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Research

Exercise-based cancer telerehabilitation is safe but not superior to a single session of physiotherapy for improving quality of life: a randomised trial

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KEY WORDS

Telehealth
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ABSTRACT

Questions: What is the effect of group exercise–based telerehabilitation compared with a single session of in-person assessment and advice on health-related quality of life in cancer survivors? What are the effects on activity, function, safety and cost-effectiveness? **Design**: An assessor-blinded, pragmatic randomised controlled trial with embedded cost analysis, concealed allocation and intention-to-treat analysis. **Participants**: Adult cancer survivors with any cancer diagnosis who were receiving treatment or within 12 months of treatment completion. **Intervention**: The experimental group received an 8-week, twice-weekly, physiotherapist-led exercise group via videoconferencing, supplemented with support resources and a single in-person session of assessment and advice (TeleCaRe). The control group received a single in-person session of exercise assessment and advice. **Outcome measures**: Assessments were completed at baseline, after the intervention (week 9) and at follow-up (week 26). The primary outcome was health-related quality of life, measured using the European Organisation for Research and Treatment of Cancer Quality of Life Questionnaire Core 30, at week 9. Secondary measures were walking capacity (6-minute walk test), physical activity (accelerometer), self-efficacy (Health Action Process Approach Questionnaire), adverse events, and health service and cost data. **Results**: In total, 117 participants were recruited. Their mean age was 59 years, 82 (70%) were female, and 47 (40%) had breast cancer. Participants attended an average of seven out of 16 sessions (SD 6). There were no major adverse events. Intention-to-treat analysis found that TeleCaRe was not superior for improving quality of life (MD –5.3 units, 95% CI –13.3 to 2.6) or any secondary outcomes. TeleCaRe cost AU$363 per participant. **Conclusion**: Group exercise–based cancer telerehabilitation was safe but attendance was poor. The addition of telerehabilitation to assessment and advice was not superior to a single in-person physiotherapy session alone for improving quality of life. **Registration**: ACTRN12621001417875. **[Dennett AM, Shields N, Barton C, Tan G, Harding KE, Peiris CL, Parente P, Lynch L, Lim D, Taylor NF (2026) Exercise-based cancer telerehabilitation is safe but not superior to a single session of physiotherapy for improving quality of life: a randomised trial. *Journal of Physiotherapy* ■:■–■]**

Introduction

Globally, over 54 million people are living with or beyond cancer.[1] More people are surviving cancer, with 5-year survival at approximately 70% in high-income countries.[2] Consequently, survivors are living with long-term effects of cancer treatment, increased risk of secondary cancers and comorbidities,[3] resulting in diminished quality of life[4] and increased risk of premature death.[5]

Exercise is widely recommended as best practice to mitigate the negative effects of cancer and improve quality of life and survival.[6,7] Structured exercise-based rehabilitation programs, supervised in person, have the greatest benefit,[8] with a recent trial of exercise after colorectal cancer treatment demonstrating longer survival in the exercise group than in the health-education group (hazard ratio for death 0.63, 95% CI 0.43 to 0.94).[9] However, engaging cancer survivors in exercise is difficult. Cancer rehabilitation programs that include exercise are available for just 1 in 200 people worldwide[10–13] and attendance is often impeded by medical treatment side effects,[14,15] competing appointments[16] and geographical challenges.[15–17] Convenience is a key facilitator to participation in exercise-based cancer rehabilitation.[16]

Technology has enabled health professionals to re-evaluate how exercise-based rehabilitation can be delivered.[18] Videoconferencing and wearable devices can replicate key elements of in-person

