Rehabilitation in Advanced, Progressive, Recurrent Cancer: A Randomized Controlled Trial

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Abstract

Context. Two million people across the U.K. are living with cancer, often experienced as a long-term condition. They may have unmet needs after active treatment. Rehabilitation aims to address these needs, maximize psychological and physical function, and enable minimum dependency regardless of life expectancy.

Objectives. We aimed to test, in a randomized controlled trial, the clinical and cost effectiveness of a rehabilitation intervention for patients with advanced, recurrent cancer.

Methods. We conducted a two-arm, wait-list control, randomized trial of a complex rehabilitation intervention delivered by a hospice-based multidisciplinary team vs. usual care for active, progressive, recurrent hematological and breast malignancies, with a follow-up at three months. The primary outcome was the psychological subscale of the Supportive Care Needs Survey (SCNS). Secondary outcomes were other domains of the SCNS, psychological status, continuity of care, quality of life, and resource use.

Results. Forty-one participants were enrolled and 36 completed the trial. The primary outcome was significantly lower in the intervention arm (adjusted difference \(-16.8, 95\% \text{ CI } -28.34 \text{ to } -5.3; P = 0.006\)). The SCNS physical and patient care subscales (-14.2, 95\% CI -26.2 to -2.2; \(P = 0.02\) and -7.4, 95\% CI -13.7 to -1.1; \(P = 0.02\), respectively) and self-reported health state (12.8, 95\% CI 3.2 to 22.4; \(P = 0.01\)) also differed significantly. The incremental cost-effectiveness ratio was £19,390 per quality-adjusted life year.

Conclusion. This intervention significantly reduced the unmet needs of cancer survivors and it is likely that it is cost-effective. Despite small numbers, the main
effect size was robust. We recommend implementation alongside evaluation in wider clinical settings and patient populations. J Pain Symptom Manage 2013;46:315–325. © 2013 U.S. Cancer Pain Relief Committee. Published by Elsevier Inc. All rights reserved.

Key Words
Cancer, survivorship, rehabilitation, hospices

Introduction

More than two million “survivors” across the U.K. are living with and beyond cancer, increasing annually by 3%. For many, cancer is a long-term condition involving multiple disabling treatments. The U.K. Department of Health encourages proactive management of long-term conditions; and research in survivorship in many cancers has identified physical, psychological, social, and spiritual needs. Rehabilitation aims to improve the quality of survival, helping people adapt and lead fulfilling lives with minimum dependency regardless of life expectancy. Key elements include interdisciplinary working; maximizing comfort and minimizing dependence; coming to terms with illness; facing uncertainty and loss; setting realistic goals; rapid response to changing need; anticipation of clinical deterioration; coordination of care; and education of staff to ensure a consistent approach.

The U.K. National Health Service (NHS) program, NHS Improvement, highlighted a rehabilitation service in a hospice day-care unit (Day Therapy Unit [DTU]) offered through the Royal Free NHS Trust and Marie Curie Hospice Hampstead, London, England. Patients with active, progressive, recurrent cancers are referred at the end of treatment and offered expert advice and support by multidisciplinary advanced practitioners who work predominantly with patients with cancer and have received higher level training regarding their rehabilitation needs.

Many hospices in the U.K. provide day-care ranging from social support to clinically oriented care, but the evidence of the relative effectiveness of different types of service, including specific rehabilitation interventions, is limited. There is evidence that a patient-centered approach to rehabilitation with strong input from the clinicians is desired by people with late-stage disease. The U.K. National Cancer Survivorship Initiative has encouraged interest in research in cancer survivors including robust testing of new interventions in clinical trials.

We report a randomized controlled trial (RCT) of the effectiveness of a complex rehabilitation intervention in a DTU for people with advanced, progressive, recurrent cancer. Post-treatment needs may be high in many cancers, some specific to diagnosis and treatments. Although our intervention was designed for all types of cancers through a patient-centered approach, for this trial, we restricted recruitment to those with active, progressive, recurrent hematological and breast malignancies because of strong working relationships between our teams. Additionally, hematology patients often undergo high-risk invasive treatments with severe side effects, and many breast cancer patients experience repeated treatments and unmet needs.

Methods

Design

This was a two-arm RCT to test the clinical and cost effectiveness of a complex rehabilitation intervention in a DTU plus usual care vs. usual care alone. To address the duty of care in advanced disease, those in the control arm joined a wait-list and were offered the intervention three months after randomization. The intervention was delivered in the DTU of Marie Curie Hospice Hampstead, London, England.

