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Research Article

Process evaluation exploring implementation and delivery of a home-based extended exercise intervention for older people with frailty: the HERO trial

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Abstract

Background: Frailty is an especially significant consequence of ageing with resulting physical decline. Some studies suggest that exercise can reduce the deleterious effects of ageing and have a positive impact on functional ability and quality of life. Further research was required to determine the clinical effectiveness and cost-effectiveness of extended community-based rehabilitation for older people following acute illness or injury. The Home-based Extended Rehabilitation for Older people trial included an embedded process evaluation and compared provision of a home-based graded exercise programme plus usual care (the Home-based Older People's Exercise intervention) versus usual care alone for community-dwelling older people with frailty.

Methods: Qualitative mixed-methods process evaluation incorporating non-participant observations, semistructured interviews and analysis of therapy records and participants' exercise diaries. Primary aims of the process evaluation were to explore fidelity and acceptability in intervention delivery. Data analysis was based on thematic analysis and was underpinned by Normalisation Process Theory.

Results: Data were generated in 10 community services in England. Non-participant observations of 10 staff training sessions, 61 intervention delivery sessions and 8 staff trial update sessions were completed. Semistructured interviews were conducted with 10 therapy service managers, 19 therapists and 4 therapy assistants. Thirty-five interviews were conducted with intervention participants, with some including supporting carers, and 19 with usual care only participants.

There was evidence of fidelity to the intervention protocol, with no significant variation between sites. Less experienced therapists were sometimes less confident in making judgements about what exercises could be adapted and tailored to the individual while maintaining intervention fidelity. Most therapists utilised planned behaviour change techniques to engage participants and sustain their involvement in the exercise programme. Intervention acceptability was generally good, with therapy staff and participants noting potential and actual benefits of the intervention and associated physical improvements for participants completing the 24-week intervention. Usual care only participant interviews provided no evidence of engagement with or perceived benefit from community-based programmes provided by the National Health Service or private providers which were equivalent to the Home-based Older People's Exercise intervention. Therapists and therapy service managers noted the value of the Home-based Older People's Exercise intervention as an addition to existing programmes that were designed to reduce the likelihood of older people with frailty requiring hospital admission. However, they felt that embedding the intervention in routine service provision would prove to be challenging within the existing resource allocation.

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Limitations: It was necessary to utilise convenience sampling for some of the data collection. It proved to be difficult to recruit family carers, as many participants lived alone. These issues may have impacted the extent to which participants were fully representative of the population targeted in the Home-based Extended Rehabilitation for Older people trial.
Conclusions: Home-based Older People's Exercise was perceived to be an acceptable rehabilitation intervention, which could be utilised to extend existing home-based rehabilitation for older people living with frailty. With appropriate resource allocation, it could be delivered by therapists and appropriately trained and supervised therapy assistants in community-based rehabilitation settings.
Future work: Research is needed to evaluate the effectiveness of structured, individually tailored, exercise interventions, like Home-based Older People's Exercise, within inpatient and community-based intermediate care settings, recognising the variation in delivery models across health services.
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Background

The world's population is ageing, and by 2050, those aged > 60 years are expected to total 2 billion,[1] which represents an increase from 900 million in 2015. With increasing age, comes an increased likelihood of illness and disability with an associated increased demand on health services, both in hospitals and in the wider community. Frailty is a common and problematic expression of ageing and is characterised by reduced biological reserves and increased vulnerability to adverse outcomes, including falls, disability, hospitalisation and care home admission.[2] Periods of hospitalisation following acute illness in older people with frailty are associated with deconditioning and an acceleration of loss of skeletal muscle mass.[3,4] This, in turn, can significantly impact individuals' ability to carry out essential daily living activities, such as dressing, walking and using the toilet independently.

In the United Kingdom (UK), a substantial proportion of older people (> 65 years) are at an increased risk of re-admission or death following discharge to home from hospital, as a direct consequence of frailty.[5] Acknowledging this increased risk, approximately 30% of older people with frailty are referred to intermediate care (IC) services for a period of rehabilitation. IC services in the UK are provided by the NHS and include bed-based care, which is typically provided in a community hospital or care home, or alternatively home-based IC provided via hospital at home.[6] However, while IC services can provide an important period of professionally led rehabilitation following an acute hospital admission, they are usually of short duration, between 2 and 6 weeks, with some evidence indicating that many older people using IC do not feel ready to leave the service after these relatively short periods of time.[7] A period of extended home-based rehabilitation may ameliorate the loss of independence in activities of daily living, which is often experienced by older people with frailty following a hospital admission for acute illness or injury. Evidence from systematic reviews of exercise interventions, particularly those based on progressive strength training, indicate that functional improvements can be made in older people with frailty.[8–11]

Building on evidence that targeted exercise interventions can improve physical function, muscle strength, gait velocity and balance in older people, the Home-based Older People's Exercise (HOPE) intervention (12 weeks), a home-based, graded exercise programme using face-to-face and telephone contacts, was developed for older people living with frailty.[12] In a pilot randomised controlled trial (RCT) of the HOPE programme, 474 potential participants (community-dwelling frail older people) were contacted, and 31% of the potentially eligible participants were recruited (n = 84).[13] The pilot trial proved feasible, and the intervention was acceptable to participants. There was evidence of potential for a positive, clinically important intervention effect on mobility.

Following the successful pilot, the Home-based Extended Rehabilitation for Older people (HERO) trial, was conducted. HERO is a multicentre individually RCT designed to evaluate the clinical effectiveness and cost-effectiveness of the revised HOPE programme for older people with frailty, who were discharged from hospital or IC services following admission with acute illness or injury.[14] The HOPE programme is a complex intervention involving a variety of different interacting components. Delivered within the HERO trial, the programme is a 24-week, home-based, manualised, graded, progressive exercise intervention aimed at improving strength, endurance and balance, alongside confidence and self-management for older people with frailty. The programme included home visits (× 5) and seven follow-up telephone calls in the first 12 weeks and then weekly telephone calls over the next 12 weeks, plus usual care (UC) provision. The intervention incorporated behaviour change techniques (BCTs) used by therapists as part of home visits

and telephone calls. A participant completed exercise diary that encouraged engagement and adherence, and a therapy record (TR) facilitated fidelity assessment. The HOPE programme was designed to extend, not replace, existing NHS rehabilitation service provision after acute hospital admission. A parallel group of older people with frailty received UC only. These elements are summarised in the logic model (see *Appendix 1*, *Figure 2*).

Process evaluations are a core component of the Medical Research Council framework for developing and evaluating complex interventions, the purpose being to understand the functioning of an intervention by examining implementation, mechanisms of impact and contextual factors.[15,16] Process evaluations facilitate understanding of factors, which may have contributed to or impacted on trial outcomes. A mixed-methods process evaluation was embedded within the HERO trial; this paper reports on the process evaluation.

Aims and objectives

Aim

To understand how the HOPE intervention is understood and experienced by providers and recipients and to explore the organisational implications of embedding and sustaining the intervention in preparation for possible wider implementation in the NHS, should the intervention prove to be effective.

Objectives

1. Observe staff training workshops, focusing on training content and staff engagement.
2. Interview therapy services managers (TSMs) to understand existing UC provision across sites.
3. Observe delivery of the HOPE intervention during face-to-face home visits.
4. Interview therapists and therapy assistants (TAs) (non-qualified therapy providers) who deliver the intervention across sites.
5. Interview intervention participants, and informal carers, where carers are involved in supporting participants with the intervention.
6. Evaluate intervention fidelity and adherence using data from participant exercise diaries and TRs completed by participating therapists.
7. Explore contextual factors influencing intervention delivery.
8. Explore the wider organisational implications of embedding and sustaining the intervention.

Methods

A qualitative mixed-methods approach was used, which included non-participant observations, semistructured interviews and documentary analysis. The HOPE logic model (see *Appendix 1*, *Figure 2*) details intervention components and anticipated outcomes, together with Normalisation Process Theory (NPT); this helped focus data collection and analysis. NPT draws attention to: (1) implementation processes and (2) organisational and structural settings in which new interventions are implemented. Four generative mechanisms, coherence, cognitive participation, collective action and reflexive monitoring, facilitate the explanation of how new interventions are embedded and 'normalised' within services (see *Report Supplementary Material 1*).[17]

Process evaluation eligibility

- Participants receiving the HOPE intervention and UC, or UC only, and (where involved) informal carers.
- Therapists and TAs participating in training workshops.
- Therapists and TAs who delivered the 24-week HOPE intervention to five or more participants.
- TSMs.

Informed consent

Older people with frailty were recruited to the HERO trial after an acute admission (including any associated IC). At trial recruitment, participants provided written consent to participate in the process evaluation. Therapists and TAs provided written informed consent prior to training observations. Additional informed consent was obtained prior to all interviews. Process consent was obtained from all participants prior to observations (see *Report Supplementary Material 2*).

Sampling

Purposive sampling was planned for all participant groups. We sought to recruit participants with differing levels of frailty, level of intervention, age and gender; we sought therapists and TAs with differing years of experience and seniority. HERO recruited from 15 sites: 7 in Yorkshire (4 counties) and 8 in the South-West of England (5 counties). The process evaluation recruited from five sites in each region, these sites provided the intervention in participants' homes via existing NHS teams (see *Appendix 2*, *Table 1*).