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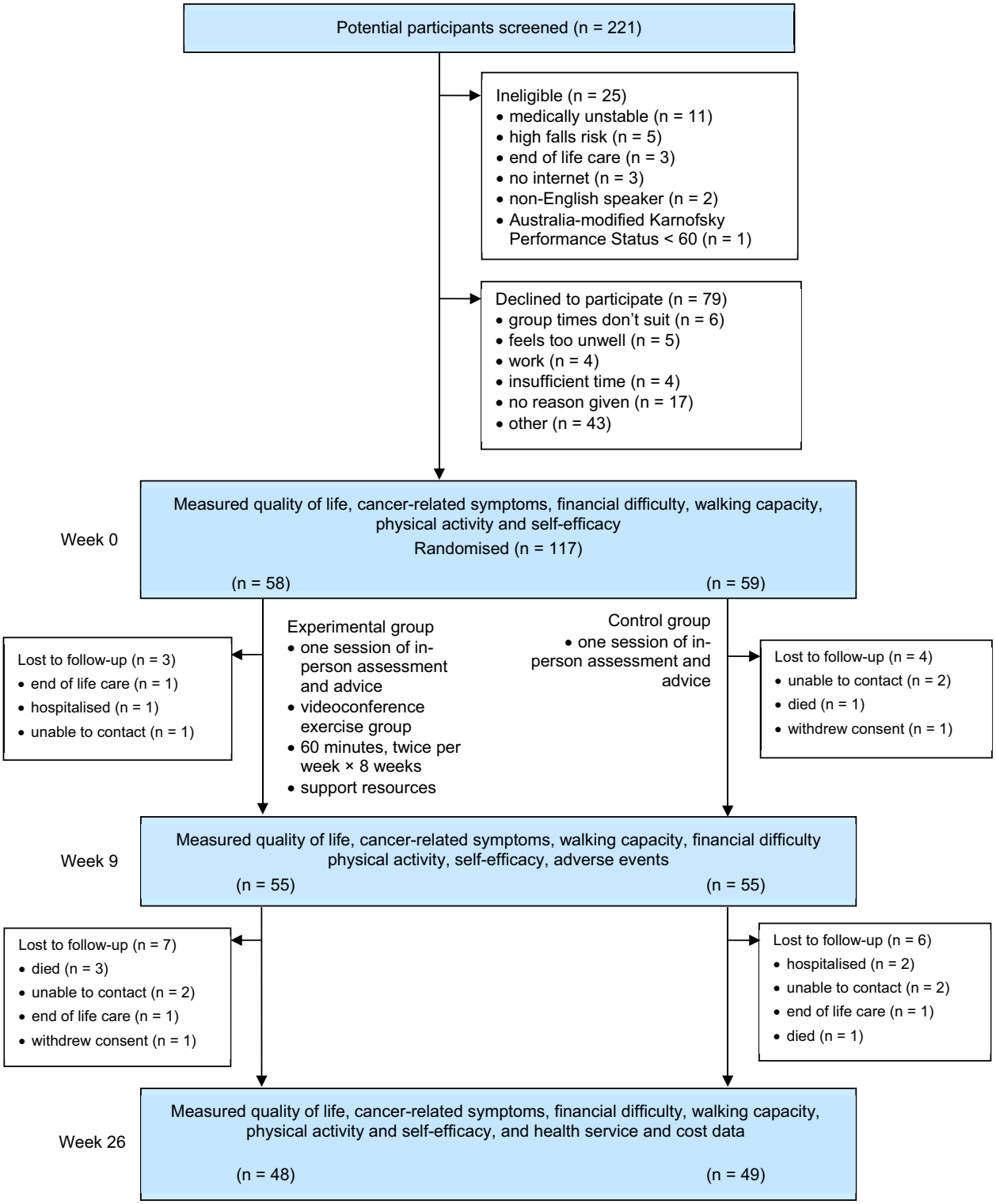

Figure 1. Design and flow of participants through the trial.

programs, such as exercise demonstration, instruction, monitoring and information provision. Delivery of rehabilitation, including exercise, using these tools is known as telerehabilitation. The safety and feasibility of telerehabilitation are well established in adults with cancer.[19–23] A recent meta-analysis of 10 trials found that exercise-based telerehabilitation improved cardiorespiratory fitness, fatigue and physical activity, but there was uncertainty about its effect on quality of life compared with usual care including advice to follow physical activity guidelines.[24] These trials delivered telerehabilitation one-to-one via telephone (8 trials) or via video supervision (2 trials).[10] The effectiveness of group-based exercise cancer telerehabilitation has yet to be established in trials.

Group telerehabilitation could be an acceptable[25,26] and cost-effective way to deliver exercise and provide peer support. Groups are a common delivery method for exercise-based rehabilitation in clinical settings[12] and were rapidly implemented using telehealth during the coronavirus 2019 (COVID-19) pandemic.[18] Telerehabilitation participants describe similar physical and psychosocial benefits to

those of in-person programs.[25] However, there are challenges to facilitating online exercise groups, especially in promoting social support.[27] Given that best practice guidelines recommend referral and assessment by an exercise professional such as a physiotherapist, it is important to compare different models of rehabilitation, such as exercise groups delivered via telehealth, with minimum guideline-recommended care.

Therefore, the research questions for this randomised trial were:

1. What is the effect of group exercise–based telerehabilitation compared with a single session of in-person assessment and advice on health-related quality of life in cancer survivors?
2. What are the effects on activity, function, safety and cost-effectiveness?

