EXTENDED REPORT

Cost effectiveness and cost utility analysis of multidisciplinary care in patients with rheumatoid arthritis: a randomised comparison of clinical nurse specialist care, inpatient team care, and day patient team care

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Objective: To assess the relative cost effectiveness of clinical nurse specialist care, inpatient team care, and day patient team care.

Methods: Incremental cost effectiveness analysis and cost utility analysis, alongside a prospective randomised controlled trial with two year follow up. Included were patients with rheumatoid arthritis (RA) with increasing difficulty in performing activities of daily living over the previous six weeks. Quality of life and utility were assessed by the Rheumatoid Arthritis Quality of Life questionnaire, the Short Form-6D, a transformed rating scale, and the time tradeoff. A cost-price analysis was conducted to estimate the costs of inpatient and day patient hospitalisations. Other healthcare and non-healthcare costs were estimated from cost questionnaires.

Results: 210 patients with RA (75% female, median age 59 years) were included. Aggregated over the two year follow up period, no significant differences were found on the quality of life and utility instruments. The costs of the initial treatment were estimated at €200 for clinical nurse specialist care, €5000 for inpatient team care, and €4100 for day patient team care. Other healthcare costs and non-healthcare costs were not significantly different. The total societal costs did not differ significantly between inpatients and day patients, but were significantly lower for the clinical nurse specialist patients by at least €5400.

Conclusions: Compared with inpatient and day patient team care, clinical nurse specialist care was shown to provide equivalent quality of life and utility, at lower costs. Therefore, for patients with health conditions that allow for any of the three types of care, the preferred treatment from a health-economic perspective is the care provided by the clinical nurse specialist.

Despite new developments in the medical treatment, rheumatoid arthritis (RA) can run a highly variable course, with periods of flares and remissions and steadily increasing damage to the joints. If the performance of activities of daily living is seriously hampered, an individual patient can be involved with a wide variety of health professionals and services simultaneously. A multidisciplinary team of health professionals who communicate with each other regularly has been proposed as the best management strategy for such complex care.[1]

Multidisciplinary team care has long been supplied mainly in inpatient settings. However, over the past decades more and more day patient or outpatient care has been provided. Moreover, in a number of countries, the clinical nurse specialist has been introduced in complex disease management.[2–4] In addition to actually delivering clinical care, education, and assistance, clinical nurse specialists can enhance and support care delivered by other health professionals.[5]

Although innovations like day patient care and clinical nurse specialist care were introduced to increase efficiency, the number of intervention studies that include a full economic evaluation is limited. In a comparison of inpatient and outpatient team care, Helewa *et al* showed that effectiveness and costs were both about three times higher for inpatient team care.[6] In a comparison of inpatient and day patient team care, Lambert *et al* concluded that the clinical outcome of both types of care was equivalent, with slightly lower overall resource costs for day care.[7]

So far, there have been no economic evaluations of care provided by a clinical nurse specialist. The results of a randomised clinical trial by our own group recently showed that clinical nurse specialist care was as effective as inpatient and day patient multidisciplinary team care,[8] on clinical outcome measures. Here we present the full two year economic analysis of that trial, comparing societal costs, and quality of life and utility measures of patients receiving clinical nurse specialist care, inpatient team care, and day patient team care.

METHODS

Study design

The cost effectiveness analysis (CEA) and cost utility analysis (CUA) were part of a randomised controlled trial that has been described in more detail elsewhere.[8] In brief, between December 1996 and January 1999, 210 patients were recruited in the outpatient clinic of the rheumatology department of six hospitals. The inclusion criteria were RA as defined by the 1987 American Rheumatism Association criteria[9] and increasing

Abbreviations: CEA, cost effectiveness analysis; CUA, cost utility analysis; ES, effect size; QALY, quality adjusted life year; RA, rheumatoid arthritis; RAQoL, Rheumatoid Arthritis Quality of Life; SF-6D, Short Form-6D; TRS, transformed rating scale; TTO, time tradeoff

difficulty in performing activities of daily living over the past six weeks. Exclusion criteria were medical complications of RA requiring immediate hospitalisation and inability to reach the hospital before 10 am.

Patients were randomly allocated to clinical nurse specialist care, inpatient multidisciplinary team care, or day patient multidisciplinary team care. Allocation was achieved by randomly assorted cards in sealed envelopes, stratified by sex and centre. The study was approved by the medical ethics committees of all six participating centres and informed consent was obtained from all patients.

The primary clinical end point was functional status as measured by the Health Assessment Questionnaire and the MacMaster Toronto Arthritis patient preference interview. Reported clinical and sociodemographic characteristics at baseline were age, disease duration, sex, and employment status.