Data collection:

Figure 1 outlines the recruitment and data collection process.

Prior to data collection, an observational framework and interview topic guides (see *Appendix 3*) were developed with

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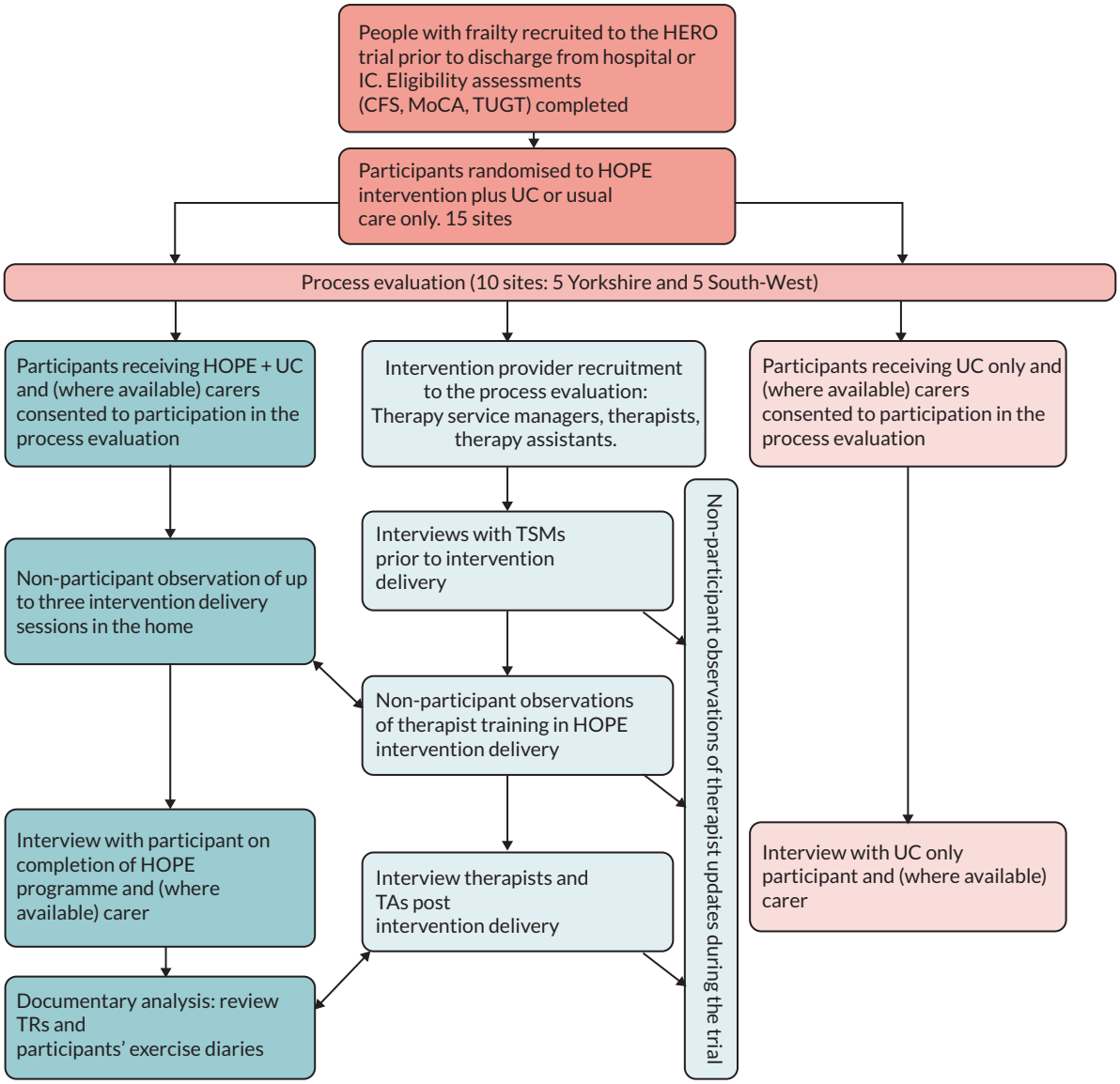

FIGURE 1 Recruitment and data collection flow chart. CFS, Clinical Frailty Scale; MoCA, Montreal Cognitive Assessment; TUGT, Timed Up and Go Test.

reference to NPT's constructs (see *Report Supplementary Material 1*). Two researchers (FZ and AJH), experienced in qualitative research, conducted most observations and interviews; process evaluation lead (DC) conducted some observations and TSM interviews in each region.

Non-participant observations of training for therapists and TAs were undertaken in 10 sites. Researchers recorded field notes, but they outlined the purpose of the process evaluation and obtained written informed consent. To supplement the training, during intervention delivery, participating therapists from each region were invited to join teleconferences with the trial manager; these provided updates on the trial's progress and encouraged therapists and TAs to discuss the trial and HOPE programme delivery issues. Researchers sought process consent and recorded field notes during teleconferences. Telephone interviews to document UC provision were conducted with TSMs in 10 sites immediately prior to delivery of the HOPE intervention.

Letters were sent to participants requesting their involvement in observation or interview; a researcher phone call then followed. Therapists were approached via e-mail or telephone call to arrange observations and interviews. Non-participant observations were undertaken during home visits to participants receiving the HOPE intervention. We observed intervention delivery for the same participants on two occasions; typically, at session 1 or 2 and at session 5. During observations, researchers

did not participate, but they discussed the intervention informally with participants and therapists before or after sessions. Researchers reviewed therapy records (TRs) and participants' exercise diaries during observations; field notes were recorded.

Semistructured interviews were conducted with participants who had been observed previously (and carers where involved) in the home, once they had completed the 24-week HOPE intervention. Interviews with a purposive sample of UC participants with similar characteristics (age, gender and frailty level) were conducted towards the end of the process evaluation.

Semistructured interviews were conducted post intervention delivery with therapists and TAs (face to face or by telephone) who had delivered the intervention to a minimum of three participants.

Purposive sampling was undertaken to ensure that TRs and exercise diaries from participants with different levels of frailty were reviewed and these were from different therapists across the 10 sites.

All interviews were audio-recorded and transcribed professionally. Interview and observational data were managed in NVivo v11 (QSR International, Warrington, UK). Data were anonymised, and participants were identified by unique identification number. Names used in direct quotations or field notes are pseudonyms.

The original protocol[14] for the process evaluation study was followed without amendment.

Patient and public involvement

Patient and public involvement[18] ensured the views of people with frailty, and those involved in their support, were considered throughout the study. The Trial Steering Committee included an older person with lived experience of frailty and a service manager from AgeUK (a national charity). The Trial Management Group included an older person living with frailty and a representative from Carer's Resource. These individuals provided advice on trial processes and potential barriers to these and the associated burden for trial participants and their carers. Involvement included people with frailty, carers and clinicians participating in a co-design approach during intervention development, consultation with people living with frailty during implementation, in dissemination of the results and planning for future intervention implementation.

Equality, diversity and inclusion

The HERO trial recruited participants from acute hospitals and linked IC services from Yorkshire and South-West England. These regions serve diverse populations (socioeconomically, ethnically and culturally) in urban and rural NHS service delivery environments. Specific measures to facilitate recruitment from South Asian communities in Yorkshire sites were used. Three research team members were of South Asian heritage and multilingual. These researchers made efforts to engage potential participants and their families in their first language if that was not English (e.g. Urdu, Panjabi and Pashto). In all sites, if researchers did not speak participants' first language, NHS interpreting services were utilised. In the main trial, 97.6% (699) participants were White, 2.4% (*n* = 17) were of other ethnicities, with data missing for 24 participants. Females represented 65.7% (486) of the trial participants.

Data analysis

An approach based on thematic analysis[19] was used in the analysis of observational and interview data, combining inductive and deductive approaches to address study aims and objectives. Analysis was a continuous process, seeking to identify commonalities and differences in data and to generate descriptive and explanatory themes. This involved reading and reviewing field notes or interview transcripts as part of immersion in the raw data. Initial coding was undertaken independently by two researchers (AJH and FZ). Preliminary codes for participant data sets were generated as data were analysed, then reviewed jointly and then discussed with a third researcher (DC) every 6–8 weeks to build consensus around emerging themes. Themes were continually reviewed in the context of the logic model and NPT's[17] constructs (see *Report Supplementary Material 1*). This process was used to develop a thematic framework which encompassed observational and interview data. These data were triangulated with findings from TRs and exercise diaries as part of the evaluation of intervention fidelity and adherence.

Findings

Context (Objectives 2 and 7)

Data were generated in two HERO recruitment hubs, Yorkshire and the South-West (five sites in each, and site numbers in the text refer to process evaluation sites). Yorkshire sites provided two-thirds of the data. The researcher for this hub worked 5 days per week, and the researcher in the South-West worked 2.5 days. In addition, trial recruitment in the South-West was lower than in

Yorkshire. Sites in the South-West were spread across five largely rural areas with low population density; travel to participants' homes in these counties could take up to 3 hours, reducing the number of participants who could be visited in the time available.