Method

Design

A parallel, assessor-blinded, pragmatic, randomised controlled trial was completed (Figure 1). Participants were assessed at baseline (week 0), after the intervention (week 9, primary endpoint) and at follow-up (week 26). Consumer advisers informed the study design by advising on the research protocol and resources. The trial was registered prospectively[28] and approved by hospital and university ethics committees. All participants provided written informed consent. The trial was reported consistent with the Consolidated Standards of Reporting Trials (CONSORT) statement[29] and the Template for Intervention Description and Replication (TIDieR) checklist.[30]

Randomisation was performed after baseline assessment using a concealed method and an online computer-generated randomisation program. Allocations were prepared before trial commencement by an independent researcher with no role in participant recruitment, intervention delivery or outcome assessments. Participants were advised of their group allocation by a research assistant who received the group allocation from the independent researcher via email.

Setting

The trial was conducted in a large public health network that services approximately 3,000 cancer survivors annually across Melbourne, Australia. Participants were recruited from cancer services at three sites within this single health network between April 2022 and August 2023. Staff providing the intervention were located at a regional community health service affiliated with the health network. During this period, some COVID-19 restrictions were in place at the health network, including mandated mask-wearing and room capacity limitations.

Participants

Adults with a cancer diagnosis (any stage or type) who were receiving any cancer treatment (curative or palliative intent) or were within 12 months of primary treatment completion (surgery/chemotherapy/radiotherapy) were eligible to participate provided they: were medically stable (as determined by their treating team); had low falls risk (Falls Risk for Older People in the Community score < 4);[31] and had access to and were willing to use the internet.[28] Broad inclusion criteria were chosen to reflect the pragmatic and inclusive nature of real-world cancer rehabilitation programs.

Intervention

All participants continued to receive their usual medical care, which may have included curative or palliative treatment; specialist, nursing and other health outpatient appointments; and visits to their general practitioner.

All participants were provided with standardised written education resources readily available from the health network relating to aspects of cancer recovery (eg, exercise, nutrition, fatigue). They also received standardised verbal and written advice on physical activity consistent with guidelines (ie, three times weekly exercise for 30 minutes, including twice-weekly strength training)[8] following a 60-minute in-person assessment by a physiotherapist.

Participants randomised to the experimental group were invited to attend an 8-week, twice-weekly group exercise program via videoconference[a] in addition to usual care. Each exercise session ran for 60 minutes and was led by a physiotherapist who had completed a 2-day online workshop delivered by the research team. Exercise sessions were individually tailored and performed according to recommendations.[8] Resistance exercise included using free weights, resistance bands, body weight and functional activities. Cardiovascular exercise comprised aerobic activities (eg, marching on the spot). Participants were provided with a resistance band. Exercise intensity was monitored and progressed during the exercise class using the modified Borg 0 to 10 scale, with participants aiming to work at moderate intensity (Borg 3 to 5). Participants were provided with a smartwatch[b] for monitoring heart rate and physical activity levels, an online information portal and a home exercise program. The program had rolling enrolment of up to eight participants per group (Appendices 1 and 2 on the eAddenda). At the end of the intervention period, participants from both groups were referred to appropriate services for ongoing support if required (eg, in-person rehabilitation), consistent with usual practice at the health network.

Study outcomes

Primary outcome

The primary outcome was health-related quality of life measured by the European Organisation for Research and Treatment of Cancer Quality-of-life Questionnaire Core 30 (EORTC-QLQ-C30) at weeks 0, 9 (primary endpoint) and 26. A higher score on the global and function subscales indicates a more favourable result. A higher score on the symptom subscales (including financial difficulty) indicates a less favourable result.

Secondary outcomes

Walking capacity (6-minute walk test) and self-efficacy, measured using a questionnaire based on the Health Action Process Approach[32] (Appendix 3 on the eAddenda), were assessed at weeks 0 and 9. Physical activity expressed as daily minutes of moderate-to-vigorous physical activity, steps and sedentary behaviour was assessed at weeks 0 and 26 using the triaxial activPAL 4™ accelerometer (24-hour wear for up to 7 days). The time spent in moderate-to-vigorous physical activity was estimated using a cut-off of 100 steps/minute.[33] Health service utilisation was assessed using hospital administration data (number of emergency department presentations, readmissions) supplemented with a questionnaire (Appendix 4 on the eAddenda) at weeks 0 and 26. Exercise completed outside the trial was documented via a self-report questionnaire. Adverse events[34] were recorded from medical records, direct observation during classes and participant self-report. They were graded using the Common Terminology Criteria for Adverse Events Version 4.[35] Participant demographics, including age, cancer history and comorbidities, were obtained via self-report or from the participant's medical record. A clinician trained in cancer exercise rehabilitation and blind to group allocation completed in-person assessments at all time points. Participant experience was also collected in the form of semi-structured interviews. These results have been reported elsewhere.[25]

Sample size

It was estimated that 104 participants would be sufficient for power of 0.80 and a two-tailed alpha level of 0.05 to detect a between-group minimum important difference of 10 points in the EORTC-QLQ-C30 quality of life score,[36] assuming a standard

Table 1
Characteristics of the study participants.

