterial/antiviral filter will be installed in the CPET circuit to minimise infection risk by reducing the amount of droplet aerosol dispersion in the air mitigating the contamination of the environment during testing. Functional performance will be captured using the Short Physical Performance Battery[25]. Muscle strength will be assessed by handheld dynamometry and a 1-RM leg press test. Hand grip strength (HGS) provides a measure of hand and forearm strength and is found to correlate well with overall muscle strength and physical function[26]. The 1-RM leg-press test will be performed as per the ReStOre II trial protocol[8]. Physical activity levels will be measured by the Godin Leisure-Time Exercise Questionnaire, a validated tool for determining physical activity levels in cancer survivors[27]. Weight (kilogrammes (kg)) and height (centimetres (cm)) will be

Table 3. Exercise Adherence variables.

Variable	Definition
Total number of supervised sessions attended	Total number of scheduled programme sessions attended on video call.
Total number of unsupervised sessions completed	Total number of unsupervised sessions reported in exercise diary as complete
Total number of compliant aerobic sessions completed	Total number of aerobic sessions where prescribed aerobic exercise dosage was achieved
Total number of compliant resistance sessions	Total number of resistance sessions where prescribed resistance training dosage was achieved
Permanent treatment discontinuation	Permanent discontinuation of the ReStOre@Home programme before week 12
Treatment interruption	Missing at least three consecutive ReStOre@Home supervised resistance training sessions
Dose modification	Number of videocall supervised sessions requiring exercise dose modification
Early session termination	Number of videocall supervised sessions requiring early session termination
Pre-treatment intensity modification	Number of videocall supervised sessions requiring modification because of a pre-exercise screening indication.

recorded by standard methods and body mass index (BMI) will be calculated as weight (kg)/ height (metres (m^2)). Mid-arm muscle circumference and waist circumference will be measured in centimetres with a flexible measuring tape. Measurements will be taken in duplicate and averaged for data entry. Bioimpedance analysis (BIA) will be performed using Seca mBCA 515 (Seca, Hamburg, Germany).

Dietary adequacy and nutrition related symptoms will be assessed by the trial dietitian at T0 and T1 using a structured dietary interview. In addition participants will also complete Foodbook 24[28], the Gastrointestinal Symptom Rating Scale (GSRS)[29] and the Simplified Nutritional Appetite Questionnaire (SNAQ)[30]. Health Related Quality of Life (HRQOL) will be determined by the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire (EORTC-QLQ-C30 version 3.0)[31] and the oesophago-gastric cancer specific subscale (EORTC-QLQ-OG25). Fatigue will be assessed using the Multidimensional Fatigue Inventory (MFI-20).

Biosample collection. As per the ReStOre II RCT[8] participants will be invited to consent to donating samples to the Upper Gastrointestinal Cancer Survivorship Biobank (Extended data[17]). Serum, plasma, and whole blood samples will be collected from consenting participants at T0 and T1. Samples will be processed and stored at -80°C at the Trinity Translational Medicine Institute, St James's Hospital, Dublin 8 for future analyses to explore the impact of multidisciplinary rehabilitation in survivorship on key biomarkers.

Safety

All incidents will be recorded, and serious incidents will be reported to the research ethics committee. Prior to baseline testing, all participants will require medical approval confirming their suitability for participation. Weight loss is a concern for UGI cancer survivors, and accordingly the study dietitian will monitor weight closely during the ReStOre@Home programme.

In light of the current pandemic additional measures to enhance safety will be implemented. All participants will be screened for signs and symptoms of COVID-19 via telephone by the research team the day before their assessments in the CRF at SJH. Participants will be screened again on the day of their assessment upon arrival at the CRF to confirm the participant and all individuals in their household are free from symptoms of COVID-19. All research staff will follow the COVID-19 National Protocol for workers and will not present themselves for work if symptomatic. Research staff will be fully equipped with alcohol hand gel, PPE and cleaning products and will receive training in how to use all correctly. As much of the assessment battery will be performed over the phone in advance of study assessments to minimise face to face contact time. Questionnaires will be provided via post to participants in advance of their assessment to further reduce face to face contact time. During the assessment in the CRF participants will be required to don a mask and clean their hands upon arrival and research staff will don appropriate PPE including a facemask, and goggles, and maintain physical distancing as much as possible. As the intervention will be delivered completely in participants homes, participants will be provided with the ReStOre@Home Exercising at Home Advice Sheet (Extended data[17]) educating them on normal and abnormal responses to exercise and what they should do if they experience an abnormal response.

