Inpatient and outpatient rehabilitation for patients with rheumatoid arthritis: a clinical and economic assessment

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Summary

The aim of this study was to compare inpatient and outpatient rehabilitation for patients with active rheumatoid arthritis from clinical and cost perspectives.

A single-centre, randomised trial design was used. Data were completed at baseline, post treatment and at 6 months follow-up. The primary outcome was the Arthritis Impact Measurement Scale 2. Several other disease activity, functional and quality of life measures were also assessed (erythrocyte sedimentation rate, C-reactive protein, visual analogue scale for pain, early morning stiffness, tender and swollen joint count, grip strength, timed ‘Up and Go’ test and Schedule for the Evaluation of the Individual Quality of Life—Direct Weighting). All direct and indirect costs were measured. A total of 47 subjects were randomised to the study.

No sustained significant differences were detected between the two groups for the primary or secondary measures at the end of treatment or at follow-up. Total inpatient costs (€81,590) were more than three times higher than total outpatient costs (€25,450).

Keywords: rheumatoid arthritis, rehabilitation, inpatient, outpatient, costs

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Introduction

Rheumatoid arthritis (RA) is a chronic inflammatory disease leading to considerable morbidity in terms of pain, fatigue, functional disability and reduced quality of life in addition to psychological, social and economic effects. Multidisciplinary rehabilitation is an essential component of the management of RA, addressing the multifaceted impact of the disease. A number of studies have been undertaken to investigate the effect of different settings (inpatient or outpatient) in managing RA. Studies comparing intensive inpatient care with regular (primarily rheumatologist and physiotherapist) outpatient care found that inpatient care was more effective. However, the studies had many methodological problems, including lack of randomisation and lack of concealment of assessors. Other studies investigating intensive inpatient and outpatient care found the two settings to be equally effective, with one study concluded that intensive inpatient care supplemented with follow-up outpatient care was more effective than inpatient care alone.

Intensive rehabilitation, particularly when delivered on an inpatient basis, is expensive and time consuming for patients. A recent randomised controlled trial in The Netherlands of patients with RA managed in intensive inpatient or day patient settings or in an outpatient setting with care primarily delivered by a nurse specialist showed no difference in any outcomes measured (functional status, quality of life, health utility or disease activity). Provision of care by a nurse specialist, whilst reducing the intensity of care, did not, however, provide a multidisciplinary approach to rehabilitation. It is thus necessary to examine the effect of extended multidisciplinary outpatient care delivered by a number of healthcare professionals (medical and nursing personnel, physiotherapists, occupational therapists, social workers, orthotists) on clinical outcomes.

It is also important to assess the economic implications of different care regimens for the treatment of RA. Costs and outcomes need to be examined to ascertain the cost effectiveness of alternative regimens of care. This is particularly important for Ireland given the increasing emphasis on value for money in the provision of health and social care services. Costs of outpatient care are lower than intensive inpatient and outpatient programmes owing to the removal of the overnight stay and the lower intensity of treatment from both settings. The recent randomised study in The Netherlands found that costs involving nurse specialist care (€212 for three visits of 3 hours per visit) were considerably lower than intensive care programmes (€4,961 total costs per study inpatient and €4,055 total costs per study outpatient). Total societal inpatient costs 2 years later remained higher than total societal outpatient costs (€22,448 vs. €16,896) and total societal nurse specialist costs (€11,572). A UK study conducted in the late 1990s found that costs were
slightly higher following intensive inpatient care (£2,021) than following intensive outpatient care (£1,789). Higher inpatient costs were also reported in two other studies ($5,417 vs. $4595; $5,000 vs. $8028), demonstrating the high costs associated with inpatient care. This paper compares intensive multidisciplinary team (MDT) inpatient care with extended multidisciplinary outpatient care for patients with RA based on a single-centre randomised trial of 47 patients. Outcomes were assessed at baseline, post treatment and 6 months follow-up. Costs were assigned for all resource use, including non-market interventions. This is the first study for Ireland in this important area and is a contribution to the small but growing international literature on the cost effectiveness of various treatment regimens for RA.