Patient management protocols

Within two weeks after randomisation, all patients randomly allocated to care provided by a clinical nurse specialist were seen by a clinical nurse specialist from one of the six participating hospitals. The clinical nurse clinics were run in addition to the regular care provided by the rheumatologist. The clinical nurse specialist provided information about RA and prescribed, in consultation with the rheumatologist, joint splints, adaptive equipment, and house adaptations if needed. If indicated, the patient could also be referred to other health professionals, such as an occupational therapist, physical therapist, or social worker. The ending of care by the clinical nurse specialist was left to his or her opinion. Patients typically visited the clinical nurse specialist three times, over a period of 12 weeks.

Inpatient and day patient team care also started within two weeks after randomisation and was given at the rheumatology clinic of the Leiden University Medical Centre, a referral centre with inpatient and day care facilities. The multidisciplinary inpatient and day patient teams comprised nurses, a rheumatologist, an occupational therapist, a physical therapist, and a social worker. Inpatients and day patients followed a prescribed treatment programme that was of equal intensity for both groups and tailored to individual needs. Treatment goals and modalities were discussed during weekly multidisciplinary team conferences. In addition, patients received written information about how to handle their disease and they participated in an educational session of one hour. Inpatient and day patient team care both consisted of nine treatment days over two and three weeks, respectively. Day care was given from 10 am until 4 pm with a fixed period of one and a half hour's bed rest.

During follow up, the decision to introduce or change disease modifying drugs, to optimise non-steroidal anti-inflammatory drugs, or to give intra-articular steroid injections was left to the attending rheumatologist in all three randomisation groups.

Quality of life and utility instruments

In the economic analysis, four measures of quality of life and utility were used that all provided a single overall score. RA-specific quality of life was assessed using the Rheumatoid Arthritis Quality of Life (RAQoL) questionnaire,[10] at 0, 6, 12, 26, 52, and 104 weeks. The RAQoL questionnaire consists of 30 yes/no items covering aspects of moods and emotions, social life, hobbies, every day tasks, personal and social relationships, and physical contact.[11] The overall score is the sum of the individual item scores ranging from 0 to 30 impairments, with lower scores indicating better quality of life. This overall score is not a utility score because it is not preference based and does not properly reflect the relative importance of the separate items. Quality of life was also assessed using the generic RAND-36 questionnaire,[12] at 0, 6, 12, 26, 52, and 104 weeks. The RAND-36 consists of 36 items on physical and social functioning, role limitations, mental health, vitality, pain, and general health perception. The RAND-36 was mapped to the Short Form-6D (SF-6D), for which a utility function is available that reflects society's preference for the patients' health.[13] The utility function assigns about three times more weight to pain than to role limitations, for example. Both questionnaires were filled out by the patient without supervision.

A rating scale (RS) was applied at 0, 6, 12, 26, 52, and 104 weeks. Patients first rated two fictitious patients on a scale from 0 to 100 (worst to best imaginable health), and then rated their own current health. The rating scale was transformed[14 15] to a utility score using the formula $TRS = 1-(1-RS/100)^{1/0.62}$. The time tradeoff (TTO) method[15] was used at 0, 26, 52, and 104 weeks. The TTO reflects the patient's preference for her current health, by measuring how much life expectancy she is willing to trade to obtain perfect health. The patient is asked how many years x in optimal health she would consider equivalent to her remaining life expectancy y in her current health. The utility score for her current health is then calculated as the ratio x/y. If she is willing to trade a large part of her life expectancy, then x is small and so is her TTO score. Both the rating scale and the TTO were administered during a face to face interview by trained independent assessors, who were unaware of the patient's treatment status.

Costs of hospitalisation

The costs of the inpatient and day patient hospitalisations comprise an important part of the cost differences. Charges per day were not considered appropriate estimates of these costs, because, in general, charges are different from costs and because not all costs are proportional to the duration of the hospital stay. Therefore, a cost-price analysis was conducted in the rheumatology clinic of the Leiden University Medical Centre to estimate the costs of inpatient and day patient hospitalisations. In a top down analysis, total annual costs were allocated to different types of patients. Patients were differentiated by their duration of hospital stay and inpatients also by their disease severities. As a proxy for severity so-called nursing points were used, according to the San Joaquin instrument.[16] Nursing points are routinely registered each day, with a maximum of four points per patient. Staff planning is based on the assumption that one nurse can provide care for patients with a total of at most six nursing points.