Statistical considerations

Sample size calculation. A sample of 12 participants will be recruited to determine the feasibility of the ReStOre@Home programme. This is based on the recommendations of Julious

et al.[32] whom recommend a minimum sample size of 12 per group as a rule of thumb and justifies this based on rationale about feasibility and precision about the mean and variance[33], in order to inform future quantitative studies. Similar sample sizes have been utilised in other rehabilitation trials in cancer survivorship[4,5,34–37].

Data management and analysis. The Data Management Plan (Extended data[17]) will outline how research data will be handled during and after the project. The data management plan is a live document and will be reviewed regularly throughout the study. Source documents for this study will include hospital records, procedure reports and data collection forms. Outcome assessments will be recorded in a paper-based case report form. Data from the case report form will then be entered into a password protected computer data repository. Data validation will be used to avoid erroneous data entry. All participants will be allocated a unique study code. The key to the study code will be stored securely and separately. All paper records will be stored in locked filing cabinets, in a locked office in a restricted access building with swipe access. Electronic records will be stored on password protected encrypted devices. Upon completion of the trial an anonymised data set will be deposited on a secure online repository in line with open access publication requirements.

Quantitative data analysis will be performed using IBM SPSS Statistics 26 software, employing statistical best practice. An inspection of patient characteristics at baseline will be carried out. Summary statistics for continuous variables (means and standard deviations or median and ranges as appropriate) and categorical variables (counts and proportions) will be presented. A qualitative descriptive approach[38] will be taken to the analysis of qualitative data. Braun and Clarke's[24] 6 stage approach to thematic analysis will be used to analyse all data collected by a team of researchers using nVivo 12 (QSR International, Australia).

Trial management and governance
The management of this feasibility study will be overseen by the ReStOre II trial management groups; a Trial management Group (TMG), Trial Steering Committee (TSC) and an Independent Data Monitoring Committee (IDMC).

Dissemination
The results of the ReStOre@Home feasibility study will be disseminated via peer-reviewed publications and conference presentations. Upon completion of the trial an anonymised data set will be deposited on a secure online repository in line with open access publication requirements.

Study status
Recruitment will begin in Winter 2020.

Ethical statement
Ethical approval has been granted by the TUH/SJH Research Ethics Committee (REC: 2020-07 List- Amendment (23)). Any modifications to this planned protocol will be reported to the ethics committee.

The study was registered with ClinicalTrials.gov on 26th October 2020 (NCT04603339).

Discussion
In the absence of an effective vaccine, the COVID-19 pandemic is likely to persist into the medium term. Whilst society continues to grapple with living with COVID-19, implementation of much needed rehabilitative programmes to people living with and beyond cancer in a face to face manner will continue to be extremely challenging due to public health restrictions and the valid fear experienced by vulnerable cancer survivors of attending face to face appointments in health care environments. To this end, never has the virtual delivery of rehabilitation to cancer survivors within their homes had such potential.

Implementing a complex multicomponent intervention virtually will not be without its challenges. Whilst existing evidence supports the implementation of single component virtual programmes such as online exercise classes, there is however emerging evidence to support the virtual delivery of other multi-component rehabilitation programmes in chronic disease management. Of note virtually delivered pulmonary rehabilitation programmes consisting of exercise, education, and self-management support has been found to be feasible, safe and result in equivalent clinical gains in comparison to face to face delivery[39] however the application of these results to other multimodal rehabilitation programmes, particularly those combining different individual interventions, is unknown and requires investigation. Successful implementation of the ReStOre@Home feasibility study would indicate the need to continue the process evaluation of the ReStOre@Home programme by RCT to assess its effectiveness. In the future, ReStOre@Home may potentially provide a viable alternative template for delivery of the ReStOre II programme to vulnerable patients who are cocooning or shielding in their homes, or those who would be otherwise unable to participate due to time constraints, or travel restrictions.