**Methods**

**Subjects**

Subjects recruited from the rheumatology outpatient clinic of one hospital were considered for entry to the study between September 2000 and July 2002. Subjects had a definite diagnosis of RA (as defined by the 1987 American College of Rheumatology criteria13) and required MDT care for management of their disease. All subjects were over the age of 18 years and resided within travelling distance of the outpatient facility. Exclusion criteria for the study included an indefinite diagnosis of RA and inability to travel to attend the outpatient facility. All subjects gave written informed consent to participate prior to randomisation to either inpatient or outpatient rehabilitation. Participants were randomised using a biased coin design14−17.

**Clinical assessment**

Assessments were conducted at baseline, post treatment and at 6 months follow-up. Timing of the post-treatment assessment occurred when the patient was discharged from the relevant setting. Thus, there was not a defined length of time between these two assessments. Assessments were conducted by the researcher, who was not blinded to subject group allocation as the two settings were in different locations. Owing the different locations of the two settings, healthcare personnel involved in the delivery of patient care and participants were not blinded to group allocation.

The Arthritis Impact Measurement Scale 2 (AIMS2) was the primary outcome measure. It is a disease-specific measure of physical, social and emotional well-being18. Secondary outcome measures included erythrocyte sedimentation rate (ESR), C-reactive protein (CRP), pain using a visual analogue scale, early morning stiffness, grip strength, 28 tender and swollen joint count, timed ‘Up and Go’ test (TUG) and the Schedule for the Evaluation of the Individual Quality of Life—Direct Weighting (SEIQoL-DW)19. To the author’s knowledge this is the first intervention study that used SEIQoL-DW for patients with RA.

**Treatment regimens**

Inpatient rehabilitation was provided in an inpatient unit by a MDT consisting of
medical and nursing personnel, physiotherapists, occupational therapists and a social worker. Hydrotherapy was also available to all inpatients. Subjects received daily physiotherapy, with occupational therapy and social work provided on an appointment basis. Weekly MDT meetings were held to discuss patient caseloads. Length of stay and thus discharge were determined by the MDT at their weekly team meetings. No personnel involved with that decision making were involved in recruiting, allocating or assessing study participants. Outpatient treatment was provided on a multidisciplinary appointment basis, which included medical, nursing, physiotherapy, occupational therapy and social work personnel. Regular team meetings were not held as per the inpatient setting. Hydrotherapy was not provided in the outpatient setting.

Cost analysis

Both direct and indirect costs associated with the delivery of care in both settings were recorded concurrently with the clinical trial. Direct costs recorded included pay costs, non-pay costs and capital costs. Indirect costs included costs borne by the patient such as travel expenses and loss of earnings.

Data were recorded from patient medical charts, physiotherapy notes and time sheets given to the relevant health professionals involved in the provision of care to the patient. In addition, patients were given diaries to record resource utilisation if attending the outpatient facility.

Information recorded in these diaries included travel expenses, time off work, home help costs, childcare costs, General Practitioner (GP) expenses and carer’s costs.

As this study commenced in 2000 and completion of data collection was in 2003, and the majority of costs occurred in 2002, 2002 was used as the cost base. Thus, where necessary, costs that occurred prior to 2002 were uprated to account for changes in the Euro changeover and also to account for inflation, according to the Central Bank of Ireland Consumer Price Index.

Direct costs

Pay costs

Pay costs were measured based on the number of hours of time spent by each health professional (rheumatologists, non-consultant hospital doctors, nurses, physiotherapists, occupational therapists, social workers, podiatrist, chiropodist, care assistants) and other staff (porters, administration staff) with the study patients. Salary costs were obtained from the Impact Union Pay and Salary scales (2002). Wage costs for care assistants and porters were obtained from the Human Resources Department and Head of Portering Services, respectively, in the inpatient facility.