The 1998 costs of different types of staff, pharmacy, equipment, and material were directly attributable to the separate inpatient and day patient departments. Annual costs of housing were attributed at a price of €830 per square metre. Annual costs of overheads (like hospital management and cleaning) were attributed by an increase of 14% on the non-overhead costs. Each cost item was assigned to either of three cost carriers: admissions (for costs independent of duration and severity), hospital days (for costs proportional to duration), and nursing points (for costs proportional to severity). Dividing the annual costs assigned to each cost carrier by the annual number of cost carriers in 1999 provided us with an estimate of the costs per admission, per hospital day, and per nursing point. Multiplying by the number of cost carriers per patient provided an estimate of the departmental costs per patient.

Hospitalisation costs are not only incurred by the rheumatology department. Non-rheumatology costs of paramedic treatments, food, and travel were added according to treatment time, the number of hot and cold meals, and the number of return visits.

Societal costs

The societal costs during the two year follow up period were estimated in accordance with current guidelines for cost

effectiveness analyses.[17] Costs were discounted at 3% a year, and are reported in euros at a 2002 price level (using the price index rate for the Dutch healthcare sector, obtained from Statistics Netherlands). The categories of healthcare costs included were hospitalisations, rheumatologists, general practitioners, physical therapy, occupational therapy, social worker, clinical nurse specialist, home nursing care, other health professionals (other medical specialists, paramedics, and alternative medicine), drugs, and appliances (like shoes and braces). The categories of non-healthcare costs included were out of pocket costs (like swimming and house adaptations), home care (professional), informal care (by family, friends, or volunteers), and paid and unpaid labour costs. Except for the initial hospitalisations, all healthcare and non-healthcare costs were estimated from cost questionnaires filled out by the patients at 26, 52, 78, and 104 weeks, each covering the preceding six months.

Most cost prices were obtained from Dutch standard prices that were designed to reflect societal costs and to standardise economic analyses.[18–20] The medical costs of rheumatologists, general practitioners, and paramedics were valued at €61, €18, and €21 per consultation.[19] Because the duration of consultations with the clinical nurse specialists could vary considerably they were valued at €56 per hour (with at least one two hour consultation), in accordance with the price per consultation for paramedics.[19] Other consultations of specialists, alternative medicine, and telephone and home consultations were valued at between €10 and €85 per consultation.[19] Home nursing care was valued at €33 per hour.[19] Drugs were valued according to the Pharmacotherapeutic Compass,[20] plus €6 for each non-drugstore purchase.[19] Medical appliances were valued as reported by the patients. The reported healthcare costs include time and travel costs. Time was valued at €5 per hour—that is, the average price the patients in our study were willing to pay to prevent spending time on outpatient visits. The valuation of transportation was based on national averages for the travel distance and valued at €1 plus €0.27 per kilometre. Out of pocket costs were valued as reported by the patients. Professional home care was valued at €19 per hour.[19] Informal care was limited to at most four hours per day and valued at €8 per hour (minimum wages).[19] Paid labour was valued using the friction cost method, in which productivity costs are calculated for at most four months—that is, the estimated time needed to find a replacement.[18 21] Time spent on unpaid labour was compared with the average over the entire sample (for men and women separately, corrected for the individual amount of home care and informal care), and the difference was valued at €5 per hour (the value of time).

Analyses

All analyses were based on the data collected during the two year follow up, according to intention to treat as initially assigned. Missing measurements were imputed by carrying the previous measurement forward. Patients without baseline measurement or any non-baseline measurement for a particular instrument were excluded from the analysis of that particular instrument. All effectiveness scores were corrected for baseline differences (by subtracting the individual baseline score and adding the overall average baseline score).

In the CEA, effectiveness was measured by the aggregate RAQoL score (defined as the area under the RAQoL curve, divided by two to correct for the two year follow up period). In the CUA, Quality Adjusted Life Years (QALYs) were estimated by the area under the SF-6D, the TRS, and the TTO utility curves. QALYs were discounted at 3% per year, to reflect the fact that later years are somewhat less important.

Because the costs of the initial inpatient and day patient hospitalisations were by far the largest cost categories, sensitivity analysis was only performed on these costs: in a threshold analysis it was determined under which cost reduction the difference in societal costs remained statistically significant at 5%.

Baseline differences between the three randomisation groups were tested using the Kruskal-Wallis, or the Pearson χ^2 test where appropriate. Because from a societal perspective it is the means that can be extrapolated to larger populations,[22] differences in outcome measures were compared using analysis of variance with post hoc Games-Howell test for pairwise differences (which corrects for multiple comparisons).

To test the validity of the instruments, change over time and responsiveness were analysed by comparing the individual baseline measurement with the individual unweighted average over the non-imputed, non-baseline measurements. Change over time was tested using the Wilcoxon signed rank matched pairs test. Responsiveness was quantified by the effect size (ES)[23]—that is, the change divided by the standard deviation of the baseline measurement.

