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HEALTH SERVICES RESEARCH

Evaluation of the impact of nursing clinics in the rheumatology services

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Abstract Nursing clinics in rheumatology (NCRs) are organisational care models that provide care centred within the scope of a nurse's abilities. To analyse the impact of NCR in the rheumatology services, national multicenter observational prospective cohort studied 1-year follow-up, comparing patients attending rheumatology services with and without NCR. NCR was defined by the presence of: (1) office itself; (2) at least one dedicated nurse; and (3) its own appointment schedule. Variables included were (baseline, 6 and 12 months): (a) test to evaluate clinical activity of the disease, research and training, infrastructure of unit and resources of NCR and (b) tests to evaluate sociodemographics, work productivity (WPAI), use of services and treatments and quality of life. A total of 393 rheumatoid arthritis and ankylosing spondylitis patients were included: 181 NCR and 212 not NCR, corresponding to 39 units, 21 with NCR and 18 without NCR (age 53 + 11.8 vs 56 + 13.5 years). Statistically significant differences were found in patients attended in sites without NCR, at some of the visits (baseline, 6 or 12 months), for the following parameters: higher CRP level (5.9 mg/l ± 8.3 vs 4.8 mg/l ± 7.8; $p < 0.005$), global disease evaluation by the patient (3.6 ± 2.3 vs 3.1 ± 2.4), physician (2.9 ± 2.1 vs 2.3 ± 2.1; $p < 0.05$), use of primary care consultations (2.7 ± 5.4 vs 1.4 ± 2.3; $p < 0.001$) and worse work productivity. The presence of NCR in the rheumatology services contributes to improve some clinical outcomes, a lower frequency of primary care consultations and better work productivity of patients with rheumatic diseases.

Keywords Ankylosing spondylitis · Nursing · Health services research · Quality indicators · Rheumatoid arthritis

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Introduction

In recent years, rheumatology departments have developed nursing clinics in rheumatology (NCR), and scientific societies have drawn up recommendations for their structure and tasks. Usually, NCR is as part of the rheumatology department, with activities that include the administration of treatments, monitoring adverse events, education of patients, and carrying out evaluations and standard rheumatology tests [1, 2]. More recently, the European League Against Rheumatism (EULAR) established recommendations on the role of nursing in rheumatology clinics in terms of the improvement of education, communication (face to face and via phone) and patient satisfaction, collaborating

on clinical handling, and evaluating the psychosocial problems of these patients [3].

On the other hand, there is no agreement on the definition of a NCR. Several initiatives have tried to define their competencies [1, 3–6]. The majority agree that an NCR should perform healthcare tasks such as monitoring drugs, training the patients in the self-administration of drugs, health promotion and education, telephone attention, specific rheumatology diagnostic techniques, etc. [5, 6].

Previous studies have shown than NCR could reduce costs by reducing the number of hospital visits and admissions as well as the consumption of drugs [7–9]. In other studies, the nursing services improve the satisfaction and health outcomes in rheumatic patients [10], provide educational interventions to reduce cardiovascular risk in rheumatoid arthritis (RA) patients [11] and monitor biological therapy and disease scores as well as rheumatologists [12, 13].

The SCORE (***S****eguimiento y* ***CO****ntrol en* ***R****eumatología-****E****nfermería* [Follow-up and Control in Rheumatology–Nursing]) is a project that aims to compare the efficiency of NCRs versus rheumatology departments without NCR in different indicators. To reduce the variability in the results, the study was limited to patients with rheumatoid arthritis (RA) and ankylosing spondylitis (AS) patients with long standing disease.

Patients and methods

An observational study of two prospective cohorts was conducted, one comprising patients treated in rheumatology departments with NCR and the other at departments without NCR, with an economic evaluation. The NCR and non-NCR departments were selected at random from the rheumatology departments in our country that responded to a questionnaire regarding their availability. The criteria for the consideration of a NCR were based on a previous published study that used the Delphi method to define it (4). According to this study, an NCR should have, at least, the following: (1) an independent office for the nurse different to that of the doctors; (2) at least one nurse dedicated to the NCR; and (3) its own appointment schedule.