The numbers and type of (home or surgery) GP visits were recorded. The cost of a GP visit to a non-medical card patient in Dublin in 2002 was used as the market value for GP visits. Patients who benefited from home-help services were asked to record the use of this service, which was then
valued at prevailing hourly pay rates. Similarly, the number of public health nurse visits to each patient was recorded, in addition to the length of each visit, and valued accordingly. The use of alternative medicines/therapy such as acupuncture, holistic health etc. was also recorded and valued.

**Non-pay costs**

Medication usage by each patient in the study was recorded. The name of the drug, the dosage and the number of times administered were recorded from patient medical records. The value of the medications used was determined using a 2002 copy of Monthly Index of Medical Specialities (MIMS). The number and type of X-rays, bone scans and blood tests taken for each patient in the study was recorded from patient medical records. The market value for each of these was obtained from the radiology department of a private hospital.

The capital and equipment costs of the inpatient unit were determined from the accounts departments\(^1\). These costs were apportioned in line with the percentage of patients attending the inpatient facility with RA (51%). The costs of the hydrotherapy pool (initial costs and ongoing maintenance costs) were also estimated. An annual discount rate of 5% was used in the initial calculation of an equivalent daily cost. The impact of a 3 and 7% discount rate was examined in the sensitivity analysis. The accounts department of outpatient facility provided figures on the capital and equipment costs. An equivalent annual cost and subsequently an equivalent daily cost were calculated and 25% of the costs were allocated to patients with RA.

Admission expenses (cost of toiletries, clothing, nightwear etc. purchased by the patient for their admission to the inpatient unit) were valued based on the amount paid by the individual on purchase. Any special aids purchased by the patient on the recommendation of their therapist were also recorded. Such items were valued based on the amount paid by the patient for their purchase. Attendance with the podiatrist for prescription of custom-made footwear was also recorded. Costs of orthotics provided to each patient were obtained from administrative records.

**Shared costs/overheads**

Costs of inpatient overheads (light, heat, laundry, household, catering, security etc.) were estimated based on data supplied by the accounts departments of the two facilities. Because of joint production, it was necessary to allocate the costs based on the percentage of patients with RA attending the two settings in 2002 (51% inpatient unit and 25% outpatient facility). These figures (51 and 25%) were used in allocation of all shared costs. The outpatient facility is a stand-alone building on the grounds of a large Dublin teaching hospital.

A number of clinical services are also provided in this outpatient facility, including the rheumatology outpatient clinics, the breast clinic and a portion of the services provided by the physiotherapy and occupational departments.
Indirect costs

There are likely to be significant opportunity costs associated with attendance for treatment at RA facilities, both inpatient and outpatient. Employment status was recorded for each patient. For patients who were employed full-time at the time of attendance for treatment, the average weekly industrial wage of €494.58 was used to calculate loss of earnings during the period of treatment. For patients who were employed on a part-time basis, one-half of the average weekly industrial wage (€247.29) was used to estimate loss of earnings. A number of patients were unemployed, retired or on disability pensions. For these patients, a value of one-quarter of the average weekly industrial wage (€123.64) was used to calculate their loss of earnings, equivalent to lost leisure time valuation. The cost of attendance for people engaged in home duties was based on a replacement cost methodology based on what it would cost to replace them in home duties while attending the facility. Similarly, childcare costs were estimated based on the market value of such replacement care while people attended the facility.

Each patient was asked to record any travel expenses incurred, for example taxi fares, bus ticket costs or the number of miles taken by the journey was multiplied by the Department of Social Welfare mileage allowance (93.04 cent) to determine the total costs of travel. An average per-patient cost was then calculated for each group.

The valuation of carer time was based on work previously conducted, which estimated carer and voluntary work at an opportunity cost of €2.18/hour (this figure has been uprated to account for the Euro changeover and for inflation). Sensitivity analysis based on replacement cost was also applied to informal care provision.