RESULTS

Baseline measurements

Sixty of the 270 patients who were screened for the study were not randomly allocated to a group for the following reasons: did not fit entry criteria (15), unwilling to be randomised (10), private circumstances (21), and the expectation that day care would be physically too burdensome (14). Of the 210 patients included, 31 did not complete the full two year follow up. They were equally distributed over the three randomisation groups. Seven of these patients died. Other reasons for withdrawal

Table 1 Baseline characteristics of patients with rheumatoid arthritis and increasing difficulty in performing activities of daily living

	Overall (n=210)	Clinical nurse specialist (n=71)	Inpatient team care (n=71)	Day patient team care (n=68)	p Value overall difference
Age (years)*	59 (23–85)	54 (24–85)	60 (22–80)	60 (29–82)	0.04†
Disease duration (years)	1.8 (0–47)	2.1 (0–46)	2.1 (0.1–47)	1.4 (0–35)	0.44
Number of women (%)	158 (75)	51 (72)	53 (75)	54 (79)	0.55
Number in paid employment (%)	52 (25)	24 (34)	12 (17)	16 (24)	0.04‡
RAQoL**	16.4 (7.0)	13.8 (7.1)	17.0 (6.0)	18.3 (7.3)	0.001†
SF-6D	0.578 (0.11)	0.622 (0.11)	0.561 (0.09)	0.553 (0.11)	<0.001†
TRS	0.719 (0.17)	0.759 (0.16)	0.701 (0.16)	0.696 (0.19)	0.05†
TTO	0.708 (0.26)	0.748 (0.22)	0.686 (0.27)	0.690 (0.27)	0.46

*Median and range; **average and standard deviation; †pairwise comparisons show significant differences between clinical nurse specialist patients and both inpatients and day patients ($p \leq 0.05$), but no difference between inpatients and day patients ($p > 0.10$); ‡pairwise comparisons show significant differences between clinical nurse specialist patients and inpatients ($p \leq 0.05$), but no difference between day patients and both clinical nurse specialist patients and inpatients ($p > 0.10$).

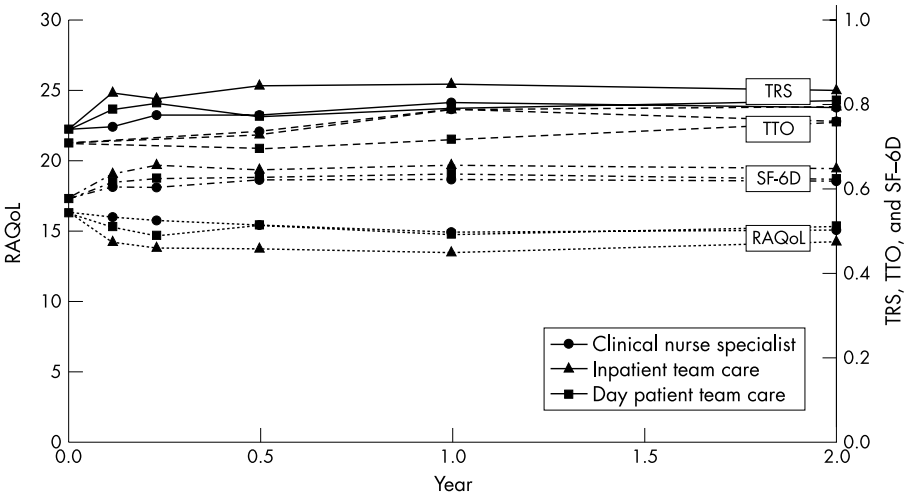

Figure 1 RAQoL, SF-6D, TRS, and TTO measurements.

were severe comorbidity, deteriorating physical condition, unwillingness, and removal.

At baseline, no differences were found in the proportion of women and the disease duration between the randomisation groups. The clinical nurse specialist patients were significantly younger than both day patients and inpatients, and more clinical nurse specialist patients were employed than inpatients (table 1). The clinical nurse specialist patients also had significantly better quality of life than inpatients and day patients, according to the RAQoL, the SF-6D, and the TRS (table 1). No differences between inpatients, day patients, and clinical nurse specialist patients were found for the previous use of second line antirheumatic drugs, recent changes of non-steroidal anti-inflammatory drugs, intra-articular steroid injections over the past six months, and oral use of prednisone (data not shown).

Medical treatment during the two year follow up

One day care patient received inpatient care instead, because travelling was considered physically too burdensome. One inpatient was hospitalised for 42 days instead of nine days owing to the severity of RA activity. During the two year follow up, no significant differences between clinical nurse specialist patients, inpatients, and day patients were found for the following treatment aspects: change of second line antirheumatic drugs, changes of non-steroidal anti-inflammatory drugs, intra-articular steroid injections, and oral use of prednisone (data not shown).