A sample size of 200 patients/cohort was planned, which would enable us to determine difference of 14 % ($\alpha = 0.05$; $1 - \beta = 0.8$) in the case of maximum uncertainty (e.g. if the principal efficacy variable at the NCR is 50 and 36 % at the non-NCR). The participation of 20 departments/group was planned with each department providing 10 patients.

Each hospital included, on consecutive days, the first patient who met the inclusion criteria: >18 years; diagnosed with RA or AS; and receiving treatment with at least one disease-modifying drug (DMARD) or a biologic. The limitation to RA and AS, and not other diagnosis, was decided to limit bias regarding much different diagnosis. RA and AS are standard inflammatory arthritis patients that have a clear consensus in the follow-up and outcomes variables. Patients included in this study were those with long standing disease, not new diagnosis. Each patient was monitored for 1 year.

Variables

At baseline visit (V0), a questionnaire was used to record socio-demographic data, comorbidities and habits. The primary outcome variable was the percentage of patients in clinical remission, and this was defined as a disease activity score of 28 joints (DAS28) < 2.6 in RA and ankylosing spondylitis disease activity score (ASDAS) < 1.3 in AS. All other were considered secondary variables.

Outcomes of disease activity and function: they were recorded at V0, at 6 and 12 months and were DAS28, visual analogue scale of global disease evaluation of patient and physician (0 = best, 10 = worst), tender and swollen joint counts and health assessment questionnaire (HAQ) in patients with RA [14]. In patients with AS, we recorded the visual analogue scale of global disease evaluation of patient and physician, tender and swollen joint counts, BASDAI (*Bath Ankylosing Spondylitis Disease Activity Index*) [15], ASDAS and BASFI (Bath *Ankylosing Spondylitis Functional Index*) [16].

Outcomes of quality of life: at V0 and V12, patients completed questionnaires to detect socio-occupational variables (domestic situation, levels of education, employment status, need for a carer, disability pension due to rheumatic disease), EuroQol-5 dimension (EQ-5D) and state of health in relation to the last 12 months (better, same or worse).

Outcomes of labour productivity: at V0 and V12, we recorded deterioration in work activity with WPAI: GH (*Work Productivity and Activity Impairment Questionnaire: General Health*) [17], number in absence due to the disease in the last year and in the last 7 days (% working hours lost, % deterioration in work activity, % loss of work productivity and % deterioration in non-work activity).

Cost: at V0, V6 and V12, we conducted questionnaires to detect the consumption of resources (use of services and treatment). The direct costs were calculated based on the use of services in the year of follow-up: number of consultations with specialists, primary care and accident and emergency; hospitalisations; diagnostic tests (laboratory analyses, X-rays and other imaging procedures); therapeutic procedures (intra-articular procedures, rehabilitation sessions and operations); and pharmacological treatment. The indirect costs comprised: loss of work productivity

(days of absence from work), early retirement or pension as a result of rheumatic disease, transport to the health centre for appointments and the need for a carer as a result of rheumatic disease.

A pilot test was carried out and a training session held for the investigators before starting the study. Telephone monitoring was carried for 100 % of the questionnaires with inconsistencies.

Data analysis

The categorical variables are described in percentages. The continuous variables with normal distribution are described using the mean ± standard deviation "mean ± SD" and those without normal distribution using the median and 25 and 75 percentiles "median (P_{25}–P_{75})".

At V0 and V12, the NCR and non-NCR departments were compared using the Chi-square test for categorical variables and for quantitative variables Student's *t* test, if the distribution is normal, or the Mann–Whitney *U* test, if normality is not assumed.

The costs of the use of the resources by each individual patient were calculated. The costs during the year of follow-up were only calculated in patients with data at V0, V6 and V12.