Ethics

A favorable opinion was received from the joint University College London/University College London Hospital (UCLH) Research Ethics Committee on October 5, 2009, ref. 09/H0714/46. The trial was registered with ISRCTN number 22485853.
**Sample**
Between August 2010 and July 2011, patients attending breast and hematological oncology outpatient clinics at the Royal Free Hospital (RFH) and UCLH joint cancer center were assessed for eligibility.

**Inclusion Criteria.** Eligible patients 1) were at the end of treatment for first or subsequent recurrence but not cured, 2) had active, progressive, recurrent malignant breast or hematological disease, 3) were older than 18 years, and 4) met the preset referral criteria.

**Referral Criteria.** Patients 1) had completed treatment, but had advanced, progressive disease and recurrence was likely; 2) required symptom management; 3) had rehabilitation needs not responsive to self-management; 4) had psychological, social, financial, emotional, and spiritual needs not met by the present care; and 5) were able to reach the DTU by their own or hospice-based transport.

**Other Patients.** Patients ineligible, not approached, or unwilling to participate were offered the usual care and further opportunities to access the trial at subsequent clinic visits.

**Procedure**
After outpatient assessment against the entry criteria, clinicians introduced the study to eligible patients and gained consent for contact details to be passed to the research team. A researcher then made contact to discuss the study further, provide written information, and arrange a meeting later in a place of the patient’s choice, usually home or hospital. After obtaining informed consent, baseline measures were completed with the researcher and randomization took place.

**Randomization and Masking.** Sealed randomization envelopes were prepared before the trial by the trial statistician, supervised through the UCL PRIMENT (Primary Care and Mental Health) accredited Clinical Trials Unit (http://www.priment.mrc.ac.uk/index.html). The randomization list was computer-generated and stratified in blocks of four by the outpatient clinic (RFH Breast Cancer, RFH Haematology, and UCLH Haematology). After the baseline interview, the researcher completed a template with patient information that was faxed to the Marie Curie Hospice Hampstead DTU. The DTU then contacted a central administrator, by telephone, who opened a sealed envelope and informed the DTU of the patient allocation. The DTU then contacted the patient to inform them of their group allocation. Participants were randomized to one of two trial arms: 1) Intervention group—an immediate appointment with the DTU in addition to usual care; or 2) Wait-list control group—usual care and enrollment on a wait-list to be offered the intervention after three months. Because of the nature of the intervention, participants and DTU care providers were not blinded to the allocation. The researcher who assessed the participants at baseline and follow-up was masked to group allocation until the end of the follow-up interview, when allocation was revealed to enable collection of hospice data for economic analysis. Participants were reminded not to mention access to DTU services during follow-up and the researcher recorded any occurrence of unmasking. The trial statistician remained masked to group allocation until the final stage of the analysis.

**The Intervention**
The rehabilitation intervention was delivered by an integrated multidisciplinary team (MDT), and developed through three cycles of an iterative process in which evidence on the feasibility and acceptability of the structure and content was collected from stakeholder consultations, patient focus groups and interviews, and adjustments made. The final version is available in manual form (see Appendix I for outline; available at jpsmjournal.com). Most patients accessed care for about three months, with the flexibility of duration according to need. Four core components were defined:

1. Systematic clinical assessment (symptoms and treatments) by senior medical and nursing staff using the National Assessment and Care Planning Framework
2. Goal setting with the review date agreed between patient and clinician; referrals within the MDT on a case-by-case basis according to current need, for example, physical (exercise), psychological, and complementary therapies
3. Weekly MDT meetings to review patients, raise problems, and discuss offering additional available services according to individual need and preference
4. Patient/clinician discussion in clinics according to goal-setting timetable to review progress, set new goals, or agree on a discharge date.

**Control Group.** Patients received usual care and joined a three-month wait-list for referral to the intervention.

**Usual Care.** Usual care included ongoing review by oncologists and access to community services including general practitioner (GP), district nurses, social services, and community specialist palliative care.

**Follow-Up.** Data were collected from participants in both trial arms three months after randomization. This minimized the wait-list time for the control group and allowed time for the intervention (likely to be ongoing at this point) to take effect. Interviews were performed by the researcher masked to group allocation.