Quality of life and utility

For the RAQoL, SF-6D, TRS, and TTO instruments respectively, 92%, 89%, 93%, and 74% of the included patients provided both baseline and non-baseline data. These patients on average provided 90%, 90%, 90%, and 93% of their non-baseline measurements. Some patients (6%) were unable to provide a baseline TTO measurement, because assessment of the TTO was started some months into the inclusion period.

Over the two year follow up period, patients in all three randomisation groups improved on all four instruments (fig 1). These improvements over time were already apparent after six or 12 weeks. All improvements were significant ($p \leqslant 0.02$), except for the RAQoL for the clinical nurse specialist patients ($p=0.18$) and the TTO for the inpatients ($p=0.23$). Aggregated over all three types of care, the average improvements on the RAQoL, SF-6D, TRS, and TTO instruments were 1.50, 0.045, 0.061, and 0.046, with respective ES 0.21, 0.49, 0.35, and 0.18.

A patient in good health would have an aggregate RAQoL score close to 0, and QALY estimates close to the follow up period of two years. The different instruments do estimate different levels of impairment over the two year follow up period (fig 1), but show no significant differences between the three types of care (table 2). All observed QALY differences were less than 0.1 year.

Costs of the initial treatment

Firstly, the costs of hospitalisation will be estimated for average patients with RA, regardless of whether they participated in the study or not (table 3). The inpatient department had twice the number of staff and twice the annual costs of the day patient department. The estimated costs for each average patient with RA in the inpatient department were also more than twice as high. This difference is mainly due to the fact that the average duration of hospitalisation is higher for inpatients than for day patients (24.6 *v* 7.5 days). The constant costs per admission were somewhat higher for the inpatients (€919 *v* €741), but the costs per day were identical (€123 + 1.85 × €61 = €236 *v* €235, where 1.85 was the average number of nursing points per day).

However, the inpatient and day patient hospitalisations in our study were not average hospitalisations. Compared with the average inpatient at the time the study was conducted, the inpatients in our study required a shorter hospital stay (12 *v* 24.6 days) and less nursing care (1.50 *v* 1.85 nursing points per day). On the other hand, compared with the average day

Table 2 Two year effectiveness

	Clinical nurse specialist (n=63, 61, 65, 52)†	Inpatient team care (n=67, 65, 67, 50)†	Day patient team care (n=63, 61, 65, 53)†	p Value overall difference
Average RAQoL*	15.3 (4.1)	15.1 (4.5)	13.9 (4.7)	0.18
QALYs, based on the SF-6D	1.202 (0.18)	1.222 (0.18)	1.264 (0.19)	0.17
QALYs, based on the TRS	1.530 (0.22)	1.538 (0.25)	1.624 (0.30)	0.07
QALYs, based on the TTO	1.474 (0.28)	1.402 (0.34)	1.485 (0.27)	0.31

*Average and standard deviation; †for RAQoL, SF-6D, TRS, and TTO, respectively.

Table 3 Cost price analysis of inpatient and day patient hospitalisation

	Inpatient hospitalisation				Day patient hospitalisation			
		Per cost carriers				Per cost carriers		
	Total	Admissions	Days	Nursing points	Total	Admissions	Days	
Rheumatology department personnel (in FTE)								
Nursing staff	12.4	→* 1%	0%	99%	4.9	→* 5%	95%	
Rheumatologists	0.9	→ 39%	61%	0%	0.7	→ 67%	33%	
Management	1.1	→ 96%	2%	2%	0.9	→ 97%	3%	
Total	14.4	10%	4%	86%	6.5	24%	76%	
Rheumatology department costs (in €)								
Nursing staff	375 000	→* 1%	0%	99%	148 000	→* 5%	95%	
Rheumatologists	117 000	→ 39%	61%	0%	55 000	→ 67%	33%	
Management	32 000	→ 90%	5%	5%	27 000	→ 92%	8%	
Pharmacy	29 000	→ 0%	50%	50%	13 000	→ 0%	100%	
Equipment and materials	21 000	→ 3%	84%	13%	13 000	→ 25%	75%	
Housing	374 000	→ 14%	86%	0%	166 000	→ 32%	68%	
Overhead	135 000	→ 13%	45%	42%	60 000	→ 30%	70%	
Annual costs	1 082 000	14%	45%	41%	482 000	30%	70%	
Annual number		161	3 963	7 315		193	1 445	
Unit costs†		919	123	61		741	235	
Costs per average patient	6 714	←‡ 1 ×	24.6 ×	45.4 ×	2 504	←‡ 1 ×	7.5 ×	
Costs per study patient	3 493	← 1 ×	12 ×	18 ×	2 856	← 1 ×	9 ×	
Non-Rheumatology costs (in €)								
Physiotherapy	418	3.4 hrs			418	3.4 hrs		
Hydrotherapy	63	0.9 hrs			63	0.9 hrs		
Social worker	38	0.8 hrs			38	0.8 hrs		
Activities	20	0.5 hrs			20	0.5 hrs		
Food	86	36 meals			16	9 meals		
Time costs	819	12 days			537	9 days		
Travel costs	24	2 visits			107	9 visits		
Costs per study patient	1 468				1 199			
Total costs per study patient (in €)	4 961				4 055			