Data availability
Underlying data
No data are associated with article.

Extended data
Open Science Framework: ReStOre@Home: Feasibility study of a virtually delivered 12-week multidisciplinary rehabilitation programme for survivors of upper gastrointestinal (UGI) cancer: Study Protocol https://doi.org/10.17605/OSF.IO/EYV3M

This project contains the following extended data:
- ReStOre@Home Interview Guide Version 1.pdf (Focus group/interview guide)
- ReStOre@Home Interview Guide Version 2.pdf (Focus group/interview guide)
- ReStOre@Home SJH Consent Form Version 1.pdf (Consent form)
- 200908 PIL_ICF_V1_Upper GI Surviorship Biobank ReStOre@Home.pdf (Biobank PIL and Consent Form)

- Data Management Plan (DMP) Version 1 RESTORE@HOME.pdf (Data Management Plan)
- ReStOre@Home Exercising at Home Advice Sheet.pdf (ReStOre@Home Exercising at Home Advice Sheet)
- 200626 ReStOre@Home Participant Logbook Version 1.pdf (Exercise session logbook)

Reporting guidelines

Open Science Framework: SPIRIT checklist for 'ReStOre@Home: Feasibility study of a virtually delivered 12-week multidisciplinary rehabilitation programme for survivors of upper gastrointestinal (UGI) cancer - study protocol' https://doi.org/10.17605/OSF.IO/EYV3M

Acknowledgments

The authors would like to acknowledge the assistance and support of the Wellcome Trust/Health Research Board Clinical Research Facility at St. James' Hospital, Dublin. The authors greatly acknowledge the ongoing support of our charity partners the Irish Cancer Society and the Oesophageal Cancer Fund, and of our patient and public representatives. The authors would like to thank our infrastructural partners, the Health Research Board Trials Methodology Research Network (HRB-TMRN) for their support with this project.

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Open Peer Review

Current Peer Review Status: ✔ ✔

Version 2

Reviewer Report 14 May 2021

https://doi.org/10.21956/hrbopenres.14465.r29359

✔ **Linda Denehy**
Melbourne School of Health Sciences, University of Melbourne, Melbourne, Australia
Lara Edbrooke
University of Melbourne, Melbourne, Australia

We only had 1 outstanding question regarding an addition that has been made to the manuscript: "If there are any findings at assessment which indicate that a person is unsafe to exercise, they will not proceed with the intervention phase of the study."
Are the authors meaning the patient will be withdrawn from the study?

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My research is focused on physiotherapy rehabilitation in acute care settings including critical care, pre and post surgery and oncology.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Reviewer Report 13 May 2021

https://doi.org/10.21956/hrbopenres.14465.r29360

✔ **Cynthia Forbes**
Wolfson Palliative Care Research Centre, Institute of Clinical and Applied Health Research, University of Hull, Hull, UK

No further comments. Reponses from authors reasonable and well done.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cancer rehabilitation, digital technology.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 22 March 2021

https://doi.org/10.21956/hrbopenres.14318.r29019

?

Cynthia Forbes
Wolfson Palliative Care Research Centre, Institute of Clinical and Applied Health Research, University of Hull, Hull, UK

This article describes a study protocol for the modified version of a previously planned feasibility RCT to deliver a multi-component rehabilitation programme to upper GI cancer survivors. Feasibility for the in-person programme has been conducted and a larger trial was planned, now on hold due to the pandemic. In order to explore remote delivery, the authors have modified the protocol for video conference delivery.

Comments
A few question arose as I was reading, some of which were answered by the previous protocol.

Is there a minimum and maximum time for the counselling, education, and exercise sessions?

Study design: I say partly because the sample is too small to really estimate SD for a sample size calculation. Many sources call for minimum 30 participants for this kind of study. 12 may even be too few to reach saturation for the qualitative follow-up. Understandably, this may be a difficult population to recruit but I think this needs to be very clear. Subsequently, the secondary outcomes should be highlighted more so as exploratory.

Do all people start the programme at the same time? With only 12, this may be feasible but I wondered how you would schedule these sessions.

You mention having smaller groups for certain sessions. Will the groups always be the same people or will it be different each time?