The cost per milligram of the drugs was calculated by averaging the standard dosage forms for each commercial brand and, for each dosage form, the packages with the most units (not considering those exclusively for hospital use). If there were several commercial brands with the same active ingredient, the average cost per milligram was calculated for the different brands. For each medicinal product,

Table 1 Baseline characteristics

Variable	NON-NCR ($n = 212$)		NCR ($n = 181$)		*p* (Chi squared)
	N	%	N	%	
Sex					
Male/Female	82/130	38.7/61.3	54/127	29.8/70.2	0.061
Level of education					
No studies	14	6.80	11	6.15	0.763
Primary	87	42.23	83	46.37	
Secondary	64	31.07	56	31.28	
University	41	19.90	29	16.20	
Actively employed					
Yes	128	60.38	105	58.01	0.634
Retired due to RD					
Yes	43	54.43	25	52.08	0.797
Diagnosis of RD					
RA	160	75.5	142	78.5	0.485
AS	52	24.5	39	21.5	
Rheumatoid factor					
Positive	114	55.3	105	62.9	0.140
Negative	79	38.3	48	28.7	
Not recorded	13	6.3	14	8.4	
ACPA					
Positive	106	55.5	94	60.3	0.150
Negative	56	29.3	32	20.5	
Not recorded	29	15.2	30	19.2	
	Mean (SD)	Median (P25–P75)	Mean (SD)	Median (P25–P75)	*p* (*t* test)
Age (years)	56.3 (13.5)	57 (47–67)	53.2 (11.8)	54 (45–61)	**0.017**
Years of progression	9.5 (8.9)	6 (3–14)	10.6 (8.8)	7 (4–15)	0.083*
ESR (mm)	16.3 (15.2)	11 (6–22)	17.5 (16.1)	12 (7–23)	0.428*
CRP (mg/L)	6.4 (11.5)	3.1 (1.2–5.6)	5.0 (9.0)	1.6 (0.3–5.5)	**0.001***

RD rheumatic disease, *RA* rheumatoid arthritis, *AS* ankylosing spondylitis, *SD* standard deviation, P25–P75 Percentile 25–Percentile 75, the *p* values marked with an * have been calculated using the Mann–Whitney nonparametric *U* test, *ACPA* anti-citrullinated peptide antibodies, *ESR* erythrocyte sedimentation rate, *CRP* C-reactive protein

the number of days that each dose was taken was calculated and, based on this information, the total amount, in milligrams, consumed during the study year was calculated.

The cost-effectiveness ratio was calculated by dividing the average total cost for each patient by the proportion of patients who achieved clinical remission in their group (NCR or non-NCR). These data indicate the average cost of achieving clinical remission in each group. Two perspectives were used: the healthcare system's perspective (direct costs only) and the social perspective (direct costs + indirect costs).

Ethical considerations

An epidemiological, non-interventional study was conducted in which the patient is not exposed to additional tests, treatments or visits other than those established in the department's protocol. All the patients signed an informed