*Separate cost items are allocated to the cost carrier(s) to which the cost item is proportional; †obtained by dividing the percentage of the annual costs by the annual number of cost carriers; ‡obtained by multiplying the unit costs and the average number of cost carriers for each patient.

patient at the time the study was conducted, the day patients in our study required slightly longer hospitalisations (9 *v* 7.5 days). As a result, the departmental costs of both types of hospitalisation were estimated at €3493 and €2856, with a difference of €637 in favour of day care. Costs outside the rheumatology departments were also in favour of the day patient hospitalisation, because the additional travel costs were outweighed by the smaller time costs. Including these non-rheumatology costs, the costs of hospitalisation were €4961 and €4055, with an estimated cost difference of €906 in favour of day care.

Patients randomly allocated to care provided by a clinical nurse specialist on average reported 3.3 visits (SD 3.7), with a total duration of 3.3 hours (SD 4.1). The costs of these visits were estimated at €212, which is almost negligible compared with the costs of the initial inpatient and day patient care. Costs of care initiated by the nurse specialist could not be estimated separately and are included with the other healthcare costs.

Societal costs

Of the patients included, 26 (12%) returned no cost questionnaires. The 184 patients who did, on average returned 3.8 of the 4 (95%) questionnaires.

For healthcare consumption other than the initial treatment, the inpatients reported longer hospitalisations and more home nursing care (table 4). For the non-healthcare costs, the inpatients reported more home care and the clinical nurse specialist patients reported more unpaid labour. However, none of these cost categories showed a significant difference. The overall trend was the same as in the costs of the initial treatment.

Owing to the initial treatment of the inpatients and the day patients, the societal costs were highest in the first semester (fig 2). The other healthcare costs and the non-healthcare costs both increased over time in all randomisation groups ($p<0.001$). The total societal costs for each patient were estimated at €11 572 (SD €11 847) for the clinical nurse specialist patients, €22 448 (SD €22 049) for the inpatients, and €16 896 (SD €10 608) for the day patients. These total societal costs for the inpatients and the day patients were not significantly different ($p=0.22$), but were significantly lower for the clinical nurse specialist patients ($p=0.003$ compared with the inpatients and $p=0.03$ compared with the day patients). The total societal costs remained significantly lower for the clinical nurse specialist patients ($p=0.05$) when the costs of the initial inpatient hospitalisation were reduced by 12% and the costs of the initial day patient hospitalisation were reduced by 66%.

Because the observed effectiveness of the three types of care was not significantly different, we did not estimate cost effectiveness ratios.

DISCUSSION

In this study we analysed the quality of life and societal costs of patients with RA with increasing difficulty in performing activities of daily living. They received clinical nurse specialist care, inpatient team care, or day patient team care. Over the two year follow up period, no significant differences were found for the aggregate RAQoL and the QALYs based on the SF-6D, the TRS, and the TTO. The costs of the initial treatments were estimated at €200, €5000, and €4100, respectively. Other healthcare costs and non-healthcare costs over the two year follow up period showed the same trend, but were