Access to broadband is essential but how will you deal with different levels of competence and grades of equipment? Will you exclude based on equipment availability, i.e. if someone doesn't have a webcam, can they participate in sessions with a smartphone?

Is the rationale for, and objectives of, the study clearly described?
Yes

Is the study design appropriate for the research question?
Partly

Are sufficient details of the methods provided to allow replication by others?
Yes

Are the datasets clearly presented in a useable and accessible format?
Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Cancer rehabilitation, digital technology.

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 11 Apr 2021

Linda O'Neill, Trinity College Dublin, the University of Dublin, Dublin, Ireland

Dear Professor Forbes,

On behalf of the authorship I wish to thank you for taking the time to review our manuscript and for your constructive feedback. Please see below our responses to your comments.

1. A few questions arose as I was reading, some of which were answered by the previous protocol.

2. Is there a minimum and maximum time for the counselling, education, and exercise sessions?
Response:
Thank you for your helpful feedback.
Group education sessions will be a maximum of one hour. Group resistance training sessions will last approx. 30-40 minutes. 1:1 phone calls will last 30 minutes, apart from the first call which may be longer as participants may have additional questions.
The following statement has been added to the 'Intervention' section of the manuscript:
"Group education sessions will last a maximum of one hour; check-in meetings and group resistance training will last approximately 30 minutes."

3. Study design: I say partly because the sample is too small to really estimate SD for a sample size calculation. Many sources call for minimum 30 participants for this kind of study. 12 may even be too few to reach saturation for the qualitative follow-up. Understandably, this may be a difficult population to recruit but I think this needs to be very clear. Subsequently, the secondary outcomes should be highlighted more so as exploratory.

Response:
Thank you for this feedback. To reinforce that secondary outcomes are exploratory only, the following statement has been included in the 'Outcomes' section:
"These outcomes are exploratory only as the sample size is not sufficient to demonstrate treatment effect."
We have carefully considered your comments regarding the sample size. We believe a sample size of 12 will provide sufficient data for the qualitative interviews. In accordance with recommendations from *Fusch et al*., we will apply specific measures to ensure the best chance of reaching data saturation: use of saturation grid, two-party coding of transcripts, and suitably-designed interview guides. We understand that, will well-conducted interview, data saturation can be achieved with 12 participants.

4. Do all people start the programme at the same time? With only 12, this may be feasible but I wondered how you would schedule these sessions.
Response:
We aim to have two groups of six participants. Depending on recruitment rates, these two groups may be run at the same time or one after another; either way, they will operate separately to ensure that the groups of six have the opportunity to develop familiarity and social connections.

5**. You mention having smaller groups for certain sessions. Will the groups always be the same people or will it be different each time?**
Response:
The groups of six will be the same participants each time.

6. Access to broadband is essential but how will you deal with different levels of competence and grades of equipment? Will you exclude based on equipment availability, i.e. if someone doesn't have a webcam, can they participate in sessions with a smartphone?
Response:
Participants will be welcome to join the online sessions on any device which has a webcam (desktop, laptop, tablet, smartphone). We will have opportunities to ensure they are familiar with the technology and provide tutorials or explanations at recruitment, assessment and during check-in calls. We will also provide each participant with 'how-to' information leaflets for the video-conferencing software and for the heart rate monitor.

We hope that you find our response to your comments satisfactory and look forward to hearing from you.

Kind regards,

Dr Linda O'Neill

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Competing Interests: The authorship have no competing interests to disclose

Reviewer Report 01 February 2021

https://doi.org/10.21956/hrbopenres.14318.r28448

?

Lara Edbrooke
University of Melbourne, Melbourne, Australia
Linda Denehy
Melbourne School of Health Sciences, University of Melbourne, Melbourne, Australia

Thank you for the opportunity to review this well written protocol paper involving 12 weeks of 'virtual' rehabilitation for patients following treatment for oesophago-gastric cancer. This work is a sub study of an ongoing randomised controlled trial the ReStOre II RCT (NCT03958019) providing rehabilitation face to face for which the protocol is already published. The virtual program aims to establish the feasibility and safety of multi-disciplinary rehabilitation, including exercise, nutrition support and education, delivered entirely remotely.