Interviews with TSMs indicated that each site provided some form of post-IC rehabilitation for older people with frailty, where pre-discharge assessment indicated the need for further support in the home, typically of up to 6 weeks' duration (see *Appendix 4*, *Table 2*). Home visits by physiotherapists to treat mobility problems were frequently mentioned, but this was often subject to waiting lists of up to 12 weeks; with one service reporting 200 on their waiting list. Reablement services were also mentioned, again of short duration, 2–4 weeks; these did not always include therapy provision, instead being led by social care teams. Relationships between health and social care services varied by site and by hub, with closer alignment between these services more evident in the South-West. Older people with frailty could be referred to community falls clinics. One service offered, on a referral basis, for people with complex mobility problems, a modified Otago exercise programme[20] adapted to individual's need. Other services also referred people, with frailty identified as being at risk of falls to group-based Otago programmes (up to 6-month duration), or strength and balance groups provided outside the home (duration 8–12 weeks); these were more commonly mentioned by TSMs in the South-West. In addition, older people with frailty were given information about exercise classes for older adults run by local councils or walking programmes offered by a national charity (AgeUK). Review of the different forms of rehabilitation support offered in both hubs indicated that, apart from Otago programmes (outside the home), which were generally considered to be too demanding or inaccessible for people with frailty, no service provided individualised, graded exercise programmes similar in approach, content or duration to the HOPE programme.

Participants

In total, 105 participants were included in the process evaluation. Ten therapist/TA training sessions (each 4–4.5 hours' duration) and 8 therapist updates were observed. Sixty-one intervention delivery sessions were observed, and 35 intervention and 19 UC participant interviews were conducted. Ten TSMs, 19 therapists and 4 TAs were interviewed. Fifty TRs were reviewed (see *Appendix 5*, *Table 3*).

Non-participant observations of home visits typically lasted for 25–45 minutes, participant interviews between 40 and 90 minutes, therapist interviews for 30–60 minutes and TSM interviews for 25–35 minutes. Unless indicated otherwise, direct quotations are from qualified therapists.

Training sessions (Objective 1): making sense of and engaging with the intervention (coherence and cognitive participation).

Therapists and TAs recruited to the process evaluation (n = 23) were predominantly female (74%), most therapists reported > 5 years post-qualifying experience (69.5%) and were in senior NHS roles (83% Band 6–7). Three of four TAs were NHS Band 4, indicating the completion of a recognised vocational training programme and were able to work independently as directed by a therapist (see *Appendix 6*, *Table 4*). NHS Banding – Bands 2, 3 and 4 are non-registered staff, and Bands 5–7 are registered Allied Health Professionals. Increasing band number represents an increased level of seniority. These characteristics are consistent with therapists and TAs across all sites in the HERO trial.

Therapists' and TA's understanding and perceptions of the HOPE intervention are integrated in the training, implementation and fidelity sections of this report. Training was delivered in single 4- or 4.5-hour sessions in each site by the trial manager (physiotherapist), a researcher (physiotherapist) and Clinical Trials Research Unit trial lead. It included formal presentations, discussion of intervention elements, including use of BCTs and a case-based group activity. Training was designed to equip therapists and TAs with knowledge and skills to deliver the intervention with fidelity and facilitate participant adherence. Training was a key element in developing coherence, making sense of the intervention and its components and engaging participants in committing to intervention delivery in their services. Interactive discussion on using BCTs (see *Appendix 1*, *Figure 2*) was important. Many therapists noted that they were not familiar with the titles of these techniques, but they used many of them routinely in practice, including graded tasks, setting individual goals, encouraging self-monitoring and praising achievement and progress. Trainers' professional backgrounds in physiotherapy lent practice credibility to the intervention, facilitating interaction with therapists and TAs, which are key elements in encouraging legitimation and enrolment. Observations suggested that training enabled therapists to recognise familiar approaches to encouraging exercise in older people with frailty and also to differentiate the structured intervention approach from their usual practice. Therapists reported that they found training to be useful and sufficient to enable them to deliver HOPE.

> *The training was really good, really informative, […] the process was all explained really clearly, it was clear what we needed to do, we could ask questions, we had scenarios that we had to work through in groups […], if this happened what would you do, just so that we knew if we came across that.*
>
> *Emily, site 4*

> *I remember at the time thinking that it was quite well covered, and I left feeling that I kind of knew what I was meant to be doing.*
>
> *Jill, site 6*

Non-participant observations confirmed that training content and approach were consistent across sites and across time. In later sessions, trainers incorporated examples of barriers and facilitators to intervention delivery in discussions and case-based activity.

Implementation (Objectives 3, 4, 6 and 7): making sense of, engaging with the intervention and working with others to deliver the intervention (coherence, cognitive participation and collective action)

Trial data indicate that, across the 15 HERO sites, on average, therapists saw four HOPE intervention participants each; some saw fewer and some more (n = 410, mean: 4.3, median: 3.0, range 1–15). The mean number of contacts per participant across trial sites was 12, so while the number of participants treated by each therapist may appear to be low, the average number of contacts (mean: 12.1, median 13.0, range 0–26) and intervention duration meant that therapists were working with intervention participants for an extended period.

Therapists' understanding of the trial and tasks integral to the intervention impacted on their approach to programme delivery. At several sites, due to slower-than-anticipated recruitment, there was a delay between completing training and commencing delivery of HOPE. Interviews, observations of home visits and update teleconferences indicated that this had an impact on cognitive participation and relational integration, that is, on therapists' recall of trial procedures and on their confidence in HOPE programme delivery.

> *We did possibly half a day (training), I can't quite remember, where we all got together and they went through the purpose of the trial and what they were hoping to achieve, some of the paperwork. […] that was before we then started. I think it was quite a long time before, in our area, we got anyone on the trial.*
>
> *Jill, site 6*

Therapists and sites varied in initiation of the implementation: some reported using training materials to refresh their memories, and others (particularly less experienced therapists) discussed processes with line managers or TSMs or attended trial therapist training updates. Some sites organised for therapists to carry out initial home visits for first HERO participants in pairs to boost confidence and gain experience of the intervention delivery. In this way, therapists and teams took action individually and collectively in preparing to implement the intervention.

The 24-week HOPE programme was intended to provide weekly contact between therapist and participant through home visits or telephone calls. It became evident that there was variation in the collective action and contextual integration (local approaches to intervention delivery) between sites, particularly in how delivery was organised within and across teams. All but one team contained qualified therapists (Bands 6 and 7) and unqualified staff (TAs) (Band 2 or 4). At some sites, therapists worked largely on their own and covered wide geographical areas. In other areas, teams consisted of therapists and TAs working independently or jointly. Observations and interviews identified the variation between sites, often influenced by usual practice at sites. Approaches included: (1) first home visits by qualified staff, then all subsequent visits and calls by TAs; (2) all visits and calls in weeks 1–8 carried out by therapists, then subsequent calls carried out by TAs; (3) all visits and calls carried out by therapists (no TAs at this site); (4) most visits carried out jointly by a therapist and TA, most calls carried out by TAs and (5) home visits and calls carried out by therapists or TAs interchangeably.

In two sites, one in each hub, intervention delivery was by therapists and TAs normally working in acute hospital settings. Non-participant observations and interviews suggested that these therapists faced extra implementation challenges:

> *I mean it's totally different (than) when I was in community because obviously the therapy, the timescales, you've got slightly different pressures and when you go and see people in their own homes you kind of, you're setting slightly different goals to the ones we're setting in here because they're very unwell here (in hospital), […].*
>
> *Carrie, site 3*

Although not typical of all sessions provided by acute-sector therapists and TAs, non-participant observations indicated that some participants in these sites were visited by different therapists at each session. Sessions

appeared to be task-focused, less person-centred, and there was less time for interaction with participants and their individual engagement with the HOPE programme (see *Report Supplementary Material 3*). In both hubs, some therapists and TAs reported that they believed the structured nature of the programme meant that therapists were 'overqualified' to deliver it and it may be more appropriate for TAs to deliver:

> *I don't want to say it's a waste of a qualified (therapist's) time but because it's quite a simple exercise programme, I think for a qualified to go and deliver it when there's obviously the pressures of, their usual job, […] I think it's more suited for, like I said I'm band 4 and I think it's kind of more suited for my level.*
>
> *Liz, TA, site 8*

> *Int: does it fit better with qualified staff delivering it do you think …?*
> *Not necessarily. I'd say, no, I'd be happy about a Band 4, delivering it.*
>
> *Alison, site 6*

While this kind of comment was not unusual, home visit observations indicated that experienced therapists were more able to adapt the intervention to participants' needs, to accommodate changes in participants' physical condition or in motivation or to work with carers to increase the likelihood of adherence to the exercise programme.[20]

Many therapists appreciated the opportunity as professionals to participate in a research trial; however, in some cases, their motivation declined over time as their work pressures increased. This impacted on the commitment of the participants to sustain the intervention:

> *I was really excited when I heard about it. It sounds awful, not as excited now because it's been going on for so long, I think we all lost momentum and having said that, we had winter pressures, we had summer pressures, when you do have this alongside going on which is my main job, this kind of takes a little bit of a backburner and less of a priority.*
>
> *Carrie, site 3*

This exemplifies the challenges in activation and relational integration (working together to introduce and embed new practices in routine work) faced by some therapists in maintaining accountability for intervention delivery. Ensuring that the division of labour within teams meant that intervention delivery was sustained over time, this demonstrated teams' capacity to incorporate the HOPE programme content alongside usual therapy provision in their local area (skill set workability and contextual integration). Interview data suggested that most therapists supported the rationale for an extended rehabilitation programme for people with frailty, but several expressed uncertainties about integration of the HOPE programme into current NHS services:

> *I think valuable. It's whether the service has the time to facilitate it on a bigger scale.*
>
> *Debbie, site 6*

The TSM at the same site said:

> *I certainly know the team would love to be able to give longer intervention and really kind of achieve peoples' aims as much as they possibly can do but it is just about having the staffing to support that long-term.*
>
> *Louise, TSM, site 6*

While variation in how teams were organised to deliver the intervention was evident, we found no evidence that differing organisational approaches led to significant differences in implementation of the intervention with fidelity.