Statistical analysis

Statistical analysis was conducted using Minitab statistical software, version 14. Sample size calculations were conducted using data from the pilot study for the AIMS2. To test clinical equivalence, the largest acceptable clinical difference in outcome between the two groups was defined as 20% on the AIMS2. A total sample size of 42 was required to detect this difference between the groups, with a power of 80% at the \( p < 0.05 \) level (two-tailed test). Baseline characteristics of age and disease duration were compared using two-sample \( t \)-tests, whilst functional classification* and gender were compared using a Mann–Whitney test. Non-normally distributed data (ESR, CRP, grip strength and TUG) were log-transformed before analysis. Back-transformed data are presented for these outcome measures.

* American College of Rheumatology classification of global functional status in RA: Class I, completely able to perform usual activities of daily living (self-care, vocational and avocational); Class II, able to perform usual self-care and vocational activities, but limited in avocational activities; Class III, able to perform usual self-care activities, but limited in vocational and avocational activities; and Class IV, limited in ability to perform usual self-care, vocational and avocational activities.
To adjust for baseline scores, analysis of covariance was used to compare outcome between the two groups at end of treatment and at follow-up. Analysis was based on intention-to-treat. The last observation carried forward imputation technique was used to assess the impact of missing data. All comparisons of outcome scores between inpatient and outpatient groups are presented as the difference in means with 95% confidence interval (CI), after adjusting for baseline differences in outcome. Ethical approval was sought and granted for the study. The study procedures were in accordance with the Declaration of Helsinki 2000.

**Results**

A total of 55 subjects were considered for entry to the study over a period of 23 months. The flow of participants through the study using AIMS2 data is shown in Figure 1. The demographic profile of the 47 subjects randomised to the study (25 inpatients and 22 outpatients) is shown in Table 1. No significant differences were found between the two groups for age ($p=0.632$), disease duration ($p=0.475$), gender ($p=0.430$) or functional classification ($p=0.420$).

**Rehabilitation programme**

Mean length of stay in the inpatient unit was 13.14 days (range 4–22 days). All inpatients received medical and nursing care, physiotherapy (including hydrotherapy) and occupational therapy treatment. Eight inpatients were seen by the social worker. The mean number of outpatient appointments was 5.7 (range 3–9 appointments). These appointments occurred on a weekly basis over a 6-week period. All outpatients received physiotherapy treatment and were reviewed by the medical team before discharge, 16 outpatients received occupational therapy, 5 patients were seen by the nurse specialist and 1 outpatient was seen by the social worker.

During the treatment period, 5 inpatients and 2 outpatients were started on a disease-modifying antirheumatic drug (DMARD), 3 inpatients and 2 outpatients had their DMARD dosage increased, whilst 13 inpatients and 11 outpatients had no change to their DMARD. A total of 8 inpatients were taking steroids during the treatment period (mean dose of deltacortril 6.25 mg/day) compared with 6 outpatients (mean dose of deltacortril 7.9 mg/day). One outpatient was started on an anti-tumour necrosis factor (TNF) therapy (infliximab) and received two doses of the treatment during the rehabilitation period. Four inpatients received joint injections during their stays in the inpatient unit, whilst 1 outpatient received joint injections during treatment.

During the follow-up phase, 15 inpatients and 14 outpatients had no change in medication. One inpatient and 1 outpatient started on MTX, whilst 1 inpatient stopped their DMARD and one had their DMARD dose decreased. One outpatient stopped steroid medication. Administration of the anti-TNF therapy for the one outpatient continued throughout the follow-up period.
Clinical analysis

At baseline there were no significant differences between the groups in outcome measures (Table 2) for the primary outcome (AIMS2) or for any of the secondary measures. At the end of treatment and at follow-up, no significant differences between the two groups were found for the primary measure (AIMS2) (Table 3). For the secondary measures, only CRP showed a significant difference between the two groups at follow-up (adjusted difference in means 2.463; 95% CI 0.011–1.792) (Table 3). Analysis with imputation of missing values did change any of the findings.