**Measures**
Social and demographic data, diagnosis, and disease severity were collected at baseline. Outcome measures were completed at baseline and after three months as follows:

**Supportive Care Needs Survey Long Form (SCNS-LF59).** This questionnaire assesses the level of need for support in the last month; it has shown good psychometric properties in similar populations, and is widely used in supportive care research in cancer. There are 59 items across five domains: psychological; health system and information; physical and daily living; patient care and support; and sexuality. Each subscale is scored from 0 to 100, 100 indicating the highest need. The psychological subscale includes 22 items, such as “Feeling down or depressed,” “Fears about the cancer returning,” and “Concern about the worries of those closest to you.”

**Kessler Psychological Distress Scale (K10).** This measure of psychological distress comprises 10 questions, scored from 10 to 50, 50 indicating the highest level of distress.

**Continuity of Care.** This is a validated measure of experienced continuity in cancer care comprising 17 items, scored 0–17, high scores indicating good continuity. Items assess the patients’ perceptions of professional responsiveness to their changing needs, understanding of their personal circumstances, and consistency in management of their care.

**EuroQol-5 Dimensions (EQ-5D).** This five-question standardized measure of health outcomes yields a score of health-related quality of life. It contains a self-report of health state on a 0–100 visual analogue scale (EQ-VAS), 100 being the best imaginable health state.

**Outcomes**
Although we expected the intervention to reduce unmet needs in a range of domains, the SCNS was not designed to be combined in a total score. Reducing the needs in any domain could affect the well-being and need for psychological support. Therefore, we chose the psychological domain as our primary outcome.

**Secondary outcomes** were the other domains of the SCNS, psychological status (K10), continuity of care, and quality of life (EQ-5D and EQ-VAS). In the economic evaluation, effectiveness was measured in quality-adjusted life years (QALYs), based on the EQ-5D score.

**Statistical Analysis**
A detailed analysis plan was written and validated by the trial steering group before unblinding of the data. The primary outcome was compared between groups by linear regression adjusted for baseline values (analysis of covariance [ANCOVA]) and outpatient clinic. Secondary outcomes were compared similarly, using logistic regression for binary outcomes. With a small sample size, results may be particularly sensitive to the ANCOVA assumptions. Normality and homoscedasticity of the residuals, parallel slopes, and presence of outliers were evaluated using appropriate plots and tests, including nonparametric sensitivity analyses and robust standard errors as required. Participants who dropped out from the trial were compared with completers. Mean imputation was used where only a few
questions (<10%) were missing from a particular questionnaire. In anticipation of the sample size being smaller than expected, it was decided before unblinding of the data to use a 10% level as the threshold of significance. Compared with a 5% threshold, this increased the risk of Type I error but decreased the risk of Type II error, a compromise made to avoid overlooking the possible trends of difference between groups. All analyses were two-sided and performed according to the randomization arm, regardless of compliance (intention-to-treat).

**Economic Considerations and Costs.** We conducted a within-trial stochastic cost-effectiveness analysis. Service use was collected retrospectively for a period of three months from randomization. Treatment effectiveness was assessed using the EQ-5D, and utility values were converted into QALYs gained over the trial period. Cost data were taken from publicly available sources where possible; otherwise, unit costs were obtained from the hospice. Uncertainty in the trial data was characterized using a parametric approach, and a Monte Carlo process modeling 10,000 patient simulations was performed. Results are presented as the incremental cost-effectiveness ratio (ICER) of the rehabilitation intervention compared with standard care. A cost-effectiveness acceptability curve was calculated using the netbenefit approach.

**Sample Size.** As we lacked previous data on effect size, the planned sample size was pragmatic, based on numbers accessing breast and hematology services across the cancer center. We expected 240 patients to be recruited over one year with 40% attrition, giving 144 evaluable patients and 90% power to detect a 0.47 standardized effect size with a 5% two-sided significance level. Recruitment was lower than expected, with an actual number of evaluable participants of 36. With significance level set at 10%, this sample size gives 90% power to detect a standardized effect size above 0.98. This corresponds to a difference between arms of 19.6 on the psychological subscale of the SCNS, with a standard deviation of 20.0.

**Results**

**Recruitment and Follow-Up**

Over the one-year trial period, 4189 patients were assessed for eligibility. Of these, 292 were eligible by the entry criteria and 81 were approached, of whom 41 consented and were randomized (Fig. 1). The median age was 62 years and 63% were female; a majority (76%) had a hematological cancer, and the median time since diagnosis was 5.6 years (Table 1). More participants of Indian ethnicity were randomized to the intervention arm and more patients unemployed for health reasons were allocated to the control group. Of those randomized to the intervention, two did not attend any appointment at the DTU. No patient in the control group attended the DTU. Five participants (12%) did not complete follow-up, two died, one withdrew because of worsening health, one withdrew following a road accident, and one was not able to be contacted after a long inpatient stay. Attrition was nonsignificantly lower in the intervention arm (one of 21 vs. four of 20; \( P = 0.18 \)). Baseline characteristics and study measures did not significantly differ between those who did and did not complete the trial (all \( P \)-values \( \leq 0.14 \)). Mainly because of poor health, participants were not always able to attend the three-month follow-up visit on the scheduled date; follow-up interviews occurred a median of 102 days after the baseline interview (range 83–182 days).