Table 2 RD, quality of life and function clinical endpoints

	NON-NCR			NCR			*p* (*t* test)
	N	Mean ± SD	Median (P25–P75)	N	Mean ± SD	Median (P25–P75)	
TJC (RA)							
Visit 0	151	2.2 ± 3.5	1.0 (0.0–3.0)	141	2.0 ± 3.3	1.0 (0.0–3.0)	0.434*
Visit 12	139	2.0 ± 2.8	1.0 (0.0–3.0)	153	1.5 ± 2.6	0.0 (0.0–2.0)	**0.048***
SJC (RA)							
Visit 0	151	1.5 ± 2.3	1.0 (0.0–23.0)	141	1.1 ± 2.0	0.0 (0.0–2.0)	**0.016***
Visit 12	139	1.2 ± 2.3	0.0 (0.0–2.0)	152	0.9 ± 2.1	0.0 (0.0–1.0)	0.170*
DAS28 (RA)							
Visit 0	149	3.0 ± 1.2	2.8 (2.1–3.8)	123	2.9 ± 1.3	2.7 (1.9–3.6)	0.487
Visit 12	139	2.8 ± 1.1	2.8 (2.1–3.7)	150	2.7 ± 1.1	2.5 (1.8–3.5)	0.274
BASDAI (AS)							
Visit 0	48	3.7 ± 2.3	3.3 (1.8–5.6)	38	3.4 ± 2.4	2.6 (1.5–4.8)	0.643
Visit 12	39	3.7 ± 2.1	4.0 (1.8–5.5)	45	3.7 ± 2.6	3.3 (1.3–5.3)	0.996
ASDAS (AS)							
Visit 0	43	2.4 ± 1.1	2.4 (1.4–2.9)	35	1.8 ± 1.1	1.8 (0.9–2.4)	**0.026**
Visit 12	36	2.3 ± 1.0	2.2 (1.8–2.7)	43	2.0 ± 1.2	1.8 (1.2–2.8)	0.239
GDE patient							
Visit 0	206	3.7 ± 2.3	4.0 (2.0–5.0)	178	3.3 ± 2.6	3.0 (1.0–5.0)	**0.004***
Visit 12	181	3.6 ± 2.3	4.0 (2.0–5.5)	197	3.1 ± 2.4	3.0 (1.0–5.0)	**0.003***
GDE doctor							
Visit 0	203	3.1 ± 2.3	3.0 (1.0–5.0)	175	2.6 ± 2.4	2.0 (1.0–4.0)	**0.004***
Visit 12	179	2.9 ± 2.1	3.0 (1.0–4.0)	195	2.3 ± 2.1	2.0 (1.0–4.0)	**0.007***
VAS EQ-5D (0 = worst; 100 = best)							
Visit 0	204	64 ± 21	67 (50–80)	181	65 ± 21	65 (50–80)	0.847*
Visit 12	179	61 ± 22	60 (50–80)	197	67 ± 21	70 (50–85)	**0.005***
EQ-5D tariff (0 = worst; 1 = best)							
Visit 0	201	0.7 ± 0.2	0.7 (0.5–0.8)	177	0.7 ± 0.2	0.7 (0.5–0.8)	0.425*
Visit 12	179	0.7 ± 0.2	0.6 (0.5–0.8)	193	0.7 ± 0.2	0.7 (0.6–0.8)	0.069*
HAQ (RA) (0 = best; 3 = worst)							
Visit 0	159	0.8 ± 0.6	0.8 (0.3–1.3)	140	0.7 ± 0.6	0.6 (0.1–1.1)	0.381*
Visit 12	140	0.9 ± 0.7	0.8 (0.3–1.4)	150	0.7 ± 0.7	0.4 (0.1–1.1)	**0.023***
BASFI (AS) (0 = best; 10 = worst)							
Visit 0	47	3.9 ± 2.6	4.2 (1.6–5.6)	37	3.2 ± 2.8	2.7 (0.7–5.0)	0.240
Visit 12	39	4.0 ± 2.8	3.4 (1.9–6.2)	45	3.9 ± 3.1	3.0 (1.0–6.8)	0.855

Comparison between groups, Visit 0 and Visit 12

RD rheumatic disease, *TJC* tender joint count, *SJC* swollen joint count, *RA* rheumatoid arthritis, *DAS* disease activity score, *BASDAI* bath ankylosing spondylitis disease activity index, *ASDAS* ASAS-endorsed disease activity score, *AS* ankylosing spondylitis, *GDE* global disease evaluation, *VAS* visual analogue scale, *HAQ* health assessment questionnaire, *BASFAI* bath ankylosing spondylitis disease activity index, *SD* standard deviation, P25–P75 Percentile 25–Percentile 75, the *p* values marked with an * are calculated using the Mann–Whitney nonparametric *U* test

consent form. The sponsor and researchers guaranteed the confidentiality of the data and ensured compliance at all times under the provisions of Spanish Organic Law 15/1999 on Personal Data Protection.

Results

In anticipation of possible losses, 48 sites were recruited (27 NCR and 31 non-NCR), of which 39 (21 NCR and 18 non-NCR) participated, with a total of 393 patients (181 NCR and 212 non-NCR) at V0. During the follow-up period, 13 patients were lost and one non-NCR site changed group due to opening an NCR during the study period; at V12 there were 380 patients (198 NCR and 182 non-NCR). For the purposes of the descriptive analysis, this site is considered a non-NCR at V0, and an NCR at V12, but was excluded from the study of costs and cost-effectiveness, as the costs could not be allocated to either of the groups without bias. The patient questionnaire was completed by 393 patients at V0 and 380 at V12.

The inclusion period ran from July to December 2012, and the data collection period from July 2012 to January 2014.

The demographic variables of both cohorts are shown in Table 1. There were no statistically significant differences except in the average age of the patients and the levels of CRP, which were significantly higher at the non-NCR departments.