Table 4 Average two year healthcare consumption and costs per patient

	Healthcare consumption*			Costs**			
	Clinical nurse specialist (n=61)	Inpatient team care (n=62)	Day patient team care (n=61)	Clinical nurse specialist (n=61)	Inpatient team care (n=62)	Day patient team care (n=61)	p Value overall difference
Costs of initial treatment				212	4 961	4 055	<0.001†
Other healthcare costs							
Inpatient hospitalisations	28%, 5.1 ds	32%, 8.5 ds	31%, 5.3 ds	1 805	2 858	1 838	0.40
Day patient hospitalisations	13%, 0.6 ds	16%, 2.7 ds	20%, 1.7 ds	283	902	619	0.22
Rheumatologist	10.8 cons	11.8 cons	9.7 cons	845	925	761	0.40
General practitioner	11.4 cons	12.1 cons	12.0 cons	328	380	344	0.79
Physical therapy	23.4 hrs	24.0 hrs	19.9 hrs	1 523	1 682	1 265	0.65
Occupational therapy	5.9 hrs	10.0 hrs	13.0 hrs	373	703	938	0.12
Social worker	0.3 hrs	1.2 hrs	1.1 hrs	17	75	67	0.58
Clinical nurse specialist	3.3 hrs	0.4 hrs	0.5 hrs	212	26	27	<0.001‡
Home nursing care	4.8 hrs	30.9 hrs	10.0 hrs	159	1 035	338	0.57
Other health professionals				490	684	786	0.26
Drugs				1 749	2 094	1 916	0.39
Appliances				307	256	299	0.84
Total				7 880§	11 621	9 197	0.16
Non-healthcare costs							
Out of pocket costs				176	214	234	0.87
Home care	145 hrs	213 hrs	67 hrs	2 687	3 958	1 251	0.25
Informal care	149 hrs	180 hrs	126 hrs	1 219	1 472	1 025	0.75
Absenteeism	20 hrs	10 hrs	28 hrs	215	161	416	0.18
Unpaid labour	1 464 hrs	1 300 hrs	1 170 hrs	–818¶	63	717	0.11
Total				3 480	5 867	3 644	0.29
Average total healthcare costs				8 092	16 581	13 252	<0.001‡
Average total societal costs				11 572	22 448	16 896	0.001‡

*Averages: ds=days, cons=consultations, hrs=hours; **averages, in €; †pairwise comparisons show significant differences between all three patient groups (p<0.001); ‡pairwise comparisons show significant differences between clinical nurse specialist patients and both inpatients and day patients (p≤0.03), but no difference between inpatients and day patients (p≥0.21); §excluding the costs of the clinical nurse specialist, already counted in the initial treatment; ¶negative costs, because these patients provided a more than average amount of unpaid labour.

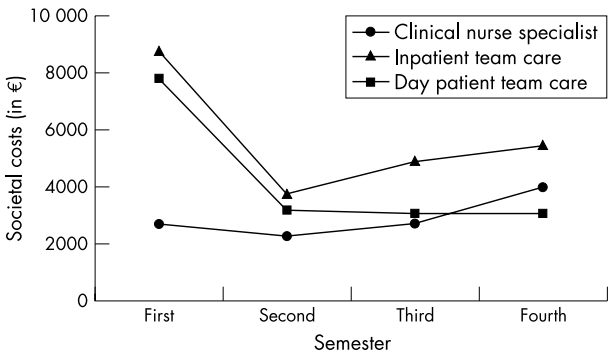

Figure 2 Societal costs per patient per semester.

not significantly different. The total societal costs did not differ significantly between inpatients and day patients. The societal costs per patient were significantly lower for the clinical nurse specialist care, by €10 876 compared with inpatient care and by €5324 compared with day patient care.

In economic comparisons of medical treatments, it is the differences in costs and effectiveness that count. Higher costs are acceptable if they are accompanied by sufficiently better effectiveness. In the American literature, an often quoted rule of thumb is that costs up to $50 000 per QALY are acceptable. In the Dutch literature, a lower threshold of €25 000 per QALY is more commonly used. Based on the latter rule of thumb and the observed €5300 cost difference between the day patients and the clinical nurse specialist patients, the two year QALYs for the day patients would have to be at least 0.2 years better than for the clinical nurse specialist patients to compensate for the additional costs. Owing to the larger cost difference between the inpatients and the clinical nurse specialist patients, the two year QALYs for the inpatients would have to be 0.4 years better than for the clinical nurse specialist patients. The estimated differences in QALYs all failed to reach these thresholds, in addition to failing to reach statistical significance.

A complicating factor in the interpretation of the observed equivalent quality of life and utility is that the clinical nurse specialist patients were significantly better off on several baseline variables. Such differences were corrected for by analysing change scores. Nevertheless, the baseline differences are likely to have led to an underestimation of the effectiveness for the clinical nurse specialist patients, because they had less scope for improvement. Given that their effectiveness was still not significantly worse than for the other patients, the baseline differences do not seem to undermine our conclusions.

In our CEA and CUAs four instruments were used to measure quality of life and utility, with considerable conceptual and statistical differences. All four instruments showed no differences between the three types of care. This lack of difference might be due to insensitivity of these types of instruments, although the clinical outcome measures also showed no differences between the randomisation groups.[8] To evaluate the validity of the instruments we analysed the change over time. All four instruments did show significant improvement over time.

The RAQoL questionnaire can be a valid instrument if one is interested in RA-specific health items and previous reports on its sensitivity to change were promising,[24] but in our economic analysis it appeared less useful than the other instruments. The responsiveness was low (ES=0.21), and the sum score does not properly reflect the relative importance of the separate items (which is why it is not called a utility).