Characteristic	Total (n = 117)	Con (n = 59)	Exp (n = 58)
Age *(y)*, mean (SD)	58.6 (14.0)	58.5 (13.3)	58.6 (14.5)
Sex, n (%) female	82 (70)	44 (75)	38 (66)
Place of birth, n (%)			
Australia	71 (61)	33 (56)	38 (66)
Europe/United Kingdom	15 (13)	7 (12)	8 (14)
Asia	12 (10)	6 (10)	6 (10)
other	18 (15)	13 (22)	6 (10)
Ethnicity, n (%)			
Caucasian	92 (79)	46 (78)	46 (79)
Asian	14 (12)	6 (10)	8 (14)
Hispanic	4 (3)	2 (3)	2 (3)
other	7 (6)	5 (8)	2 (3)
Cancer type, n (%)			
multiple myeloma	7 (6)	4 (7)	3 (5)
acute myeloid leukaemia	6 (5)	4 (7)	2 (3)
Non-Hodgkins Lymphoma	7 (6)	3 (5)	4 (7)
breast	47 (40)	20 (34)	27 (47)
prostate	7 (6)	3 (5)	4 (7)
lung	9 (8)	6 (10)	3 (5)
upper gastrointestinal	8 (7)	5 (9)	3 (5)
lower gastrointestinal	9 (8)	5 (9)	4 (7)
other	1 7 (15)	9 (15)	8 (14)
Bony lesions, n (%)	21 (18)	7 (12)	14 (24)
Time since diagnosis *(mth)*, mean (SD)	14.3 (29.4)	13.3 (26.2)	15.4 (32.5)
Advanced cancer, n (%)	42 (39)	20 (34)	22 (38)
Comorbidities, n (%)			
none	31 (27)	16 (27)	15 (26)
musculoskeletal	44 (38)	22 (37)	22 (38)
cardiovascular	51 (44)	25 (42)	26 (45)
respiratory	12 (10)	4 (7)	8 (14)
endocrine	18 (15)	6 (10)	12 (21)
neurological	6 (5)	5 (9)	1 (2)
other cancer	14 (12)	9 (15)	5 (9)
Current treatment, n (%)			
chemotherapy	75 (64)	42 (71)	33 (57)
immunotherapy/targeted therapy	13 (11)	4 (7)	9 (16)
bone marrow transplant	1 (1)	1 (2)	0 (0)
radiotherapy	3 (3)	1 (2)	2 (3)
hormone therapy	9 (8)	4 (7)	5 (9)
none	8 (7)	3 (5)	5 (9)
Body Mass Index *(kg/m^2)*, mean (SD)	26.8 (5.6)	26.1 (5.4)	27.5 (5.7)
AKPS score *(0 to 100)*, n (%)			
60	5 (4)	3 (5)	2 (3)
70	25 (21)	10 (17)	15 (26)
80	33 (28)	18 (31)	15 (26)
90	49 (42)	23 (39)	26 (45)
100	5 (8)	5 (8)	0 (0)
Meeting COSA guidelines, n (%)	25 (21)	13 (22)	12 (21)

AKPS = Australia-modified Karnofsky Performance Status, Con = control group, COSA = Clinical Oncology Society of Australia, Exp = experimental group.
AKPS: 60 = Able to care for most needs, but requires occasional assistance; 70 = Cares for self, unable to carry on normal activity or to do active work; 80 = Normal activity with effort, some signs or symptoms of disease; 90 = Able to carry on normal activity, minor sign of symptoms of disease; 100 = Normal; no complaints; no evidence of disease.

deviation of 18 points.[36] We expected a dropout rate of 10%[37] and therefore, planned to randomise 116 participants.

Data analysis

Continuous longitudinal outcomes were analysed using linear mixed-effects models. Modelling accounted for variation in baseline values and within-participant dependence of observations over time, and allowed for missing observations at certain time points. As more than 5% of data were missing, multiple imputation using 25 datasets was conducted for the primary analysis. Sensitivity analyses were conducted to compare results from the imputed datasets with those from complete-case analyses. The proportion of participants meeting physical activity guidelines[38] was described using risk ratios. The number of emergency department presentations and hospital admissions was reported as incidence rate ratios using a negative binomial regression model. All available data were analysed according to allocation (intention-to-treat analysis), regardless of adherence. Between-group differences at baseline relating to the presence of bony metastases were observed and adjusted for by including this as a covariate in the analyses. Data were analysed using commercial software[c].