Fidelity (Objectives 3, 4, 6, 7 and 8): working together to implement the intervention in different services (interactional workability and relational integration in collective action).

Fidelity refers to the consistency of what is implemented with the planned intervention,[15] that is, how closely delivery of the HOPE programme was as intended in the trial protocol and therapy manual. A summary of factors influencing fidelity in HOPE programme delivery is provided below, and a more detailed report is published in Hall *et al.* (2024).[21]

We reviewed 50 TRs across 10 sites. The level of completion was comprehensive in 11 (22%) cases, adequate in 31 (62%) and poor in 8 (16%) (see *Appendix 7*, *Table 5*). Records demonstrated that most therapists attempted to deliver all five face-to-face contacts, making multiple attempts to rearrange visits when participants were unavailable. Intervention delivery and adaptations made were largely recorded consistently. Follow-up phone calls were less well documented.

The exercise diary was intended as a motivational tool to encourage participants to take ownership of the programme, to help them keep track of their practice

and act as an aide-memoire. Diary review indicated good levels of completion overall. Tick-box sections indicated that exercises had been undertaken and were more often complete than were weekly notes' sections related to the week's exercises. Some participants were conscientious in carrying out and recording exercises, and others were less compliant.

> *Int: Did people like it (exercise diary)? Did people fill it in did you find …?*
> *I think they like to be proud of what they've done. They like to show us, [….] that's something you don't get when you don't get the face-to-face. Because I'd always look back and go 'oh, you know, that's really good'.*
>
> *Jenny, site 9*

Some participants reported that they forgot to complete diaries; for others, it appeared that they lacked motivation in both exercise adherence and diary completion. Therapists were aware of this and tried to include partners or carers:

> *She struggles with that (diary completion), so we've tried to get her husband involved with ticking the boxes, I tried to say to her that it is just literally ticking a box, she doesn't necessarily need to write comments and things, but she just hasn't engaged with it at all.*
>
> *Briony, site 1*

Observations of home visits and interviews indicated that individual goal-setting skills, important in therapists' usual work and a key BCT in the HOPE programme, were variable. Specific, measurable, achievable, relevant, time-bound (SMART) goals were discussed during training with all therapists, indicating familiarity with the approach. However, our evidence indicated that there was sometimes uncertainty among therapists about what constituted SMART goals and how to set them effectively. Documentary analysis demonstrated that goal setting was recorded variably, with few SMART goals being evident. Examples not using the SMART approach included:

> *HV (home visit)1: to keep muscles strong.*
>
> *Therapy record, participant a, site 3*

> *HV1: Goal 1: to improve walking distance outside. Goal 2: to go dancing with wife.*
>
> *Therapy record, participant b, site 3*

Therapists and TAs reported what they perceived to be strong emphasis on the methods and rigour necessary for ensuring fidelity within an RCT, particularly in early training sessions. Interviews suggested that some therapists understood research to be a rigorous but inflexible process that is necessary to ensure objective trial outcome evaluation. To some extent, this was reinforced by the nature of the HOPE programme itself, which was perceived by some therapists as prescriptive, with the manual seen as a step-by-step guide with no room for flexibility. These therapists were concerned with following HOPE programme guidance to the letter to ensure that the intervention was delivered with fidelity across patients, teams and sites.

> *Because it's a research trial I don't feel I would suggest that (adaptation of exercise prescription) there's probably an awful lot of time and effort and discussion gone into choosing those particular exercises therefore if little (therapist name) comes along and starts tweaking them […] that's not ideal, so I think your exercises that you've (trial team) chosen are there for a reason so I don't tweak them, I wouldn't dream of it.*
>
> *Sue, site 4*

Observations indicated that key intended intervention components, including the five home visits, introduction and monitoring of graded exercises and follow-up phone calls, were largely delivered as intended but were impacted by contextual, therapist and participant-based factors. Some therapists felt that the intervention level (1–3) indicated by the Timed Up and Go Test test was too great for some participants and risked compromising participant adherence. To address this, and where exercise diary monitoring and review with participants identified reduced adherence, therapists reassured participants that they could reduce the exercise level, intensity or dose and revised targets, and goals were agreed. This approach, demonstrated most by experienced therapists, appeared more likely to be associated with programme completion. In instances where therapists or TAs adopted a more rigid approach and did not adapt dose or frequency of the exercise prescription, sometimes driven by the perception that they could not deviate from the protocol and therapy manual guidance, there was some evidence that participants were less likely to adhere and potentially more likely to withdraw from the programme.

Observations and TR review indicated that BCTs were evident in many therapist–participant interactions. BCTs more commonly observed included introducing graded tasks, use of verbal persuasion about exercise capability, suggesting reorganisation of the home environment to facilitate exercise completion, encouraging participant self-monitoring of progress and encouraging two-way feedback on progress through the exercise diary and praising progress in home visits. Where problems arose

in exercise prescription, problem-solving and graded task revision were frequently evident (see *Report Supplementary Material 4*). The use of BCTs in follow-up telephone calls was less evident and was more commonly restricted to verbal encouragement and praise to continue exercises prescribed.

The total number of follow-up telephone calls was not always completed as intended. Several reasons were evident, including participant non-response, participants with hearing deficits finding calls difficult to hear and staff time and availability to make calls. In one case related to hearing difficulties, the therapist replaced weekly calls with 3-weekly home visits. Concerned with maintaining fidelity, this variation was agreed by the therapist with the trial manager.

> *I was ringing him and saying 'are you doing your exercises?' That's when he'd get annoyed when I was bothering him about his exercises. He was quite hard of hearing as well so that was a difficult one on the phone.*
>
> *Nichola, site 1*

The work done by therapists and TAs to understand and appraise the intervention and how it affects their day-to-day roles (coherence and cognitive participation) is important to help understand intervention delivery. There were elements of the HOPE programme that therapists reported would need adapting to integrate HOPE into standard practice, thus the systemisation of practices. Some therapists felt the last contact should be a face-to-face visit rather than a telephone call. Our data suggested that many therapists were uncomfortable with using telephone contacts, particularly to progress exercises (to increase repetitions), as this represented a new way of working and differing significantly from their standard practice where they have progressed exercises by undertaking face-to-face contacts:

> *I think it's such a short period for the 5 initial visits that you see them and then such a long period that you don't, I'm not saying they don't do them (exercises), but you can only go on their word and what they say to you on the phone, so for me it would have been nice to do maybe 1 or 2 (home-visits) further down the line just to kind of keep track of that.*
>
> *Jane, site 7*

Similarly, the perception that the intervention was generic led some therapists to believe the programme was insufficiently tailored to individual needs. The lack of tailoring was deemed by some therapists as being inferior to what they would normally offer this patient group, and they questioned the validity of the programme:

> *It's very much set up that you do them (exercises) breakfast, lunch and dinner, and yes you do the work around 'so where are you going to stand and where are you going to sit before or afterward or whatever? Here's the pen and here's the paper'. But I think it's very much given to them. There's not enough opportunity for them to explore their own options and to make, and for us to make adaptations to make it really pertinent to the person.*
>
> *Cathy, site 8*

However, most therapists indicated that a HOPE like programme was a good fit for the selected population. Several commented that participants were sometimes pleasantly surprised at how easy and manageable the exercises were and that most seemed happy to carry them out three times daily on 5 days a week. Some therapists initially questioned the novelty of the HOPE programme for addressing frailty in older people as they had experience of delivering Otago exercises to people at an increased risk of falls. However, in interviews, therapists familiar with the Otago programme conceded that they understood that HOPE was aimed at more frail people who may not be able to benefit from the more demanding higher-level exercises associated with the Otago programme and who would normally not be asked to undertake sustained exercise programmes delivered outside the home.

Overall, acknowledging the issues identified above, the intervention was largely delivered with fidelity. Observations and interviews indicated that, over time, therapists understood that the intervention could be delivered with fidelity and also with some flexibility to ensure that it was accommodating participants' needs.

Participants experiences of the HOPE intervention (Objectives 3, 5 and 6)

Seventy-eight people with frailty were recruited to the process evaluation (see *Appendix 8*, *Table 6*); their mean age was 83 years, and the majority were experiencing mild to moderate frailty (n = 58, 74%). In the intervention group, 72% (n = 43) were allocated to HOPE level 1 exercises, with 20% (n = 12) at level 2 and 8% (n = 5) at level 3. Females represented 63% of intervention group participants and 55% in the UC group. These participants did not differ significantly in age, frailty level or HOPE exercise manual level from participants in the trial as a whole.