For the majority of the clinical endpoints, there were significant differences between the NCR group and the non-NCR group at some of the visits (V0, V6 and/or V12), with the patients in the NCR group always being in a better clinical situation: tender joint count, swollen joint count, ASDAS, and global disease evaluation by the patient and by the doctor (Table 2). If we consider the patients in clinical remission (Fig. 1) at V12, the difference is very close to being significant ($p = 0.069$). In terms of the quality of life and function, significant differences were observed in the patients' state of health, EQ-5D and HAQ at V12 (Fig. 2), (Table 2).

No significant differences were observed between the groups in terms of the number of absences/year due to the rheumatic disease. However, there were significant differences at one of the visits for all the WPAI indicators that measure the effect of the disease in the last 7 days, with there always being less effect in the NCR group: % of hours lost at V0, % of deterioration in work activity at V12, % loss of work productivity at V12 and % of deterioration in non-work activity at V12 (Table 3).

In the analysis of the direct costs resulting from the annual consumption of drugs, no significant differences were observed between the two groups nor were significant the differences between the treatment subgroups (biological or DMARDs). In the case of corticosteroids, the non-NCR group had significantly higher costs (Table 4).

With regard to the use of healthcare services, the costs resulting from consultations carried out at healthcare centres were significantly higher in the non-NCR group. No significant differences were observed between the two groups in terms of the total annual cost of the use of services (Table 4).

No significant differences were observed between the two groups in terms of indirect costs resulting from work, travel or carer costs. The direct costs are also summarised in Table 5 with no significant differences between the two groups.

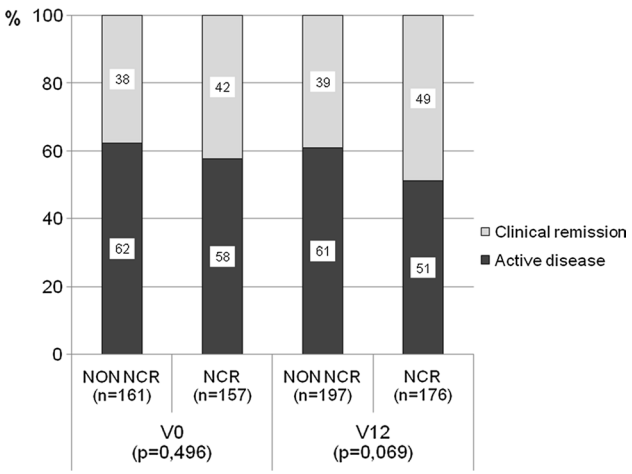

Fig. 1 Clinical remission in RD (with DAS28 or ASDAS). Comparison of NCR and Non-NCR departments at baseline visit (V0) and at one year (V12)

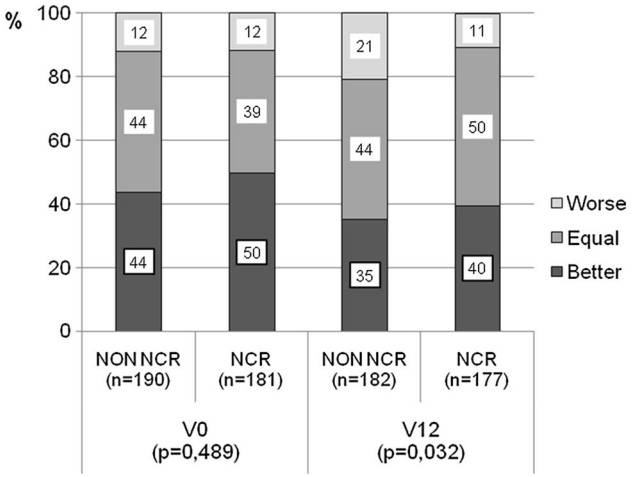

Fig. 2 State of health today in relation to the last 12 months. Comparison of NCR and Non-NCR departments at baseline visit (V0) and at one year (V12)

Table 3 Work productivity data (WPAI)