**Outcomes**

Trial outcomes at baseline and follow-up are reported in Table 2, with results from the ANCOVA. The primary outcome was significantly different between the trial arms. At the three-month follow-up, patients in the intervention arm demonstrated significantly lower needs for support on the psychological subscale of the SCNS compared with patients in the control arm (adjusted difference -16.8 points, 95% CI -28.34 to -5.3; \( P = 0.006 \)). Other outcomes that significantly differed included the physical and patient care subscales of the SCNS (adjusted difference -14.2, 95% CI -26.2 to -2.2; \( P = 0.02 \), and -7.4, 95% CI -13.7 to -1.1; \( P = 0.02 \), respectively) and the self-reported health state (12.8, 95% CI 3.2 to 22.4; \( P = 0.01 \)). Other secondary measures all favored better outcomes in the intervention arm, but without significant differences.
Model Validity and Sensitivity Analyses

All regression assumptions were respected in the primary analysis. Some secondary analyses showed potential deviation from the ANCOVA assumptions, but all findings were robust to sensitivity models. Findings were not sensitive to adjustment for imbalance at baseline on ethnicity or employment.

Economic Analysis

Over the trial period, the rehabilitation intervention was associated with both greater total costs (mean difference £955, 95% CI £82–£1975) and greater quality of life (mean difference 0.05 QUALYs, 95% CI 0.000–0.112) (Table 3). This resulted in an ICER of £19,391 per QALY gained, which reflects the additional cost associated with the intervention to gain an extra year of life in full health (Table 3). The cost-effectiveness acceptability curve (Fig. 2) shows the likelihood that the intervention in addition to usual care is more cost-effective than usual care alone across a range of threshold values of the decision maker’s willingness to pay for a QALY. The U.K. National Institute for Clinical Excellence often uses a threshold of £20,000 per QALY when determining whether a treatment should be offered on the NHS. At a threshold value of £20,000 or £30,000, the intervention is expected to be

Fig. 1. Trial flow chart.
Discussion

Main Findings

This rehabilitation intervention delivered in a DTU significantly reduced the unmet needs for support in the psychological domain of the SCNS for people with advanced, recurrent, progressive breast or hematological malignancies. Improvements also were observed in other patient outcomes, and the intervention was associated with a significant reduction in health service resource use and a corresponding improvement in quality of life.

Despite low numbers, we report a robust significant difference between trial arms in our primary outcome. Although significant differences in secondary outcomes must be considered cautiously, the findings enhanced our confidence in the effect of the intervention. We report significant benefit in the intervention group on the physical and patient care subscales of the SCNS and the self-reported health state on our quality-of-life measure. We did not find any significant effect on psychological distress, but the confidence margin does not allow ruling out a potential benefit; any effect might be detected by a larger sample size or longer follow-up period. Effect of the intervention on sexuality support needs, continuity of care, and health-related quality of life was much less apparent.

Recruitment Issues

Despite large numbers of potentially eligible patients, recruitment was slow. Extension was limited by funding restrictions, and the trial was concluded after accrual of 17% of predicted numbers. The slow recruitment rate was surprising. Referral criteria, agreed by the Palliative and Supportive Care Network, were developed in consultation with the local clinicians, and an education program ran throughout the trial. Although many patients accessed clinics ($n = 4189$), only 292 (7%) were deemed eligible and 81 (28%) were approached, of whom 50% agreed to participate. Researchers screening patients with clinicians noticed fewer than predicted had obvious rehabilitation needs and pragmatic reasons for nonreferral. Many patients at the end of treatment have complex and fluctuating clinical needs. Some may have become rapidly too unwell to consider entering the trial; others may have restarted further treatment or those with urgent needs may have been referred to day-care services immediately. There were 189 eligible patients not approached by clinicians, and to explore this, we interviewed the clinicians at the end of the trial. Some reported discomfort with the wait-list design delaying the delivery of an intervention with potential benefits, others lacked confidence in exploring issues of prognosis with patients, and a few