Intervention acceptability was largely good, with many participants identifying physical improvements such as 'feeling stronger' or 'more confident in walking' associated with it. Although participants did not comment directly on the use of BCTs, they appreciated therapists' expertise and support, and their approach to motivating them to engage with the exercise programme.

> *[…] they've been very supportive, very helpful, they explained what's got to be done, make sure I understood and I felt they're interested in what I'm doing, they're there to try and help me and not think, oh I've going to tick that box so I've got to say this, it's very well done.*
>
> *Robert, site 6*

Several participants reported limited understanding of the HOPE intervention at recruitment; many agreed to take part to 'help others', viewing their involvement as helping others benefit:

> *If it's going to do somebody some good somewhere down the line, I'll take part in anything.*
>
> *Eric, site 5*

Several participants seemed not to consider themselves 'frail' or appreciate that the intervention was designed for someone like themselves. Some were initially uncertain whether the exercises would have any personal benefit. However, as benefits became evident after a few weeks, adherence to and satisfaction with the programme increased. Other participants reported that they knew they were experiencing physical deterioration with ageing, and for many, living alone required them to stay as fit as possible. Many wanted to reduce their risks of falls, to remain independent, to slow deterioration and to stay in control of their lives as long as possible.

> *Because I want to stop falling down. (Laughs) I hated it. I don't like to feel unwell I like to be able to please meself what I do. I don't want to be, you know, say you can't do this, you can't do that, that wouldn't do for me.*
>
> *Peter, site 1*

Participants often reported that the social interaction inherent in home visits, and in follow-up telephone calls, was an 'added intervention benefit' which increased satisfaction and facilitated adherence. The intervention provided an opportunity to engage with someone with skills to help maintain their independence, and therapists also noted the importance of this contact for some participants:

> *The fact that somebody was taking an interest, she was quite a lonely person, […] she may not have done brilliantly well physically, but she signed up for the programme probably because it was really enjoyable to have somebody come round every week, or phone them up every week.*
>
> *Therapist 23, site 7*

Individuals' motivation to participate in HOPE appeared to be closely linked to determining their likely adherence to the intervention. This links to legitimation in cognitive participation, whereby the person seeks to understand the importance of participating in a specific practice. Goal setting was described as providing something to work towards and enjoyment when goals had been achieved. This was particularly useful for participants who reported that they lacked motivation to exercise.

> *Somehow or other I've got to be incentivised, and this programme in fact did provide us the incentives, because there was a programme to keep up to, and the follow-up was by the physiotherapists, and so if you needed it that was your incentive.*
>
> *Mary, site 5*

Over time, participants described their progress in terms of exercises becoming easier and a sense of feeling less tired after exercising. Carers often reported tangible improvements that acted as a motivation for participants. Most were happy to continue exercising to maintain their progress after they had achieved their goal(s) before the end of the programme:

> *I said, 'well when I did it first time I felt, I've got to admit I felt a bit tired'. She said 'right' and said, 'how do you feel now?' 'Well, I don't feel so bad'. I think it was just the initial increase but then I says 'no', I says 'I'm alright' […] She says, 'oh you're coming on very well, keep doing your exercises'.*
>
> *Liam, site 5*

But, for some participants, the HOPE programme exercises were perceived as an additional burden after a period of illness and hospitalisation and were one factor in participants, often with complex health problems withdrawing from the intervention:

> *Well, yeah, when you're in hospital it's quite easy to say yes but when you come home and you're on your own and you've got everything to do and your balance is gone, exercises is the last thing you want.*
>
> *Jean, site 2*

Experiences of UC participants (Objective 5): despite limited memory of recruitment to HERO, UC participants were very willing to discuss their experiences of post-discharge rehabilitation and frailty more generally. Overall, experiences of rehabilitation provision accorded with TSMs' descriptions of services available in each site.

> *He was supposed to have a physio coming once every week for a couple of weeks, but it never happened unfortunately, because he could do with some exercise.*
>
> *Toby, site 10*

> *Once I got home, they sent a physiotherapist to help me walk. And she came once a week for three weeks and she would take me for a walk, and she gave me exercises to do, and gradually I improved.*
>
> *Edith, site 3*

Participants valued home-based support provided by NHS or Social Care staff, but they noted that this was typically of short duration and was often supplemented by support with activities of daily living from spouses, adult children, friends and carers.

> *When I first came out of hospital when I'd been really ill with this infection, I've a really good friend over there, and she was a carer for thirty-five years. She's a little bit younger than me […], the first shower, she washed me all, and then now she's, she'd just sit and watch me and now I go on me own.*
>
> *Annie, site 5*

For those who had reportedly been active during their lives, exercise or remaining active and independent as an older person remained an important goal:

> *You don't get anywhere without the work that you put in […] I have had two hip replacements, […] because if you're only going to do well if you can get those, that muscle strength back, so I am very aware of how important your muscles are […].*
>
> *(Violet, site 4)*

> *I bought a treadmill when I came out of hospital so, and I sort of go on it on very slow walk and I do about 3, 4 minutes at a time, and I try and do it about three times a day at least.*
>
> *Jack, site 6*

But, for others, the challenge of living with complex health problems dominated their thinking about what they could achieve and what kind of activity they wanted to engage in:

> *Well, you see there I can't do that because of me back, I find it hard to sit and I'd have to prop meself up by my hands […] Mm, see if I stand, I stand bent, like that, I can walk around a bit, but I can't straighten me back up so there's no way I could stand straight.*
>
> *Maureen, site 4*

> *I don't think folk, there isn't many that would do it (exercises), When you're getting to this age, you can't be bothered (laughs). I couldn't do it, I'm sure I can't. […] I'm not sporty, I'm not an exerciser so I just carried on with a normal life of walking, going out and what not.*
>
> *Ted, site 3*

Similar comments were broadly evident across sites in both hubs. UC interviews indicated that people with frailty largely understood the potential value of regular exercise in enabling them to remain independent and to prevent the physical decline they associated with ageing. However, when asked if they themselves routinely engaged in exercise in or outside the home, individually or in groups, UC participants' views on exercise participation tended to reflect the beliefs and attitudes developed across their lives. Some indicated that they had always valued exercise, would have welcomed being in the intervention group in HERO and outlined the way in which they tried to include exercise in their everyday lives. Others indicated that while they had always valued exercise, ill health, loss of a partner, increasing frailty, fear of falls and limited opportunities to get to group exercise programmes meant that they felt they could no longer participate in structured exercise. The remaining participants indicated some ambivalence towards exercise in general, indicating that it had never been a priority for them and was not something that at this stage in their lives they wanted to engage with. UC interviews provided no evidence that participants were receiving home-based structured exercise support like the HOPE programme.

Discussion

The process evaluation sought to understand how the HOPE intervention was implemented, experienced and understood by providers and recipients and to explore the organisational implications of embedding and sustaining the intervention in the NHS. Our evidence indicates that the intervention was largely implemented and delivered with fidelity across sites in both hubs. The intervention proved acceptable to most participants, but it was clear that frailty typically involves fluctuating states of health and well-being, and for some participants, completing exercises 3× daily for 5 days a week was challenging. Adherence to exercise programmes for frail older people is reportedly poor, with adherence to simple community-based exercise interventions as low as 10%.[22,23] The HERO trial findings did not demonstrate that extended rehabilitation provided through the HOPE programme led to an increase in health-related quality of life when compared to the UC group. However, those who

completed the HOPE programme acknowledged that the perceived benefits outweighed the initial physically demanding nature of the exercises.

Home-based exercise programmes for people with frailty need to be flexible and dynamic. The HOPE intervention was designed to provide flexibility in delivery, but it was evident that some therapists, mainly the less experienced, and TAs, perceived they could not make changes to prescribed exercises within a RCT context. However, more experienced therapists used their clinical judgement to adapt the exercise programme to individual's need without compromising fidelity. Robinson *et al.*[24] suggest that (physio)therapists need to move from experts to enablers and aim to let patients take more control of their rehabilitation. In HOPE, BCTs were incorporated effectively to try and increase engagement and ownership. Participants who engaged with the programme successfully had often identified a need for support and were likely to have goals they wanted to achieve. Although the quality of goal setting evidenced in TR reviews was variable, both therapists and participants noted the importance of goal setting, a key component of exercise interventions for older people.[25–27]

It was evident that a wide range of support and/or rehabilitation interventions were offered in all HERO trial sites. However, it was also clear that except for group-based Otago programmes, which were reportedly too demanding for people with moderate-to-severe frailty, most rehabilitation programmes were of short duration and did not always meet the needs of this population. The extended nature of the HOPE intervention was perceived positively by therapists, TAs, TSMs and people with frailty. Our findings indicated that if introduced into NHS services, the intervention may best be delivered using a joint approach, whereby initial and mid-point assessments were undertaken by an experienced therapist with ongoing home visits and follow-up calls managed by TAs, with supervision from experienced therapists to enable individual participant exercise programme problem-solving where required. TSMs acknowledged the potential value of an extended rehabilitation programme like HOPE, but they held the view that the duration of the programme would place additional workload demands on community therapists and TAs. This, they argued would need to be addressed with service commissioners if such a programme was to be integrated into NHS services going forward. In addition, therapists' and TAs' views on their training to deliver the HOPE intervention indicated that if the intervention was to be included in UC practice, a structured approach incorporating routine refresher training may be necessary to ensure consistent content and approach in services where staff turnover is inevitable.