	NON-NCR			NCR			*p*
	N	Mean ± SD	Median (P25–P75)	*N*	Mean ± SD	Median (P25–P75)	
Patient absences due to RD last year							
Number of absences/year due to RD							
Visit 0	28	1.2 ± 1.0	1.0 (0.3–1.8)	22	1.0 ± 0.8	1.0 (0.0–2.0)	0.753
Visit 12	8	1.3 ± 1.3	1.0 (0.3–1.8)	9	1.1 ± 0.9	1.0 (0.5–1.5)	0.963
Last 7 days due to RD							
% of hours lost							
Visit 0	62	10.7 ± 24.8	0.0 (0.0–5.8)	62	3.0 ± 13.2	0.0 (0.0–0.0)	**0.024**
Visit 12	58	4.3 ± 15.4	0.0 (0.0–0.0)	68	6.8 ± 21.8	0.0 (0.0–0.0)	0.426
% Deterioration in work activity							
Visit 0	72	25.1 ± 24.1	20.0 (0.0–47.5)	62	22.9 ± 24.9	15.0 (0.0–40.0)	0.521
Visit 12	56	31.1 ± 27.7	20.0 (10.0–50.0)	68	16.0 ± 24.5	0.0 (0.0–20.0)	**<0.001**
% Loss of work productivity							
Visit 0	60	26.9 ± 30.4	12.8 (0.0–48.7)	54	23.0 ± 26.2	15.0 (0.0–32.5)	0.647
Visit 12	52	30.3 ± 27.5	20.0 (10.0–47.5)	62	19.8 ± 30.2	1.9 (0.0–20.0)	**0.004**
% Deterioration in non-work activity							
Visit 0	79	33.7 ± 25.8	30.0 (10.0–50.0)	65	29.1 ± 23.7	20.0 (10.0–50.0)	0.309
Visit 12	57	36.0 ± 25.3	30.0 (20.0–50.0)	70	26.7 ± 30.4	10.0 (0.0–40.0)	**0.010**

Comparison between groups, Visit 0 and Visit 12 (patients not in active employment)

RD rheumatic disease; *SD* standard deviation, P25–P75 Percentile 25–Percentile 75, the *p* values have been calculated using the Mann–Whitney nonparametric *U* test

The cost-effectiveness ratio from a healthcare perspective (direct costs) did not show any difference between the two groups nor were there any significant differences from a social perspective (Table 5).

Discussion

Although a rheumatology department with an NCR could offer better patient services than another department without it, the literature supporting this concept is scarce and, to the best of our knowledge, this is the first national multicentre study specifically investigating the beneficial effects that NCR can offer to patients. Other previous effectiveness, cost-effectiveness and/or cost/utility studies have had a smaller scope or have focussed exclusively on patients with RA [7, 8, 18, 19].

Some of the differences of our study were found at baseline visit. This is not surprising because the centres that participated in the study had or did not have the NCR before the study and the patients included were not new diagnosed ones, they had a long standing disease. So, the effect of the selection with or without NCR at baseline could impact over the entire study.

When the results obtained for the effectiveness variables are analysed, it can be stated that the patients treated at departments with an NCR consistently have a better clinical situation compared to the patients at non-NCR departments. In our study, the proportion of patients in remission was higher in the NCR group, and this difference was very close to being statistically significant. In one study in patients with RA [19], similar clinical results were found in the group assigned to specialised rheumatology nursing care and in the group of patients assigned to rheumatologists after 1 year of follow-up. There were similar findings in the study by Ndosi [8] that demonstrated non-inferiority in the improvement achieved by the group of patients with RA assigned to nursing clinic care. Primdahl et al. [20] found that, in patients with RA and low disease activity, there was an improvement in the DAS28 score after 2 years of follow-up in the group assigned to nursing consultations compared to the group assigned to rheumatologists.