Table 1

Baseline Characteristics of Participants by Trial Arm

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Intervention ($n = 21$)</th>
<th>Control ($n = 20$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sociodemographics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>60.8 ± 15.6</td>
<td>61.5 ± 12.6</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>12 (57%)</td>
<td>14 (70%)</td>
</tr>
<tr>
<td>Marital status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/cohabiting</td>
<td>14 (67%)</td>
<td>9 (45%)</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>11 (52%)</td>
<td>13 (65%)</td>
</tr>
<tr>
<td>Black</td>
<td>4 (19%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Indian</td>
<td>6 (29%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Other</td>
<td>0 (0%)</td>
<td>2 (10%)</td>
</tr>
<tr>
<td>Employment</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Employed</td>
<td>5 (24%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Retired</td>
<td>11 (52%)</td>
<td>10 (50%)</td>
</tr>
<tr>
<td>Too sick to work</td>
<td>1 (5%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>Other</td>
<td>4 (19%)</td>
<td>0 (0%)</td>
</tr>
<tr>
<td>Education</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University/postgraduate</td>
<td>10 (48%)</td>
<td>9 (45%)</td>
</tr>
<tr>
<td>Clinical</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Outpatient clinic$^a$</td>
<td></td>
<td></td>
</tr>
<tr>
<td>RFH Breast</td>
<td>6 (29%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>RFH Haematology</td>
<td>12 (57%)</td>
<td>13 (65%)</td>
</tr>
<tr>
<td>UCLH Haematology</td>
<td>3 (14%)</td>
<td>5 (15%)</td>
</tr>
<tr>
<td>Diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Breast cancer</td>
<td>6 (29%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>Myeloma</td>
<td>8 (38%)</td>
<td>11 (55%)</td>
</tr>
<tr>
<td>Lymphoma</td>
<td>6 (29%)</td>
<td>4 (20%)</td>
</tr>
<tr>
<td>Other haematology</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>Time from diagnosis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;1 year</td>
<td>3 (14%)</td>
<td>3 (15%)</td>
</tr>
<tr>
<td>1–4 years</td>
<td>8 (38%)</td>
<td>6 (30%)</td>
</tr>
<tr>
<td>≥5 years</td>
<td>10 (48%)</td>
<td>11 (55%)</td>
</tr>
<tr>
<td>ECOG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>1 (5%)</td>
<td>1 (5%)</td>
</tr>
<tr>
<td>1</td>
<td>6 (29%)</td>
<td>9 (45%)</td>
</tr>
<tr>
<td>2</td>
<td>12 (57%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>3</td>
<td>2 (9%)</td>
<td>5 (25%)</td>
</tr>
<tr>
<td>4</td>
<td>0 (0%)</td>
<td>0 (0%)</td>
</tr>
</tbody>
</table>

RFH = Royal Free Hospital; UCLH = University College London Hospital; ECOG = Eastern Cooperative Oncology Group.
Data are frequency (%), or mean $\pm$ SD.
$^a$Randomization stratification variable.
expressed anxiety about the delivery of the intervention in a hospice setting. It remains unclear if there were important differences between those who were and were not approached by clinicians. It would be interesting to repeat this work in a cancer support center, and compare recruitment rates, acceptability, and feasibility.

**Strengths and Limitations**

We were able to conduct an RCT in people with advanced, progressive, and recurrent disease, a population in whom clinical trials of complex interventions are rarely attempted. This meets the recommendations of a systematic review of research evidence on survivorship, calling for robust testing of new interventions in clinical trials.

A major limitation is that the intervention was delivered in a single hospice with participants referred from one inner-city cancer center. Our findings may not be generalizable to other services in other areas. Care was taken to define the intervention in manual form to maximize capacity for its replication and testing elsewhere. However, the intervention is complex, multicomponent, and dependent on interdisciplinary team working, in turn dependent on the local environment. Although the intervention is patient-centered and aims to meet the needs of all cancer populations, we do not know if it would do so. We have compared our intervention with usual care, but not with alternative specific models of hospice day care.