A cost-effectiveness analysis was planned, with provision for a cost-minimisation analysis if there were no differences between groups in the primary or secondary outcomes. Total direct costs to the health network for each participant were determined from the intervention costs and cost of health services utilised over 6 months, as recorded from hospital administrative data and the health service utilisation questionnaire. Total costs for each participant were determined from the intervention costs and cost of health services utilised over 6 months for each group (Appendix 5 on the eAddenda). All costs are reported in Australian dollars (2024).

Results

Flow of participants

A total of 221 participants were approached (Figure 1). Twenty-five participants were ineligible, including 11 who were medically unstable and three who had no internet. Over a third of potential participants (n = 79) declined, including 19 who preferred in-person rehabilitation due to a lack of confidence with, or dislike of, technology. A total of 117 participants were randomised; 110

Table 2
Mean (SD) of groups, mean (SD) difference within groups, and mean (95% CI) difference between groups for quality of life.

EORTC QLQ C30 *(0 to 100)*	Groups						Difference within groups				Difference between groups (95%CI)	
	Week 0		Week 9		Week 26		Week 9 minus Week 0		Week 26 minus Week 0		Week 9 minus Week 0	Week 26 minus Week 0
	Exp (n = 58)	Con (n = 59)	Exp (n = 58)	Con (n = 59)	Exp (n = 58)	Con (n = 59)	Exp	Con	Exp	Con	Exp minus Con	Exp minus Con
Global	57 (20)	61 (20)	58 (16)	65 (16)	60 (15)	62 (15)	0 (23)	5 (25)	2 (21)	3 (17)	−5 (−13 to 3)	−1 (−9 to 7)
Physical function	76 (17)	80 (17)	76 (13)	78 (13)	77 (13)	78 (13)	−1 (16)	−1 (15)	−0 (23)	−1 (19)	−1 (−5 to 2)	1 (−5 to 8)
Role function	59 (30)	62 (32)	59 (23)	65 (23)	62 (23)	66 (23)	0 (3)	5 (33)	4 (36)	5 (33)	−5 (−17 to 7)	−2 (−14 to 10)
Emotional function	69 (20)	73 (19)	74 (15)	70 (15)	73 (15)	73 (15)	3 (21)	−2 (22)	2 (20)	1 (18)	5 (−2 to 13)	1 (−7 to 9)
Cognitive function	66 (26)	71 (24)	72 (14)	73 (13)	72 (13)	74 (13)	4 (28)	4 (19)	5 (27)	5 (23)	0 (−8 to 9)	0 (−9 to 9)
Social function	54 (32)	59 (30)	56 (21)	62 (21)	62 (21)	62 (21)	0 (30)	5 (28)	7 (30)	5 (28)	−5 (−15 to 5)	1 (−9 to 11)
Fatigue	50 (23)	47 (23)	47 (18)	43 (18)	46 (18)	46 (18)	−2 (23)	−5 (−26)	−3 (22)	−2 (28)	3 (−6 to 12)	−1 (−10 to 8)
Nausea	11 (14)	15 (23)	11 (13)	9 (13)	11 (13)	5 (13)	−1 (15)	−5 (20)	−1 (17)	−9 (26)	4 (−3 to 11)	8 (1 to 14)
Pain	35 (30)	26 (26)	32 (20)	28 (20)	30 (20)	31 (20)	0 (25)	−1 (27)	−2 (27)	2 (31)	1 (−9 to 11)	−3 (−13 to 7)
Dyspnoea	24 (23)	27 (29)	28 (20)	28 (20)	24 (20)	23 (20)	3 (27)	1 (26)	0 (27)	−3 (29)	2 (−8 to 12)	3 (−7 to 12)
Insomnia	44 (34)	34 (32)	39 (23)	38 (23)	39 (23)	39 (23)	−2 (37)	0 (33)	−2 (30)	2 (36)	−3 (−15 to 8)	−4 (−16 to 8)
Appetite	25 (31)	28 (29)	25 (24)	22 (24)	26 (24)	19 (24)	−1 (30)	−5 (32)	−1 (35)	−8 (36)	5 (−7 to 17)	8 (−3 to 20)
Financial difficulty	34 (36)	31 (36)	27 (21)	32 (21)	26 (21)	30 (21)	−5 (29)	0 (28)	−7 (29)	−2 (27)	−6 (−16 to 4)	−4 (−14 to 6)

For functional quality of life scales, higher score is better; for symptom scales a lower score is better. Shaded cell is the primary outcome.
Con = control group, EORTC QLQ C30 = European Organisation for Research and Treatment of Cancer Quality-of-life Questionnaire Core 30, Exp = experimental group.

completed post-intervention measures (94% retention) and 97 completed follow-up measures in February 2024 (83% retention).