Given the impact the COVID-19 pandemic has had on traditional face-to-face models of rehabilitation delivery and taking into account rural or remote survivors who have limited access to services, work in this area is timely and of critical importance.

The protocol is well written and clear and generally reproducible. Following review of the manuscript we have the following questions and comments for the authors:

1. Despite the justification references used for the sample size, I am not convinced that n=12 would provide enough patients to be representative of the target study population for using telehealth rehabilitation methods. The authors should remove the statement on page 9 that….'similar sample sizes have been used in in other rehabilitation trials in cancer' This is not a scientific justification of sample size. Thabane *et al.* 2010 in A tutorial on pilot studies: what, why and how provide a simple confidence interval approach to estimating samples to establish feasibility[1]. Additionally, I don't believe that 12 patients will provide enough information on efficacy and variance estimates for the battery of outcome measures to

estimate treatment effects in future trials and may lead to biased or unrealistic estimates. Further, the authors should keep in mind the impact that the COVID-19 pandemic could potentially have on the outcomes collected, including CPET, physical activity levels and health-related quality of life and caution against the use of these data for powering future trials.

2. This is a sub study of the larger RESTORE RCT. It is not documented how recruitment will work alongside the larger RCT at the one hospital site? This is important to ensure that bias is not introduced if patients have a choice or are not sequentially offered to participate in this smaller virtual sub study. Please add.

3. What cut-points will be used for the proportion of eligible patients recruited, adherence to intervention sessions and outcome assessments to guide whether implementing the intervention is feasible? Please add to aims/hypotheses.

4. If the baseline SPPB indicates balance impairments will participants still be prescribed outdoor walking or is loan of a stationary cycle for aerobic exercise possible? Please add to method.

5. Will participants be provided with equipment (bike/treadmill) in the event that walking outdoors is limited by government COVID-19 restrictions? Our recent experience is that participants may be wary of walking outdoors given the current situation. A suggestion.

6. The authors state one of the key aims of the programme is to increase participants' self-efficacy over their recovery – the authors could consider including a patient-reported self-efficacy questionnaire to assess this. It would also strengthen the study to have an objective measure of physical activity using accelerometry, in addition to the use of the Godin Leisure Time Exercise questionnaire. A suggestion.

7. The authors state and Figure 2 highlights that this is a complex intervention. Will weekly video calls from the dietitian, the physiotherapist and group education sessions be co-ordinated/performed in conjunction to reduce the burden on participants of multiple weekly contacts? Please ad to method.

8. It is not clear (or may have missed it) if all outcome measures are being performed at the hospital? Clearly CPET would be but for others there is potential to undertake these remotely as well? This should be made clear.

References

1. Thabane L, Ma J, Chu R, Cheng J, et al.: A tutorial on pilot studies: the what, why and how.*BMC Med Res Methodol*. 2010; **10**: 1 PubMed Abstract | Publisher Full Text

Is the rationale for, and objectives of, the study clearly described?

Yes

Is the study design appropriate for the research question?

Partly

Are sufficient details of the methods provided to allow replication by others?
Partly

Are the datasets clearly presented in a useable and accessible format?
Not applicable

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: My research is focused on physiotherapy rehabilitation in acute care settings including critical care, pre and post surgery and oncology.

We confirm that we have read this submission and believe that we have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however we have significant reservations, as outlined above.

Author Response 11 Apr 2021

Linda O'Neill, Trinity College Dublin, the University of Dublin, Dublin, Ireland

Dear Professor Edbroke and Professor Denehy,

On behalf of the authorship I would like to thank you both for taking the time to review our paper and for your constructive feedback. Please see below our response to your comments.

1. **Despite the justification references used for the sample size, I am not convinced that n=12 would provide enough patients to be representative of the target study population for using telehealth rehabilitation methods.**
The authors should remove the statement on page 9 that….'similar sample sizes have been used in in other rehabilitation trials in cancer' This is not a scientific justification of sample size. Thabane et al. 2010 in A tutorial on pilot studies: what, why and how provide a simple confidence interval approach to estimating samples to establish feasibility1.
Additionally, I don't believe that 12 patients will provide enough information on efficacy and variance estimates for the battery of outcome measures to estimate treatment effects in future trials and may lead to biased or unrealistic estimates.
Further, the authors should keep in mind the impact that the COVID-19 pandemic could potentially have on the outcomes collected, including CPET, physical activity levels and health-related quality of life and caution against the use of these data for powering future trials.