Strengths

We reported the experiences of therapists, participants and their carers of receiving the HOPE intervention, comparing these with a similar group of UC participants. We incorporated interviews, non-participant observations and documentary analysis. Triangulating data from these different sources increases the reliability of the findings. NPT proved to be a valuable theoretical lens to analyse the data relating to implementing the HOPE intervention.

Limitations

We aimed to recruit a purposive sample of participants with frailty; however, slow recruitment rates at the beginning of the trial meant that convenience sampling was used for some of the data collection. Similarly, it proved difficult to recruit carers as many participants lived alone, and where family carers were involved, often their commitments meant that we were unable to involve them in the process evaluation. These issues may have impacted the extent to which those recruited were representative of the population targeted in the HERO trial.

Conclusion

Delivering an exercise intervention to frail older people is complex due to a multitude of physical and psychosocial factors and the interaction between these factors. It is evident that any intervention needs to be highly flexible and adaptable to meet the needs of each participant. HOPE was perceived to be an acceptable extended rehabilitation intervention for older people living with frailty, which, with appropriate resourcing, could be used in community-based rehabilitation such as IC settings as part of the growing range of rehabilitation interventions designed to reduce hospital (re)admission in older people with frailty.

Future research recommendations

- Future intervention development should adopt a coproduction approach, involving older people with frailty, carers, physiotherapists and support workers, to ensure that exercise programmes are acceptable, feasible and appropriately flexible for this population.
- Further research is needed to evaluate the effectiveness of structured, individually tailored, exercise interventions like HOPE within both inpatient and community-based IC settings, recognising the variation in delivery models across health services.
- Research should explore delivery models that utilise TAs under the supervision of qualified staff,

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with a focus on optimising workforce capacity while maintaining fidelity and effectiveness of rehabilitation programmes.
- The role of BCTs in supporting engagement and adherence should be further investigated, including strategies for enhancing therapists' confidence and competence in using these techniques consistently.
- Research should explore the integration of digital tools – such as video consultations, remote monitoring and electronic exercise diaries – into rehabilitation programmes for older people with frailty, particularly in rural or under-resourced areas.
- Longitudinal studies are required to assess the sustainability of intervention effects, including long-term functional outcomes, independence and healthcare utilisation beyond the initial 24-week programme period and typical follow-up of up to 1 year.
- Implementation research should examine how service-level factors, including staffing structures, training needs and commissioning priorities, influence the integration and scalability of extended rehabilitation interventions within routine health care.

Additional information

CRediT contribution statement

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Patient data statement

The manuscript does not include data routinely collected by the National Health Service.

Data-sharing statement

Data supporting this work may be available on reasonable request. All requests will be reviewed by relevant stakeholders based on the principles of a controlled access approach. All data requests would be subject to review by a subgroup of the process evaluation team, which will include the chief investigator, process evaluation lead and data guarantor. Access to anonymised data could be granted following this review. All data-sharing activities would require a data-sharing agreement. Requests to access data should be made to a.p.clegg@leeds.ac.uk in the first instance.

Ethics statement

The HERO trial and embedded process evaluation was approved by the Yorkshire and Humber – Braford Leeds Research Ethics Committee (17/YH/0097) on 22 June 2017.

Information governance statement

Bradford Teaching Hospitals NHS Foundation Trust; the University of Leeds; and the University of Exeter are committed to handling all personal information in line with the UK Data Protection Act (2018) and the General Data Protection Regulation (EU GDPR) 2016/679. Under the Data Protection legislation, Bradford Teaching Hospitals NHS Foundation Trust

and the University of Leeds are joint Data Controllers, and you can find out more about how we handle personal data, including how to exercise your individual rights and the contact details for our Data Protection Officer here: https://ctru.leeds.ac.uk/privacy/.

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Claire Hulme reports NIHR grant funding paid to her institution and reports being a Trial Steering Committee/advisory group member of NIHR, Royal College of Nursing, National Institute for Health and Care Excellence and Nuffield funded projects and being a member of NIHR grant funding panels (2012–7).

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Ellen Thompson reports no conflict of interest.

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List of supplementary material

Report Supplementary Material 1
Normalisation process theory

Report Supplementary Material 2
Example participant information sheet

Report Supplementary Material 3
Home-based Extended Rehabilitation for Older people PE observation of therapist visit: field note example 1 (abridged)

Report Supplementary Material 4
Home-based Extended Rehabilitation for Older people PE observation of therapist visit: field note example 2 (abridged)

Supplementary material can be found on the NIHR Journals Library report page (https://doi.org/10.3310/GJAC2501).

Supplementary material has been provided by the authors to support the report and any files provided at submission will have been seen by peer reviewers, but not extensively reviewed. Any supplementary material provided at a later stage in the process may not have been peer reviewed.

The supplementary materials (which include but are not limited to related publications, patient information leaflets and questionnaires) are provided to support and contextualise the publication. Every effort has been made to obtain the necessary permissions for reproduction, to credit original sources appropriately, and to respect copyright requirements. However, despite our diligence, we acknowledge the possibility of unintentional omissions or errors and we welcome notifications of any concerns regarding copyright or permissions.

List of abbreviations

BCT	behaviour change technique
HERO	Home-based Extended Rehabilitation for Older people
HOPE	Home-based Older People's Exercise
IC	intermediate care
NPT	normalisation process theory
RCT	randomised controlled trial
SMART	specific, measurable, achievable, relevant, time-bound
TA	therapy assistant
TR	therapy record
TSM	therapy services manager
UC	usual care

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Appendix 1

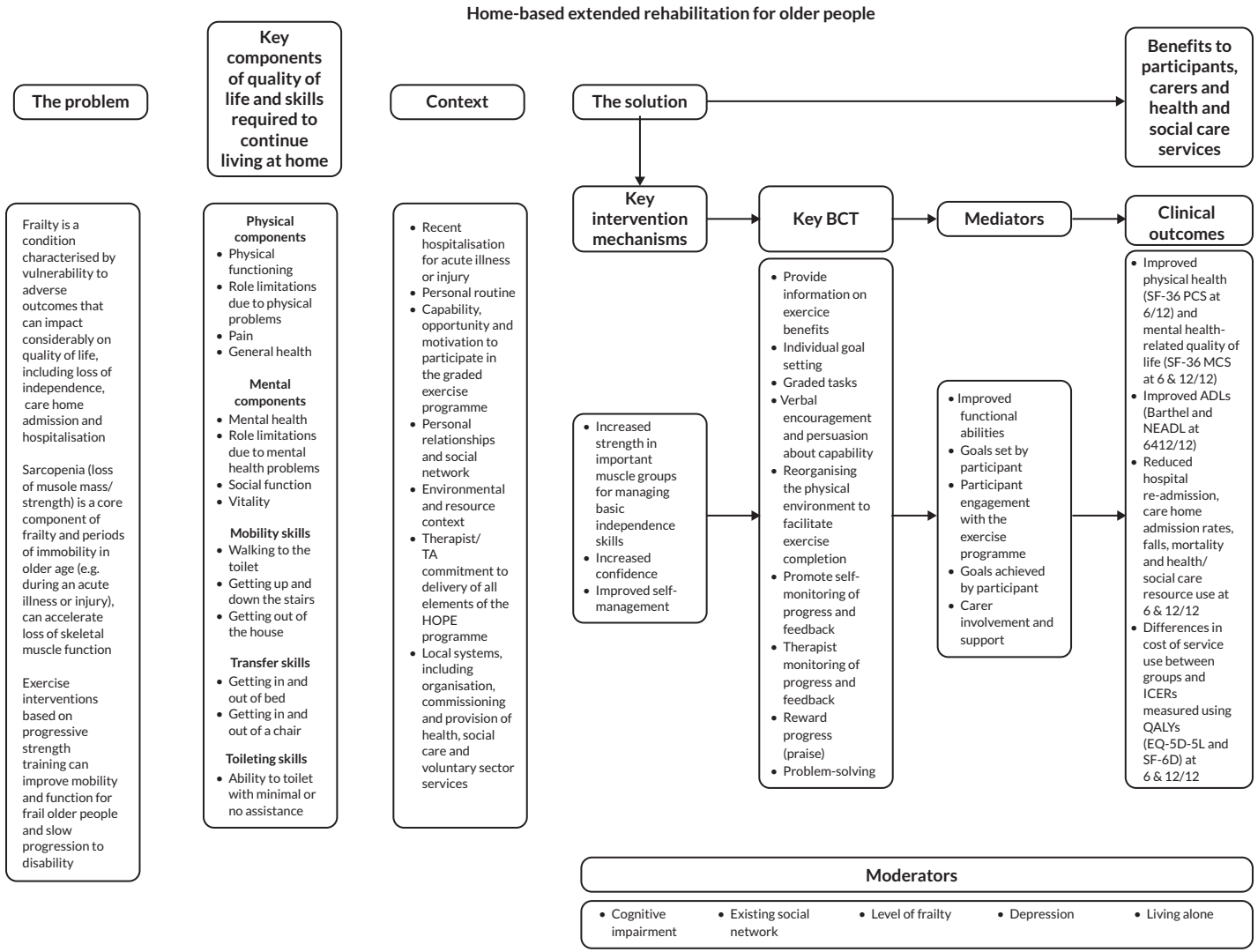

FIGURE 2 The HOPE logic model. ADL, activities of daily living; EQ-5D-5L, EuroQol-5 Dimensions, five-level version; ICER, incremental cost-effectiveness ratio; MCS, mental component score; QALY, quality-adjusted life-year; SF-36, Short Form questionnaire-36 items; SF-6D, Short Form questionnaire-6 Dimensions.