Characteristics of the participants

On average, participants were aged 59 years (SD 14), 70% were female (n = 82) and 40% had breast cancer (n = 47). Typically, participants were 14 months after diagnosis, without significant comorbidity (n = 86, 74%) and were receiving chemotherapy (n = 75, 64%). Forty-two participants (39%) had advanced cancer, of whom 21 (18%) had bony lesions. Groups were well balanced on most outcomes, although participants in the experimental group appeared more likely to have bony lesions, pain and insomnia than those in the control group (Table 1 and the first two columns of data in Tables 2 and 3).

Twenty-eight participants experienced disease progression during the trial, and 20 were lost to follow-up (n = 10 each group), of whom five had died (n = 3 experimental group, n = 2 control group).

Compliance with the study protocol

Participants attended an average of seven out of 16 sessions (SD 6). Common reasons for non-attendance were feeling unwell, having other appointments and low motivation. Only 28 of 58 (48%) experimental group participants wore the Fitbit during the intervention, completing an average of 4,929 daily steps (SD 2,994). At week 9, one-third of participants in each group (n = 23 control; n = 21 experimental) self-reported completing an exercise program independently (Appendix 5 on the eAddenda).

Adverse events

No major adverse events were reported. Four participants developed skin irritation from the activity monitor dressing. Five minor adverse events occurred during the intervention (musculoskeletal pain n = 4, dizziness n = 1), which resolved with rest and exercise modification.

Primary outcome: health-related quality of life

Adding TeleCaRe was not clearly superior to a single in-person session of exercise assessment and advice for improving health-related quality of life at weeks 9 or 26 (Table 2). The size of the adjusted between-group difference was –5.3 points (95% CI –13.3 to 2.6) favouring the control group at week 9, with the upper confidence interval less than the nominated threshold.

Secondary outcomes

There were generally no clear between-group differences observed for any secondary outcome in the main analysis (Table 3). A small detrimental effect on nausea from the experimental intervention was noted (Table 3), but the confidence interval mainly spanned negligible effects.

There were no clear between-group differences in the rate of unplanned hospital admissions (incidence rate ratio = 0.84, 95% CI 0.47 to 1.50) or emergency department presentations (incidence rate ratio = 0.77, 95% CI 0.39 to 1.55) (Table 4).

Costs

The total cost of telerehabilitation, inclusive of the single session of advice and assessment, was AU$363 per participant. The cost of the single session of assessment and advice was $92 per participant (Appendix 6 on the eAddenda). No between-group differences were observed in healthcare utilisation costs between the experimental and control groups (Appendix 7 on the eAddenda).

Discussion

We found that group exercise–based cancer telerehabilitation added to a single session of in-person exercise assessment and

Table 3
Mean (SD) of groups, mean (SD) difference within groups, and mean (95% CI) difference between groups for secondary outcomes.

Outcome	Groups						Difference within groups				Difference between groups (95%CI)			
	Week 0		Week 9		Week 26		Week 9 minus Week 0		Week 26 minus Week 0		Week 9 minus Week 0		Week 26 minus Week 0	
	Exp (n = 58)	Con (n = 59)	Exp (n = 58)	Con (n = 59)	Exp (n = 58)	Con (n = 59)	Exp	Con	Exp	Con	Exp minus Con		Exp minus Con	
6-minute walk test distance (*m*)	436 (92)	448 (104)	454 (80)	455 (82)			16 (78)	15 (75)			−1 (−31 to 29)			
Self-efficacy (*0 to 5*)	1.8 (0.7)	1.9 (0.6)	1.7 (0.6)	1.7 (0.6)			−0.1 (0.8)	−0.1 (0.7)			0.1 (−0.2 to 0.3)			
MVPA (*min*)	13.2 (7.6)	13.2 (7.6)			12.1 (12.0)	16.4 (12.1)			−0.7 (9.7)	2.6 (20.9)			−4.2 (−10 to 1.6)	
Steps (*n*)	5,997 (1,205)	6,006 (1,219)			6,019 (1,888)	6,808 (1,952)			−87 (2,216)	591 (2,873)			−681 (−1,609 to 246)	
Sedentary time (*hr*)	18.8 (1.7)	18.4 (0.3)			18.3 (1.1)	18.0 (1.3)			0.05 (2.1)	−0.5 (6.0)			0.2 (−0.5 to 0.8)	