Close cooperation between the researcher and clinicians in screening patients minimized the selectivity of enrollment, and our sample probably represents those who would be offered the intervention as part of usual practice. The smaller sample size could have been a serious limitation had no significant difference been observed, limiting our ability to draw definitive conclusions. However, our sample size did appear sufficient to demonstrate the effect of the intervention with reasonable confidence. Nonetheless, our small numbers remain a limitation for interpreting the nonsignificant secondary outcomes and the economic evaluation. As is inherent in the

### Table 2

<table>
<thead>
<tr>
<th>Outcome Measure</th>
<th>Baseline</th>
<th>Follow-up</th>
<th>Analysis of Covariance</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Intervention (n = 21)</td>
<td>Control (n = 20)</td>
<td>Intervention (n = 20)</td>
</tr>
<tr>
<td>Psychological*</td>
<td>35.8 ± 24.9</td>
<td>33.5 ± 21.6</td>
<td>22.8 ± 19.9</td>
</tr>
<tr>
<td>Health system and information</td>
<td>32.4 ± 18.4</td>
<td>29.1 ± 17.0</td>
<td>23.3 ± 11.9</td>
</tr>
<tr>
<td>Physical and daily living</td>
<td>50.3 ± 24.2</td>
<td>44.5 ± 26.5</td>
<td>37.0 ± 23.3</td>
</tr>
<tr>
<td>Patients care and support</td>
<td>24.4 ± 10.8</td>
<td>20.9 ± 9.3</td>
<td>20.8 ± 10.8</td>
</tr>
<tr>
<td>Sexuality (any need)†</td>
<td>7 (35%)</td>
<td>7 (35%)</td>
<td>5 (26%)</td>
</tr>
<tr>
<td>Kessler psychological distress</td>
<td>19.9 ± 6.1</td>
<td>21.6 ± 7.4</td>
<td>17.6 ± 6.5</td>
</tr>
<tr>
<td>Continuity of care</td>
<td>14.0 ± 2.2</td>
<td>13.9 ± 2.7</td>
<td>14.5 ± 2.2</td>
</tr>
<tr>
<td>Quality of life (EQ-5D)</td>
<td>0.605 ± 0.26</td>
<td>0.554 ± 0.35</td>
<td>0.653 ± 0.27</td>
</tr>
<tr>
<td>EQ-VAS</td>
<td>61.5 ± 18.0</td>
<td>58.8 ± 17.1</td>
<td>67.0 ± 13.4</td>
</tr>
</tbody>
</table>

EQ-5D = EuroQol-5 Dimensions; EQ-VAS = EuroQol Visual Analogue Scale.

Data are mean ± SD, frequency (%), mean difference (95% CI), or odds ratio (OR) (95% CI). Analysis of covariance = results from linear or logistic regression, adjusted on baseline value and clinic.

*Primary outcome.

†One participant with missing data item at baseline and follow-up (intervention arm).
evaluation of health care interventions, participants could not be blinded to their allocation, limiting the objectivity of patient-reported outcomes and possibly introducing effectiveness bias. Blinding of the researcher could not always be preserved and nine participants mentioned the intervention during the follow-up interviews. The short follow-up period, chosen to enable a wait-list design, means we are unable to draw conclusions on the long-term effects of the intervention.

**Costs**

The key limitation of the economic analysis is the length of the study period. Measured over three months, the cost-effectiveness of the intervention sits on the cusp of the £20,000 per QUALY threshold often used by the U.K. National Institute for Clinical Excellence. This within-trial analysis cannot account for what may happen once patients discontinue the intervention—patients who showed initial benefit might continue to do so. If benefit were sustained after the three-month intervention period, the ICER would decrease accordingly. The details of the sensitivity analyses will be reported in a separate paper. However, preliminary work suggests that if the full benefit of the intervention were sustained for one year after discharge from the service, the ICER would be approximately £4,400 and it would be expected to be cost-effective in 92.7% of simulations at a threshold value of £20,000 per QALY. Even if benefit gains from treatment were lost over time and there were no difference between groups after one year, this would still lead to a reduced ICER if we assume that benefit gains are lost gradually, not immediately, after treatment cessation.

**Recommendations**

Further research to test the effectiveness of this intervention in other clinical settings is needed. Considering the strength of our evidence, equipoise and the ethicality of conducting a further RCT may be debatable, and methods such as a stepped wedge design or an observational study should be considered. It may be that delaying further the wider implementation of rehabilitation is unethical, particularly for this patient group for whom life expectancy is short.