The generic SF-6D is similar in the sense that it also asks the patient for only a description of her health. The scoring function does, however, reflect the relative importance of the separate domains as valued by the general population, which is

recommended for societal decision-making about healthcare resources. Moreover, the SF-6D showed the best responsiveness (ES=0.49).

For non-societal decision-making from the perspective of the patient, methods like the TRS and the TTO would be preferred. Instead of obtaining a health description, these methods directly obtain the utility score from the patient. As a result these methods not only include variance due to differences in health but also variance due to differences in valuation. Conceptually, the TTO is a more valid method than the TRS, because it explicitly asks the patient to express her valuation by making a tradeoff. However, the method is associated with a considerable variance, at least partially caused by difficulties that patients experience in understanding the method. As a result, fewer patients provided TTO data and the estimated responsiveness was low (ES=0.18). Previous research in patients with RA found similarly low responsiveness.[7] For patients undergoing total hip replacement better responsiveness of the TTO has been reported,[25 26] but this was mainly because of a greater improvement over time. Although the TRS is considered a less valid method to measure utility, its practicality can make it an acceptable alternative to obtain utilities from the patient. It can be obtained without an interview, and the transformation can be used to prevent undesirable scale properties. In line with earlier research[27] it showed a reasonable responsiveness (ES=0.35).

With all three types of care, patients showed a sustained improvement over time. This finding is in contrast with other studies[6 7] and may reflect differences in the intensity of routine outpatient management. Our study does not provide direct evidence on whether the improvement should be attributed to the medical care provided or to regression to the mean, because patients were included when they experienced increased difficulty in performing activities of daily living. However, in an earlier study we did include a control group, comparing inpatient team care with routine outpatient non-team care.[28 29] In that study it was found that the inpatients reached clinical improvement significantly and considerably earlier, at a time that was comparable with the present study.

Taking the time difference into account, our cost estimates are similar to other published cost estimates. Helewa *et al* estimated the costs of inpatient hospitalisation in 1984 at $3000.[6] Lambert *et al* estimated the costs of inpatient and day patient hospitalisation in 1995 at £1800 and £2000.[7] Our estimates are similar and confirm the relatively small difference between inpatient and day patient hospitalisation. Van Jaarsveld *et al* estimated the Dutch direct costs in 1997 during the first six years of RA at £3680 per year,[30] which is in between our overall estimates with or without the initial treatment. Our estimated cost differences mainly consist of the costs of the initial hospitalisations. As a result, the conclusions of our study are likely to apply to other settings as well. Notwithstanding possibly large local and international cost differences, hospitalisations are expensive anywhere.

The observed equivalent effectiveness of inpatient and day patient team care is in line with the findings of Lambert *et al*.[7] Others have found inpatient team care more effective than intensive or routine outpatient non-team care.[6 29] Our study estimates that the effectiveness of care provided by the clinical nurse specialist is similar to inpatient and day patient team care, with costs that are similar to outpatient non-team care. Therefore, for patients with health conditions that allow for any of the three compared types of care, the preferred treatment from a health-economic perspective is the care provided by the clinical nurse specialist.

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ECHO

NSAIDs provoke severe acute diarrhoea

Please visit the Annals of the Rheumatic Diseases website [www.annrheumdis.com] for link to this full article.

Serious intestinal upsets from taking non-steroidal anti-inflammatory drugs (NSAIDs) are more widespread than generally recognised, according to a prospective case-crossover study.The next step, the authors say, is to see whether this milder disease shows intestinal lesions indicating colitis.

The relative risk of severe, acute diarrhoea increased roughly threefold after taking various NSAIDs over one, three, and six days before the upset compared with the preceding four months in patients consulting general practitioners in France. This was true for 231 patients from an initial sample of 285 patients consulting between December 1998 and July the following year. Forty one patients had diarrhoea of microbial origin.

The study included a prospective series of patients with diarrhoea lasting more than a month and judged serious enough to warrant investigation by their general practitioners, who were participants in France's *Sentinel* communicable disease network

The general practitioners recorded patient data, onset of diarrhoea, and NSAID exposure and duration in the four months leading up to the consultation. Stool specimens were taken to identify potential communicable diseases.

The researchers assessed the risk of severe acute diarrhoea by comparing diarrhoea in one day after exposure to NSAIDs (risk period) with 60 days before the risk period (control period), and for three and six day risk periods with 20 and 10 day control periods, respectively.

Until now, NSAIDs have been recognised as a risk factor for acute colitis, but not for less serious severe, acute diarrhoea.

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