Con = control group, Exp = experimental group, MVPA = moderate-to-vigorous intensity physical activity.

advice was not superior to assessment and advice alone for improving participant or health service outcomes. Telerehabilitation was safe but adherence was poor, with attendance typically impeded by participant symptoms. Healthcare utilisation costs were also similar between groups. These results suggest that telerehabilitation may not be suitable for all cancer survivors. Improvements observed in the comparison group suggest that a single session of assessment and advice may be sufficient to improve patient outcomes, although comparison with a non-intervention control group would be required to test this hypothesis.

In this trial, participants attended, on average, less than half of the total exercise sessions, contrasting with previous research finding that telehealth may increase adherence to exercise,[39] and carefully controlled cancer exercise trials where adherence is reported to be as high as 90%.[24,40] Uptake of telerehabilitation was also an issue as approximately 1 in 3 participants approached for the trial declined, with many preferring to attend an in-person exercise program. This is an important finding given that non-adherence to exercise is likely to mitigate any potential benefits of regular supervised exercise. Reasons for non-attendance were not dissimilar to reasons for non-attendance at group exercise programs delivered in practice in hospital cancer settings, where non-attendance is also an issue.[41,42] This emphasises the need to offer flexibility and tailoring in service offerings.

It is plausible that exercise-based rehabilitation programs may be more suited to some individuals than others. Two previous group-exercise telerehabilitation trials conducted with women with breast cancer after treatment completion had positive outcomes and high adherence.[43,44] These participants may be more amenable to telerehabilitation due to younger age and potential life stage compared to our participants, who were older, largely inactive and had advanced cancer. Uptake of telerehabilitation may also be higher for participants who would otherwise have no other options to access exercise-based cancer rehabilitation, such as those living outside metropolitan areas.[45]

Participants in our control group received best practice care consistent with clinical guidelines for cancer survivors and demonstrated similar outcomes to those receiving additional supervised intervention.[38,46] Advice was provided by a skilled physiotherapist who offered expertise and reassurance, which are valued by cancer survivors.[47–49] This finding is consistent with previous research showing that physical activity improves when advice is combined with a formal education session and/or printed resources, exercise diary and pedometer in cancer survivors.[47–49] Therefore, a brief intervention alone may be sufficient to motivate some people to implement lifestyle changes at their own pace without attending structured exercise classes. Indeed, one-third of participants in our control group self-reported completing an exercise program independently. Our results raise questions about how much health professional support to exercise is needed to improve health outcomes after cancer, given that similar outcomes may be achieved even with relatively modest intervention.

While there is evidence that exercise-based telerehabilitation interventions can be effective, most previous trials have been conducted using individual consultations,[24] rather than group settings. In this trial, efforts were made to tailor exercise prescription, including in-person assessment, exercise monitoring, smartwatches and exercise diaries. However, when providing group exercise via telerehabilitation, it is harder to supervise and tailor exercise and give individual feedback without others observing. There is also limited equipment, and the absence of tactile feedback restricts real-time correction of technique.[26] In our trial, some participants commented that the intensity was '*a bit easy*'.[25] Despite telerehabilitation being recognised as safe,[19] there may have been subtle messages from the therapist to participants not to push as hard with exercise intensity as they would in person.[26] These factors may contribute to lower fidelity and dosage of exercise.

Our findings support the idea that there is no one-size-fits-all model for providing cancer rehabilitation. While exercise-based telerehabilitation may provide an extra level of flexibility and convenience highly desired by some cancer survivors,[26,27] there are trade-offs that

Table 4
Number and reasons for emergency department and hospital admissions.

Outcome	Total (n = 117)	Experimental (n = 58)	Control (n = 59)
Participants admitted to hospital, n (%)	47 (40)	24 (41)	23 (39)
Cause of hospitalisation, n (%)			
medical treatment-related event	19 (16)	10 (17)	9 (15)
acute event related to disease progression	14 (11)	8 (14)	6 (10)
other non-cancer acute event	5 (4)	2 (3)	3 (5)
fall	1 (< 1)	1 (2)	0 (0)
elective procedure	27 (23)	12 (21)	15 (25)
other	1 (< 1)	1 (2)	0 (0)
Unplanned readmissions per participant *(n)*, mean (SD)	0.35 (0.69)	0.41 (0.73)	0.29 (0.65)
Length of stay per unplanned readmission *(d)*, mean (SD)	3.12 (8.80)	4.26 (10.06)	2.00 (7.26)
Participants admitted to ED, n (%)	39 (33)	23 (40)	16 (29)
Reason for ED, n (%)			
treatment-related event	33 (28)	16 (28)	17 (29)
acute event related to disease progression	9 (8)	8 (14)	1 (2)
other non-cancer acute event	11 (9)	7 (12)	4 (7)
fall	3 (3)	2 (3)	1 (2)
other	1 (< 1)	1 (< 1)	0 (0)
Number ED presentations per participant mean (SD)	0.5 (0.82)	0.41 (0.79)	0.59 (0.84)