**Disclosures and Acknowledgments**

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References


Appendix I

The Rehabilitation Intervention Delivered in Hospice Day-Care

1. Process

(i) Assessment
Patients are assessed in the nurse-led clinic or medical clinic. All patients have access to the core elements of the service, which include the outpatient clinic, nurse-led clinic, the day suite, volunteer support, and relaxation groups. Additional elements are offered to the patient on the basis of meeting his/her individual needs and goals after their assessment. These elements are not prescriptive and vary depending on the availability and local need both in terms of physical and psychological well-being. They may include the following:

- Acupuncture: It is the insertion of fine needles at pressure points to relieve pain.
- Art therapy: To benefit from this therapy, patients do not have to be good at art or even to have tried it before.
- Bach flower remedies: These are dilutions of flower material developed by Edward Bach, an English physician and homeopath, in the 1930s. The remedies are intended primarily for emotional and spiritual conditions.
- Counseling: Sessions of varying lengths are offered to patients, couples, families, and friends to talk through fears and anxieties; to explore emotions, such as depression and low self-esteem; and to enable people to adapt to living with and surviving illness and to dying. Various therapeutic models are used appropriate to the needs of individuals. Spiritual counseling is also offered.
- Dietician/Nutritional therapy: This includes dietary advice and supplements.
- Healing: This is the flow of healing energy through the healer to the patient to allow the body’s own self-healing mechanisms to work more effectively. It does not require a religious faith or belief.
- Homeopathy: This is a system of medicine based on treating “like with like.” Appropriate remedies are prescribed in the form of tablets, powder, or drops over a period of time to stimulate the body’s own natural healing system.
- Hypnotherapy: The therapist takes the patient into a deep state of relaxation so that the patient can be helped to let his/her mind float onto things that they might wish to change and ways to do this away from anxious thoughts.
- Indian head massage: Indian head massage is based on the ayurvedic system of healing. The aim of Indian head massage is to release the stress that has accumulated in the tissues, muscles, and joints of the head, face, neck, and shoulders.
- Massage: This is one of the earliest forms of powerful “hands on” therapeutic touch. It helps to release physical tension in the body that can lead to mental and emotional release and a feeling of well-being.
- Physiotherapy/Hydrotherapy: Following an individual assessment, a personalized exercise program is developed for patients to follow in our well-equipped gymnasium. Additionally, we offer water-based exercises and relaxation in our hydrotherapy pool.
- Reflexology: It is believed that different areas of the hands and feet are linked with different parts of the body. The reflexologist assesses any imbalances and by applying light but firm pressure, generally to the feet, aims to bring the body back into balance.
- Reiki: This is a simple form of healing, which originated in Japan. Reiki is not linked to any belief system.
- Social work: Advocacy on a range of complex social issues including access to care, benefits and financial problems, and legal issues including wills, funeral arrangements, housing, and immigration. We also offer emotional support to patients, carers, family members, and friends.
- Writing therapy: This can provide a creative outlet for emotional stress.

(ii) Goal Setting
The reason for attending may be expressed in a number of ways. Patients may present with aims, problems and/or goals to be met or achieved. For some patients these may be specific and measurable goals, for example, to walk to the bus stop. For other patients, they may be expressed as existential needs, for example, the need to feel safe. Patients may express problems or issues that they wish to address where clearly measurable goals are not appropriate or the patients may not want to engage in a goal-setting process. Skills in communication and goal setting are essential along with the provision of professional commitment to assist in achieving these goals/needs. Success in this area requires an open and honest exchange between the two parties. However, such discourse requires considerable skill not least in renegotiating specific goals as personal circumstances change, physical frailty
increases, or the dying process begins. Goals/issues/problems are initially identified and agreed with the patient and documented on the patient’s care plan in the language used by the patient.

(iii) Review of Goals
Goals/issues/problems are reviewed with the patient at each visit to the medical or nursing clinic on an individual basis depending on the expected time it will take to achieve them.

(iv) Care Package
Once goals have been agreed, a program of services is arranged. This is referred to as the patient’s “care package” and is documented on the care plan in the patient’s records. Patients may only require access to the core elements of the service; however, the additional elements are offered to the patient singly or in combination on the basis of meeting his/her individual needs and goals.

Careful consideration should be given to the timing and pace of planned interventions. For example, counseling interventions may not always be accepted in the acute treatment phase but may be appropriate several months after treatment ends. This may be the time when the shock of diagnosis and the fatigue of treatment have passed but the reality of a changed existence is realized.

(v) Documentation, Communication, and Care Plans
The assessment is recorded in the patient notes using the assessment and care planning framework documentation. A care plan is agreed with the patient and a copy given or sent to the patient. Following each clinic, a letter summarizing the consultation is dictated by the doctor or nurse who led the clinic. This is typed up by the administrative staff and, with the patient’s permission, a copy sent to the patient’s general practitioner (GP), hospital consultants and other relevant health care professionals. A copy is also sent to the patient if they wish to have one.