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Appendix 2

TABLE 1 Process evaluation sites

Site	Location
1	Yorkshire
2	Yorkshire
3	Yorkshire
4	Yorkshire
5	Yorkshire
6	South-West
7	South-West
8	South-West
9	South-West
10	South-West

Appendix 3

Observational framework:

HERO Trial Process Evaluation
Therapist Home Visit
Observation Guide
Record
Date and time of observation
Participant ID
Participant DoB
Therapist ID
Therapist Visit No
Observation No
Researcher Name
Includes: Diary and TR review

Aims and objectives of the observations

1. To develop and understanding of how the intervention is implemented by the therapist
   - describe therapist's interaction with patients and family
   - describe therapist's activities related to the intervention
   - describe context and setting
   - identify and describe how therapist deals with any issues
   - identify and describe facilitators or barriers to delivery of the intervention.
2. To develop an understanding of how participants (and family) engage with the intervention
   - describe how participants and carers interact with each other and with the therapist
   - identify and describe how participants carry out or engage with intervention related activities
   - identify and describe any barriers or facilitators of engagement
   - describe how participants raise issues.

Areas of observation (after Spradley, 1980)[28]

1. Setting and spaces
   - Describe the home (e.g. access to front door) and layout of room(s) in which the meeting is held, or in which participant is doing exercises. Is the exercise area spatially separate or integrated into the rest of the room? How are the manual and diary and any other equipment used spatially located?

2. Objects
   - Identify and describe objects used by participant or therapist (e.g. mobility aids, chair, table and wall)
   - Are different objects used for different acts or activities; and/or by different actors?
   - Use of the manual; diary; TRs throughout

3. Participants/actors
   - Who is present in the room?
   - Are people present throughout? (comings and goings, e.g. carers and family, visitors and phone calls)

4. Activities
   - What activities take place?
   - In which order do activities take place?
   - How do Physiotherapists implement the training?
   - What instructions are given? How are they given?
   - What BCTs are used by PTs? For example, are goals mentioned?
   - How is progress promoted?
   - How do PTs adapt the routine or exercises to the individual participant?
   - How are carers and family members involved by PTs or participants?
   - How do therapists and participants relate to each other (e.g. use of first names and use of humour/joking)
   - How well do participants seem to know the exercises? How confident are they? For example, do they struggle to follow instructions or to remember them?
   - What is the level of engagement of participants in relation to the exercises and the study (and family/carers?)
   - How well are the exercises integrated into a daily routine?
   - What issues do participants raise, and how do PTs respond to these verbally or non-verbally?

5. Feelings
   - What feelings do participants convey throughout the session? For example, enjoyment, confusion, trust and enthusiasm (or lack of)?
   - Any evidence of therapists' feelings in what is said/done and how it is said/done? [e.g. frustration, (im)patience, empathy, confidence in the delivery of intervention and believe in the value or efficacy of the intervention]?

6. Time and timing
   - How are activities timed
   - What is the sequence of events or activities?
   - Any particular focus?

Interview topic guide:
HERO Process Evaluation
Intervention Participants
Interview Topic Guide
Introduction:
Thank you for taking part in the HOPE *programme. As I indicated (in my letter/on the phone), at the same time, as agreeing to take part in the* HOPE *programme, you kindly agreed to participate in an interview with us. The purpose of our conversation today is to learn a little bit about yourself, to understand your experiences of the* HOPE *programme and how it was delivered and to find out if you have any suggestions of how the programme could be improved in the future.*
Have you had a chance to read the information sheet? Are there any questions you wish to ask about the interview or this part of the study before we start?
With your permission, I will be audio-recording the conversation, but I just wanted to reassure you that everything you say will be anonymised. That means we will not use your name or any other details about you in the reports or publications we write.
If you wish to have a break during the conversation, please say and we can take a break at any time.
Just to give you an overview of what I will be talking to you about: we will start by talking a bit about yourself and how you got involved in the programme; then, we will try and take you back to the beginning of the programme and the therapist visits, what it was like and how you felt about it. After that, we will discuss how you got on with it as the weeks passed, and last of all, we will discuss what you have got out of it for yourself and what improvements we could make to the programme if you have any suggestions. Is that ok?
Shall we start? OR Are you ready to start?
So, before we discuss your involvement in the HOPE *study, I would like to ask you a couple of general questions about yourself:*
Q1: How would you describe yourself as a person?
Prompt: Has that changed as you have got older?
Prompt: Have you or someone else ever seen yourself as frail?
Q2: Do you think it is important to be doing exercise/s as people get older?
Prompt: How important do you feel is it for you personally to remain active and to stay as independent as possible?
Prompt: Is that something you have always believed?
Prompt: Do you think people can learn new things at any age?
Q3: Did the therapist who introduced you to the HOPE programme talk to you about the importance of exercise for older people?
Prompt: Do you remember what they said?
Turning now to the HOPE *study and your experiences of undertaking the exercise programme*:
Q4: Can you tell me why you chose to take part?
Prompt: Did anyone else encourage you to take part, and if so, how and for what reason?
Q5: What do you think the HOPE programme exercises were designed to achieve?
Q6: What were you (or family members) hoping to achieve by participating in the study?
Q7: When you first started the programme, what did you think was expected from you?

Prompt: How did you feel about the programme or the exercises in the beginning?
Q8: Was the therapist's explanation of the programme and the exercises clear?
Prompt: Could they have done anything differently or better?
I want to talk to you now about some of the practical aspects of the programme of exercises.
If we can talk first about the discussion you had with the therapists about the things that were important for you to achieve – we called these your goals in the study:
Q9: Can you tell me a little bit about how you and the therapist decided on your goals.
Prompt: Can you recall why you chose those goals?
Prompt: How helpful was the therapist in setting the goals?
Prompt: Were the goals what you really wanted to achieve or was there some compromise?
Prompt: Did you feel you could achieve the goals easily, or that it would take a bit of effort?
Q10: Did you change any of your goals during the programme?
Prompt: If so, how did you go about changing the goals with the therapist?
Q11: How useful did you find the discussion of your goals with your therapist when they visited you at home?
Prompt: And, when they telephoned you?
Prompt: Was it the same person? Was there a difference?
Q12: Were you able to achieve the goals you agreed? If so, how did that feel?
Q13: Did you identify any rewards or incentives with the therapist?
Prompt: Were they useful in motivating you along the way?
Q14: Did you ever feel anxious that you could not achieve your goals?
Prompt: Or , were you anxious about other aspects of the programme?
Prompt: What did your therapist say or do to help or support you?
If we can talk about doing the exercises themselves now:
Q15: What did you think of the exercise manual?
Q16: How did you find learning the exercises?
Prompt: Did you have any difficulties remembering the exercises?
Prompt: What did you do to help you remember to do your daily practice?
Prompt: Did the fridge magnet, pens and bag help to remind you?
Q17: How did you find the exercise diary?
Prompt: Did the therapist give you instruction on how to complete the diary?
Prompt: Do you complete the diary every day?
Prompt: Did the diary help you to see your progress?
Prompt: Did you ever 'cheat' on filling in your diary? (alternative: Did you always complete the diary accurately?)
Q18: When you started the exercise programme, do you remember if your therapist talked to you about what to expect in terms of aches or pains?
Prompt: How did you feel about that at the time?
Q19: As you started doing the exercises how did you feel?
Prompt: Did you experience any difficulties or ever feel like giving up the exercises?
Prompt: Were you able to discuss these issues with the therapist?
Prompt: Did your therapist support you with those?
Prompt: Did anyone else support you?
Q20: In your first or second session, did the therapist discuss with you how to exercise safely?
Prompt: Do you recall what they said or what they showed you?
Prompt: Did they or you make any changes in your home to improve your safety?
Prompt: How did you feel about making those changes?
Now we are interested to hear about how the exercises fitted into your daily life:
Q21: Did your therapist help you to plan the exercises into your daily routine?
Prompt: How did this work out? Did you have to make adjustments?
Prompt: Did you feel that the therapist listened to you and was then able to adapt the exercises to fit in with your routine?
Prompt: How did the therapist help you to keep up your exercises as much as possible?
Q22: Did you discuss how and where you would do the exercises with other people/family members?
Q23: How did your therapist progress or change the exercises over the months you worked with him/her?
Q24: Did you use the 'staying on track' exercises? Did your therapist explain to you when and how to use these exercises?
Q25: Did you ever make any changes to the plan yourself?
Prompt: If so, what did you change? How did it work out?
I want to ask you now about the different way the therapist worked with you while you were completing the exercises:
Q26: How did you find the five home visits with the therapist?
Prompt: Were there any issues with organising the visits?
Prompt: In your face-to-face contacts with the therapists, did you discuss your progress?
Prompt: Did you feel that you could be honest with the therapist if you were struggling?