Cost analysis

Total inpatient costs were more than three times higher than total outpatient costs (Table 4). Inpatient pay costs were

AIMS2, Arthritis Impact Measurement Scale 2.
seven times higher than the equivalent costs in the outpatient setting and also accounted for almost 50% of the total costs in that setting. X-ray costs in the inpatient setting were almost four times that of the outpatient setting. Drug costs were relatively low in both settings. Overheads in the inpatient setting accounted for €11,872, reflecting the intensity of the inpatient stay. Work foregone costs in the inpatient group were significantly higher than for the outpatient group. The average cost per patient from start to finish of treatment in the inpatient setting was €3,263 compared with €1,293 in the outpatient setting. In the follow-up period, one outpatient was admitted to hospital following a fracture of the tibia, unrelated to his diagnosis.

A sensitivity analysis was conducted to test the robustness of the results, as there were a number of areas of uncertainty with respect to the estimation of costs. These areas were mainly in relation to buildings, equipment and homemaker costs.

Table 1. Demographic profile of study participants.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Inpatients (n=25)</th>
<th>Outpatients (n=22)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years) (mean (sd))</td>
<td>58.8 (8.8)</td>
<td>60.4 (12.3)</td>
<td>0.632</td>
</tr>
<tr>
<td>Disease duration (years) (mean (sd))</td>
<td>14.6 (9.8)</td>
<td>12.5 (9.7)</td>
<td>0.475</td>
</tr>
<tr>
<td>Sex</td>
<td>7 male/18 female</td>
<td>4 male/18 female</td>
<td>0.430</td>
</tr>
<tr>
<td>Functional classification</td>
<td></td>
<td></td>
<td>0.420</td>
</tr>
<tr>
<td>I</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>II</td>
<td>12</td>
<td>11</td>
<td></td>
</tr>
<tr>
<td>III</td>
<td>11</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>IV</td>
<td>2</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

SD, standard deviation.

Table 2. Baseline values (mean (standard deviation)) for both groups for all clinical measures.

<table>
<thead>
<tr>
<th>Measure</th>
<th>Inpatient</th>
<th>Outpatient</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIMS2 (0–100; lower score better)</td>
<td>60.46 (17.74)</td>
<td>52.81 (16.82)</td>
</tr>
<tr>
<td>ESR (mm/Hg)</td>
<td>31.32 (23.61)</td>
<td>26.33 (18.22)</td>
</tr>
<tr>
<td>CRP (mmol/l)</td>
<td>31.12 (35.68)</td>
<td>23.94 (21.25)</td>
</tr>
<tr>
<td>EMS (minutes)</td>
<td>66.70 (57.50)</td>
<td>71.10 (82.50)</td>
</tr>
<tr>
<td>Grip strength (KPa)</td>
<td>11.27 (6.26)</td>
<td>10.63 (9.26)</td>
</tr>
<tr>
<td>VAS for pain (0–10 cm)</td>
<td>4.60 (2.50)</td>
<td>3.80 (2.40)</td>
</tr>
<tr>
<td>Swollen joint count (0–64)</td>
<td>8.20 (4.87)</td>
<td>10.41 (6.53)</td>
</tr>
<tr>
<td>Tender joint count (0–64)</td>
<td>8.64 (6.28)</td>
<td>9.95 (7.82)</td>
</tr>
<tr>
<td>TUG (seconds)</td>
<td>13.77 (4.89)</td>
<td>14.37 (7.09)</td>
</tr>
<tr>
<td>SEI-QoL (0–100; higher score better)</td>
<td>55.44 (25.12)</td>
<td>55.31 (19.27)</td>
</tr>
</tbody>
</table>

AIMS2, Arthritis Impact Measurement Scale 2; ESR, erythrocyte sedimentation rate; CRP, C-reactive protein; EMS, early morning stiffness; VAS, visual analogue scale; TUG, timed ‘Up and Go’ test; SEI-QoL, Schedule for the Evaluation of the Individual Quality of Life.
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Two differing discount rates were used in the sensitivity analysis, 3 and 7%. The additional analysis did not change the conclusion from the original results.