(vi) Multidisciplinary Clinical Meetings
The clinical team meets weekly to plan and review appropriate involvement of different disciplines. At this meeting, there is case review of all new referrals and all patients who have been seen in the medical or nurse-led clinic. This meeting also provides an opportunity for individual therapists to discuss problems that have risen over the previous week. The meeting is attended by medical staff, nursing staff, physiotherapist, and representative(s) from the psychosocial team. Feedback from other staff or volunteers involved in the patient’s care is provided by the clinical team leaders, for example, gym volunteers’ feedback via the physiotherapy team, complementary therapists through the nurse coordinator.

(vii) Review
All patients have a set review date when they are seen either in the medical or nurse-led clinic. At this appointment, the clinician discusses the content, difficulties, and benefits of the care plan with the patient. The package of care is reviewed and reformulated or plans for discharge set. The frequency of reviews is individualized and dependent on previous clinical assessment as well as the changing needs of the patient.

(viii) Emergency Care
Patients requiring emergency care are triaged by the medical or nursing staff. If appropriate, patients may be admitted to the hospice inpatient unit. If the patient has a need for acute care in hospital, then the staff will contact the patient’s hospital medical team to arrange appropriate transfer. In situations of genuine emergency, patients will be transferred by an emergency ambulance to the hospital. The hospice has basic life saving equipment only. Decisions related to do not attempt resuscitation (DNAR) status are made in line with the hospice DNAR policy and recorded in the patient’s notes.

(ix) Discharge
Discharge will be considered when outpatient specialist palliative care is no longer required. Decisions related to discharge are made with the patient and discussed in the multidisciplinary meeting. A discharge plan will be considered in the following circumstances: Patients who (i) no longer fit the service access criteria, (ii) no longer wish to access the service or who do not receive any benefit
from the service, (iii) have had no contact with the unit for more than six months, or (iv) whose behavior is inappropriate and inhibits other patients from accessing the service.

All discharge arrangements are coordinated by the nurse-in-charge and recorded in the patient’s notes. Continuity of care between health care settings is a principal component of discharge planning. Patients are informed of options available for ongoing support. The nurse who coordinates the discharge will establish who else is involved in providing support. Referral to a community palliative care team is considered. The patient’s GP, support team and any other professional involved in the patient’s care are informed of the discharge via letter. The nurse-in-charge is responsible for ensuring that the discharge letter is typed and sent by the administrative team to the relevant professionals. After discharge, patients who meet the referral criteria can be re-referred to the service.

2. Additional Elements of the Services Available

(i) Physiotherapy

There is a fully equipped gym and hydrotherapy pool. All patients who wish to access the gym or hydrotherapy pool are assessed by a member of the medical team prior to assessment by the physiotherapist. Initial assessment by the physiotherapist consists of a consultation identifying the current issues affecting physical function and specific goals are set. The physiotherapist will develop the exercise program with the patient in this session before joining our group sessions. They are continually monitored by the physiotherapy team and gym volunteers and programs adapted and progressed as necessary.

All patients require medical assessment before using the pool. Regaining physical strength or mobility is often a priority but there also may be psychological benefits. The gym program exploits the benefits of exercise in a social setting. Exercising patients who are deconditioned as a result of illness or treatment-related side effects can produce significant improvements in muscle strength and functional independence. Additionally, exercise is associated with fitness and absence of disease and our qualitative assessments show that patients report an enhanced sense of positivity and hope.

(ii) Complementary Therapies

Hypnotherapy may be useful in helping patients who are phobic, anxious, or perhaps are experiencing sleep disturbance. Touch techniques such as aromatherapy, or healing reflexology may engender a sense of well-being and reinstate the sense of touch as a pleasurable rather than invasive experience. There also may be benefits for those with altered body image.

(iii) Psychosocial Team

The psychosocial team comprises counseling staff, art therapist, chaplain, and social workers. Team members offer advocacy on a range of complex social issues including access to care; benefits and financial problems; and legal issues, including wills, funeral arrangements, housing, and immigration. The team also offers emotional support to patients, carers, family members, and friends through sessions of varying lengths to talk through fears and anxieties, to explore emotions such as depression and low self-esteem, and to enable people to adapt to living with and surviving illness and to dying. Various therapeutic models are used appropriate to the needs of individuals. Spiritual counseling and a bereavement support service also are available.

Outline Summary of Tookman A, Eades J, Hopkins K et al. A rehabilitation approach to day therapy for people with advanced, progressive illness. The Manual, March 2012. Full details available from Dr. Louise Jones at caroline.jones@ucl.ac.uk.