Response:
Thank you for your thorough and helpful feedback.
The statement on page 9 has been removed.
We have carefully considered your comments regarding the sample size. We acknowledge

the sample size is small in comparison to many other feasibility studies. The target study population is wide, covering a variety of ages, genders, levels of impairments and socio-economic backgrounds. It will certainly be difficult to fully represent this population in a feasibility study, and our randomised control trials in this population will more effectively reflect the broader population. The characteristics of the sample as a reflection of the target population will be discussed in the manuscript for publication and will be acknowledged as a limitation of it is under-representative of the target population.

We wish to emphasise that the primary aim of this study is to examine the feasibility of implementing the ReStOre programme virtually using video-conferencing software. Therefore, the main aspects of feasibility we will explore are related to how the programme translates to a virtual rehabilitation setting. We believe a sample size of 12 will provide sufficient data for the feasibility outcomes of recruitment, adherence, acceptability, retention and adverse incidents, as well as qualitative interviews and the telehealth usability questionnaire.

- No minimum sample size is required for the Telehealth Usability Questionnaire (Parmanto et al. 2016).
- In interview-based studies, data saturation can be achieved with 12 interviews (Guest et al. 2006). In accordance with recommendations from Fusch et al. (2015), we will apply specific measures to ensure the best chance of reaching data saturation: use of saturation grid, two-party coding of transcripts, and suitably designed interview guides.

As described in the paper's introduction, the feasibility and effectiveness of the ReStOre programme has already been evaluated in an in-person setting, with both a feasibility study and a pilot randomised controlled trial. Regarding the information needed to estimate treatment effects in future trials, the pilot study and RCT with the ReStOre programme will assist greatly in providing this information, and it will not solely be acquired from this feasibility study. To communicate more clearly that the secondary outcomes are exploratory only and we do not aim to derive treatment effects from this data, we have included the following statement has been in the 'Outcomes' section:
"These outcomes are exploratory only as the sample size is not sufficient to demonstrate treatment effect."
As you have highlighted, the secondary outcomes of CPET, physical activity levels and health-related quality of life may be influenced by the government-enforced restrictions, personal decisions to 'cocoon' and subsequently reduce physical activity, or indeed by the effects of the disease itself. To understand the effects of the COVID-19 pandemic on participants, we will include the following question on the interview guide:
"How do you feel your health, fitness and overall wellbeing has been impacted by the COVID-19 pandemic and the restrictions imposed over the last year?"
In addition, the potential influence of Covid-19 restrictions on secondary outcomes for this study will be highlighted as limitations in future manuscripts detailing the study results.

2.This is a sub study of the larger RESTORE RCT. It is not documented how recruitment will work alongside the larger RCT at the one hospital site? This is important to ensure that bias is not introduced if patients have a choice or are not sequentially offered to participate in this smaller virtual sub study. Please add.

Response:
The main RCT is currently on hold due to the COVID-19 pandemic. Ireland continues to experience high numbers of cases and exercising in groups has not been permitted for over one year. Therefore, recruitment for both trials will not be happening at the same time. We aim to commence recruitment for ReStOre@Home in May 2021 and for ReStOre II after the summer, when, hopefully, the wider population is vaccinated and a return to group exercise is permitted.
The following statement has been included in the 'Study Participants' section:
"Recruitment for ReStOre@Home will not occur at the same time as recruitment for the main ReStOre RCT."

3. What cut-points will be used for the proportion of eligible patients recruited, adherence to intervention sessions and outcome assessments to guide whether implementing the intervention is feasible? Please add to aims/hypotheses.

Response:
Cut-points will be as follows:
- Proportion of eligible patients recruited: 50%
- Adherence to intervention sessions: mean of 80% adherence to supervised sessions, 70% adherence to unsupervised sessions.
- Attendance of assessment sessions (expressed in paper as 'retention'): 100% attendance at T0, 83% attendance at T1

The following statement has been included in the Outcomes section:
"Feasibility to proceed to a definitive trial of ReStOre@Home will be determined by considering all the above factors, and the specific achievement of the following criteria: ≥50% of eligible patients recruited; mean of ≥80% adherence to supervised exercise sessions and ≥70% adherence to unsupervised sessions; ≥83% attendance at T1 assessment."