**Discussion**

This study shows that over a 6-month follow-up period, no sustained differences in clinical effectiveness were observed between inpatient MDT care and extended multidisciplinary outpatient care. Both interventions had a positive effect on the functional ability of patients with RA, their disease activity and quality of life. The provision of rehabilitation in the inpatient setting was three times more costly than in the outpatient setting.

The finding of similarity of clinical outcome between intensive inpatient and outpatient...
The higher inpatient costs found in this study are consistent with results from other studies which found that inpatient costs were higher than outpatient costs. Total outpatient (regular outpatient care) costs were 15.8% of total inpatient costs in a previously reported study. In this study, the high inpatient costs were mainly attributable to salary costs (approximately 50% of total inpatient costs), a feature of inpatient care. X-ray costs were four times higher in the inpatient setting, perhaps attributable to the ease of access to the radiology department in the inpatient setting, which is a smaller facility than the outpatient facility. Travel costs in the outpatient setting were double the equivalent inpatient cost and represent a transfer of cost to the patient in the delivery of care in this setting. Higher costs are only acceptable if they are accompanied by greater effectiveness. In this study, distinct and sustained differences in outcome were not seen between the two settings despite the higher cost of inpatient care.

There is conflicting evidence regarding the duration of benefit from rehabilitation for RA. Improvements in inpatients and outpatients at follow-up compared with baseline were found in a number of studies, with another study reporting deterioration at follow-up (1 year) with a significant deterioration in function and disease activity in each group. Similar to this study, there were no differences between the two groups at follow-up. Inpatients had a greater improvement at follow-up in one study only. The duration
of follow-up is variable between studies (0.5 years, 2 years, 1 year), making direct comparisons difficult.

**Strengths and limitations**

This is the first study based in Ireland to examine costs associated with the provision of multidisciplinary rehabilitation for patients with RA. It provides valuable information on the costs associated with the provision of care for this patient group. It does have some limitations; nevertheless, the authors believe the strengths of the study in other aspects of its design make the results noteworthy. This was a single-centre trial in a country with a population of approximately 4 million, 1% of whom are estimated to have RA. There are only two inpatient MDT settings in Ireland, thus accessing large numbers of patients was limited from the outset. In addition, a slower than predicted throughput of patients meeting the inclusion criteria and a restricted time frame prevented the inclusion of more subjects. Second, changes in drug use were not controlled for in either setting. However, documentation of drug use during treatment and follow-up showed that drug use was generally similar in both groups, except for one outpatient who started on anti-TNF therapy. The effect of this one patient on the overall results was not measured. Also, it was not possible to blind the assessor to group allocation owing the participants receiving treatment at different sites and it was not feasible to bring participants to a neutral venue for assessment. However, the assessor was not involved in delivering care to participants, thus reducing assessor bias.

Lastly, the Health Assessment Questionnaire (HAQ) was not included as an outcome measure as it was thought that the AIMS2, having a functional aspect, would suffice. Omission of the HAQ reduces the identification of functional disability and the extent to which the study can be compared with other studies in this area.

**Conclusion**

In summary, this study, despite its small sample size, does have some important contributions to make to the topic of inpatient and outpatient multidisciplinary rehabilitation. It verifies the results of previously conducted studies reporting similar clinical outcomes when comparing inpatient and outpatient rehabilitation. It builds on other research by showing that an extended multidisciplinary outpatient approach offering flexibility in the delivery of rehabilitation is a viable and less costly alternative to more intensive inpatient approaches.

**Acknowledgements**

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**References**


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