Prompt: If you were struggling, what advice or solutions did the therapist offer you? Did you come up with a solution yourself?
Q27: What about the telephone call from the therapists – did you find those helpful?
Prompt: Were there any issues with organising the phone calls?
Prompt: Was the therapist supportive?
Prompt: Was it the same person as in the home visits? Did that matter?
Prompt: Did the phone call keep you motivated?
We know that support from other people around you can be important in continuing to do exercises like those in the HOPE *programme. I have just a few more questions about that now:*
Q28: Were any members of your family or your friends involved in helping you with the programme in any way?
Prompt: Did you ask them or anyone else for help? If so, were they supportive?
Q29: Were any members of your family involved in deciding on goals or thinking about incentives to do the exercises?
Prompt: Did any members of your family take part in the exercises with you?
Prompt: Do you know anyone who does similar exercises?
Prompt: Did you discuss your participation in the research, or the exercise programme with other people, friends or neighbours?
We have now come to the last couple of questions; these focus on your thoughts about participating in the programme and what we might do to improve on the programme for other people:
Q30: Have you enjoyed taking part in the programme?
Prompt: What do/did you particularly like about it?
Prompt: What do/did you get out of it for yourself?
Prompt: If they supported you, do you think your family members thought it was helpful for you to take part in the programme?
Q31: Do you think you will continue with the exercises now that the programme has finished?
Prompt: What other goals do you have for the future?
Q32: Do you feel that the exercises make a difference to how you feel or what you are able to do?
Prompt: Was it worth the effort?
Prompt: Have the exercises improved your confidence?
Q33: Did or do the exercises fit in with the rest of your daily life?
Prompt: If it does not fit, can you explain some of the reasons?
Prompt: What would help you to exercise more regularly?
Prompt: Did or does the programme help with any other aspirations or wishes you have?
Q34: How do you feel about the length of the programme?
Prompt: There were five home visits and 19 phone calls
Prompt: Have your thoughts on the length of the programme changed as you have gone through it?
Q35: Overall, do you think the programme is well thought out?
Prompt: Are there things you think we might improve for other people like yourself in the future?
And, the last question is:
Q36: Do you have any further comments or is there anything we have forgotten to talk about?
Thank you very much for your time. I really enjoyed talking to you.

Appendix 4

TABLE 2 Existing post-hospital and IC rehabilitation services (UC provision)

Site	UC (NB: falls risk groups are often also referred to as strength and balance groups)	Service provided by (in HERO trial)	Notes
Yorkshire 1	Falls risk service and falls pathway: refer to Otago programme Home visit monthly up to 6 months (physiotherapist or TA) Active Recovery Team (duration 2–4 weeks) Group-based strength and balance exercise classes	Community physiotherapy services (part of integrated care teams, linked to social care teams)	
Yorkshire 2	Reablement service (short duration) does not include therapists Hospital to home service (therapists not involved) Community Falls Clinic (2 days a week falls and balance class) or assessment for one-off home visits Community physiotherapy (12-week waiting list)	Hospital outreach	No routine rehabilitation service associated with the hospital-based team Voluntary sector: extend exercise classes (referral-based)

continued

TABLE 2 Existing posthospital and IC rehabilitation services (UC provision) (*continued*)

Site	UC (NB: falls risk groups are often also referred to as strength and balance groups)	Service provided by (in HERO trial)	Notes
Yorkshire 3	Acute physiotherapy service, patients seen within 5 days of discharge from hospital Supported discharge service: not therapy-led, no rehabilitation Reablement service (social care provision, no therapists involved) Falls risk service: Refer to adapted Otago programme Home visits monthly up to 7 months Specialist neurology and multiple sclerosis teams; acute community service: up to 12 weeks Community rehab team (# long waiting lists)	Community physiotherapy services	Voluntary sector: AgeUK community-based exercise groups Group exercise classes and walking groups run by the local council
Yorkshire 4	Virtual ward: short-term multidisciplinary team support post hospital aimed at preventing re-admission to hospital Falls risk service: strength and balance classes: weekly exercise classes up to 8 weeks Home visits (physiotherapists or TA) up to 6 over 2–3 months	Community physiotherapy services	Community-based falls prevention exercise group (independent) Voluntary sector activity and walking groups, including AgeUK 'walk from home' scheme
Yorkshire 5	Community rehabilitation: up to 6 weeks (home-based) can include physiotherapy or occupational therapy. Home visits: average 3 Reablement and supported discharge service: 2–6 weeks Falls rehabilitation team: adapted Otago programme: average 1 home visit a week for up to 6 months	Community physiotherapy services	TSM reported: recent (2018) integration of social care with Community Care Teams – one aim is to prevent re-admission to hospital
South-West 1	Community rehabilitation team Falls risk groups or clinic Parkinson's disease clinic	Community physiotherapy services	
South-West 2	Community rehabilitation team Falls risk groups or clinic	Community physiotherapy services	
South-West 3	Community rehabilitation team Stepped rehabilitation programme Parkinson's disease and multiple sclerosis clinics Leisure centre referrals (exercise-based)	Community physiotherapy services	
South-West 4	Community rehabilitation Falls risk clinic	Community physiotherapy service	
South-West 5	Community rehabilitation Strength and balance group	Community physiotherapy service	

Appendix 5

TABLE 3 Data collected

Data	Yorkshire	South-West	Total
TSM interviews – pre-intervention delivery	5	5	10
Training observations	5	5	10
Therapist update observations (Yorkshire and South-West combined)	8		8
Intervention observations (home visits)	44	17	61
Participant (post intervention) interviews	25	10	35
UC interviews	10	9	19
Carers involved in interviews (joint)	16	4	20
Therapists interviewed: Therapists were NHS Band 6 (n = 14) or 7 (n = 5). TAs were NHS Band 2 (n = 1) or 4 (n = 3).	15	9	23
TR reviews	37	13	50

Appendix 6

TABLE 4 Characteristics of therapy staff

Age	**Range**	***N* = 24**
	16–24	2
	25–34	4
	35–44	8
	45–54	5
	55–64	3
	Not reported	1
Gender		
	Female	17
	Male	5
	Not reported	1
Length of experience	**Years**	***N* = 24**
	0–5	7
	6–10	5
	11–15	5
	16–20	5
	21–25	0
	26–30	1
NHS Banding		
	2	1
	3	0
	4	3
	5	0
	6	14
	7	5

Note
NHS Banding – Bands 2, 3 and 4 are non-registered staff; Bands 5–7 are registered allied health professionals. Increasing band number represents an increased level of seniority.

This article should be referenced as follows:
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Appendix 7

TABLE 5 Review of TRs

Level of completion	Definition	Number of TRs	Reviewer comments
Comprehensive	All items intended for delivery at the assessed exercise level are recorded as completed, and treatment notes are evident	11	Generally, TRs were completed well for home visits, but fewer notes were made on telephone call contacts. Notes on home visits typically included comments indicating progression or regression in ability to complete prescribed exercises and actions taken in these instances
Adequate	Most items intended for delivery at the assessed exercise level are recorded as completed, and some treatment notes are evident	31	Completion of TRs was varied. In most cases, home visits were adequately completed, but notes on phone calls were less often completed in any detail; Some TR items were ticked, with few supporting treatment notes' comments attached. In these cases, it was more difficult to understand the reasons why progressions or adaptations to prescribed exercises were/were not made
Poor	The record of items intended for delivery at the assessed exercise level was frequently incomplete. Few treatment notes are evident	8	It was difficult to determine fidelity to the intervention from these TRs. Generally, there were few comments regarding telephone calls. These records suggest poor attention to record completion but do not allow accurate judgement to be made on intervention delivery or individual exercise prescription adaptation

Appendix 8

TABLE 6 Process evaluation participant characteristics columns 1–3

	UC, *n* = 19	Intervention participants, *n* = 60	Intervention participants interviewed	HERO trial, *n* = 410	UC, *n* = 330
	(All interviewed)		35 (58.3%)		
Age (years)					
Mean	83.33	83.18	80.88	82.4	82.9
SD	6.29	7.77	7.64	7.3	6.9
Median	83.00	83.00	81.0		
Range	71–97	72–98	66–93		
Sex					
n = Female	10	38	14	276	210
(%F)	55.56	63.33	40.0	67.3	63.6
Frailty level					
Mild	13 (72.2)	32 (53.3%)		215 (52.5%)	160 (50.8%)
Moderate	5 (27.7%)	26 (43.3%)		176 (42.9%)	148 (43.9%)
Severe	0(0%)	2 (3.3%)		18 (4.4%)	20 (6.1%)
HOPE exercise manual level					
1	N/A	43 (71.6%)		259 (63.2%)	207 (62.7%)
2	N/A	12 (20.0%)		103 (25.1%)	84 (25.5%)
3	N/A	5 (8.33%)		48 (11.7%)	39 (11.8%)

N/A, not applicable.

Note
HERO trial participant characteristics columns 4 and 5.