4. If the baseline SPPB indicates balance impairments will participants still be prescribed outdoor walking or is loan of a stationary cycle for aerobic exercise possible? Please add to method.
If researchers find that a participant has a balance impairment which would make it unsafe to walk outdoors, they will not be included in the study. By clearly identifying in the participant information leaflet and in recruitment discussions that a core component of this study is outdoors walking, we think it is unlikely that a participant will be excluded at assessment for this reason.

Response:
The following statement has been added to the 'Study Participants' section:
"If there are any findings at assessment which indicate that a person is unsafe to exercise, they will not proceed with the intervention phase of the study."

5. Will participants be provided with equipment (bike/treadmill) in the event that walking outdoors is limited by government COVID-19 restrictions? Our recent experience is that participants may be wary of walking outdoors given the current

situation. A suggestion.

Response:
Walking outdoors has been permitted in Ireland throughout the pandemic, and has even been encouraged by the government, with city and county councils providing specific hours for vulnerable individuals to have preferential use of local parks. We will discuss participant's levels of comfort around walking outdoors and provide safety advice such as wearing a mask and avoiding exercising outdoor in times where parks and pavements are busy. Unfortunately, we do not currently have the means to loan home exercise equipment.

6. The authors state one of the key aims of the programme is to increase participants' self-efficacy over their recovery – the authors could consider including a patient-reported self-efficacy questionnaire to assess this. It would also strengthen the study to have an objective measure of physical activity using accelerometry, in addition to the use of the Godin Leisure Time Exercise questionnaire. A suggestion.

Response:
Thank you for these two helpful suggestions. We aim to examine changes in self-efficacy through the qualitative interviews, however on reflection we can see that the study will benefit from this being addressed more explicitly. We have therefore added the following questions to the interview guide, which directly explore self-efficacy concepts:
"Have you noticed any changes in your confidence, specifically around being able to do the things that are important to you? How do you feel now about starting or completing something (a task or personal goal) that you find challenging?"
We have chosen not to use an accelerometer because, as physical activity is not a main outcome of the study, objectively measuring physical activity is not a priority in this feasibility trial. Additionally, as participants will be using videoconferencing software as well as the heart rate monitor and its associated smartphone app, we feel this is already a lot of novel technologies for this population and do not wish to over-burden them from a technological perspective. The results from this study will inform the feasibility of using additional wearable technology in future studies.

7. The authors state and Figure 2 highlights that this is a complex intervention. Will weekly video calls from the dietitian, the physiotherapist and group education sessions be co-ordinated/performed in conjunction to reduce the burden on participants of multiple weekly contacts? Please add to method.

Response:
Video calls and sessions will be scheduled to suit participant's personal commitments, and, as much as possible, will be grouped together and scheduled at the same time each week. This will be achieved as follows: at recruitment, researchers will ask participants what times and days suit best for attending sessions online and, with this information, a 12-week timetable will be generated for each participant and provided at the start of the intervention. Group sessions (strength training, education) will be at the same time each week. We aim to run 1:1 sessions directly before or after group sessions as able, but this will not always be possible due to staffing numbers. Participants can alter 1:1 sessions on the timetable by consulting the study physiotherapist or dietician as needed.

The following statement has been added to the 'Intervention' section:
"To ensure the schedule is acceptable to each participant, group sessions will be planned for the same time each week and 1:1 sessions will be scheduled at times chosen by participants."

8. It is not clear (or may have missed it) if all outcome measures are being performed at the hospital? Clearly CPET would be but for others there is potential to undertake these remotely as well? This should be made clear.

Response:
This is detailed in the 'Study Participants' section as follows:
"In advance of the assessment as much information as possible will be collected via telephone interview e.g. background medical history, dietary interview and questionnaires will be provided in advance to minimise face to face contact."

We hope that you find the above changes to the manuscript satisfactory.

Kindest regards,

Dr Linda O'Neill

Competing Interests: The authorship have no competing interests to declare.