ED = emergency department.

may limit effectiveness. Future models of exercise could be designed using the Cancer Rehabilitation to Recreation Framework,[50] which provides guidance for the provision of support by exercise professionals based on self-efficacy, physical capacity and symptoms. This support could include telerehabilitation as participant needs and preferences allow. Triage models such as Moving Through Cancer,[51] Alberta Cancer Exercise Program[27] and Personalised Exercise Rehabilitation in Cancer Survivorship[52] have all demonstrated feasibility in improving access to exercise-based cancer rehabilitation and have included elements of telerehabilitation.

Strengths and limitations

This trial was conducted pragmatically in a large health network to include people of a broad age range and cancer diagnosis, including those with advanced cancer who are often omitted from exercise oncology trials, thus enhancing generalisability. The trial was reported in accordance with CONSORT and TiDiER checklists.[30,53] Other strengths include high participant retention through the study despite poor intervention adherence, assessor blinding, concealed allocation and randomisation, as these factors lower risk of bias.

Limitations include possible selection bias, as participants may have been motivated to exercise at recruitment. However, participants in this trial reported low levels of exercise self-efficacy. This group of participants was heterogeneous in cancer diagnosis. Therefore, findings may differ when specific cancer groups are targeted for telerehabilitation. There was also no cost to participate in the exercise groups, which may have negatively impacted adherence rates by reducing intrinsic motivation to attend sessions due to no financial commitment.[54] In the absence of a no-intervention control group, which reflects the experience of many people with cancer despite best practice recommendations,[12] we cannot conclude whether both interventions appeared to be similarly effective or ineffective in improving quality of life. Given the unexpected low adherence to the intervention, the trial was likely underpowered to detect an effect on outcomes. The trial was also not powered for subgroup analyses and a full cost-effectiveness analysis was not completed as initially planned in the absence of superiority. However, our findings related to effectiveness and cost could be used to inform decision-making around designing and implementing future telerehabilitation models of care.

In conclusion, group exercise–based cancer telerehabilitation in addition to assessment and advice from a physiotherapist was safe but not more effective than a single session of assessment and advice from a physiotherapist alone. Future models of cancer rehabilitation should consider a flexible approach to exercise delivery, offering multiple modalities and intensities of support.

What was already known on this topic: Exercise is recommended for people living with and beyond cancer because it can improve quality of life, physical function and health outcomes. Telerehabilitation offers a convenient way to deliver exercise support remotely and has been shown to be safe and feasible, but evidence for the effectiveness of group-based exercise programs delivered by videoconference is limited.
What this study adds: This randomised trial found that adding an 8-week group exercise telerehabilitation program to a physiotherapy assessment and advice session was safe but did not improve quality of life or other health outcomes more than assessment and advice alone. The findings suggest that a single physiotherapy consultation with tailored exercise advice may be sufficient for some cancer survivors, and that flexible rehabilitation options are needed to match individual preferences and circumstances.

Footnotes: [a] Zoom, Zoom Communications, Inc., San Jose, USA. [b] Fitbit Inspire 3, Fitbit, Mountain View, USA.
[c] SPSS, IBM, Armonk, USA.

eAddenda: 7 (Appendices 1 to 7) can be found online at https://doi.org/10.1016/j.jphys.2026.06.008.

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Competing interests: None.

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Patient involvement: Beyond the patients who kindly participated in the study, consumer advisers informed the study design by advising on the research protocol and resources. No other patients or members of the public were directly involved in the conduct, analysis, interpretation or dissemination of this study.

Data sharing: The data that support the findings of this study are available at https://opal.latrobe.edu.au/. AD & GT had full access to all the data in the study and took responsibility for the integrity of the data and the accuracy of the data analysis.

Author contribution: All authors contributed to the study conception and design. Material preparation and data collection were performed by Amy Dennett and Germaine Tan. The first draft of the manuscript was written by Amy Dennett, Nicholas Taylor and Nora Shields and all authors commented on previous versions of the manuscript. All authors read and approved the final manuscript.

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