The quality of life and some biological variables improved in patients treated at NCRs. One possible explanation for the better clinical situation of patients treated in the departments with a NCR could lie in the fact that a larger proportion of them (10 % more) received treatment with biologics, with the proportion of those who received biologics in combination with DMARDs also as well (12 % more frequently) (data not shown). However, the role played by the nursing staff in controlling and monitoring of these treatments is important, and for this reason,

Table 4 Annual cost of drug consumption and use of healthcare services (€)

	NON-NCR			NCR			*p*
	N	Mean ± SD	Median (P25–P75)	*N*	Mean ± SD	Median (P25–P75)	
Biologics	182	6529 ± 6716	5699 (0–12,446)	178	7583 ± 7083	7798 (0–13,171)	0.158
DMARDs	182	157 ± 254	26 (10–243)	178	107 ± 200	21 (9–40)	0.110
Other drugs							
Corticosteroids	182	23 ± 23	22 (0–47)	178	18 ± 22	0 (0–46)	**0.029**
NSAIDs	182	19 ± 22	22 (0–36)	178	18 ± 18	13 (0–35)	0.565
Gastroprotectants	182	18 ± 20	22 (0–31)	178	17 ± 16	29 (0–31)	0.973
Annual drug cost	182	6746 ± 6657	5940 (157–12,524)	178	7743 ± 7071	7937 (140–13,297)	**0.401**
Consultations at							
Health Centre	182	116 ± 233	43 (0–172)	178	59 ± 101	0 (0–86)	**0.001**
Specialist at a hospital	181	292 ± 314	238 (79–396)	178	277 ± 300	158 (79–396)	0.760
Specialist at outpatient clinic	182	170 ± 196	79 (0–238)	178	141 ± 153	79 (0–238)	0.436
Other specialists	182	105 ± 266	0 (0–79)	178	58 ± 112	0 (0–79)	0.207
Accident and emergency	182	45 ± 109	0 (0–0)	178	37 ± 142	0 (0–0)	0.195
Hospitalisation							
Days of hospitalisation	182	131 ± 319	0 (0–0)	178	110 ± 416	0 (0–0)	0.195
Ancillary tests							
Laboratory tests	181	528 ± 350	419 (286–638)	177	603 ± 433	454 (286–715)	0.131
X-rays	181	24 ± 40	0 (0–36)	178	26 ± 38	18 (0–37)	0.292
Other imaging procedures	182	110 ± 198	0 (0–157)	178	61 ± 125	0 (0–67)	**0.037**
Intra-articular treatments	182	18 ± 59	0 (0–0)	178	16 ± 56	0 (0–0)	0.669
Rehabilitation	179	14 ± 62	0 (0–0)	178	54 ± 468	0 (0–0)	0.766
Surgical treatments	182	105 ± 1000	0 (0–0)	178	161 ± 1235	0 (0–0)	0.680
Other procedures (various)	182	35 ± 175	0 (0–9)	178	22 ± 69	0 (0–10)	0.977
Annual cost of service use	182	2853 ± 2835	1920 (965–3690)	178	2631 ± 2744	1911 (998–3227)	**0.749**

Comparison between groups

SD standard deviation, P25–P75 Percentile 25-Percentile 75, the *p* value was calculated using the Mann–Whitney *U* test

Table 5 Annual indirect, direct and total costs (€). Cost-effectiveness

	NON-NCR			NCR			*p*
	N	Mean ± SD	Median (P25–P75)	*N*	Mean ± SD	Median (P5–P75)	
Work costs of RD							
Pension or retirement	182	1590 ± 3814	0 (0–0)	178	1560 ± 3776	0 (0–0)	0.953
Absences from work	182	122 ± 922	0 (0–0)	178	301 ± 1576	0 (0–0)	0.724
Other indirect costs							
Transport to the consultation[a]	176	91 ± 213	18 (0–74)	176	55 ± 118	12 (0–49)	0.279
Paid carer	182	112 ± 596	0 (0–0)	178	107 ± 1013	0 (0–0)	0.205
Total indirect costs[a] (IC)	176	1911 ± 4012	30 (3–538)	176	1979 ± 4055	18 (4–269)	0.378
Total direct costs[a] (DC)	182	9599 ± 7945	9447 (1668–15,581)	178	10,373 ± 8167	11,110 (2030–15,679)	0.347
Total costs (DC + IC)	176	11,524 ± 9723	11,770 (1814–18,565)	176	12,306 ± 9850	13,304 (2330–17,132)	0.494
Cost-effectiveness (health perspective)	182	24,549 ± 20,319	24,162 (4266–39,849)	178	21,257 ± 16,736	22,765 (4161–32,130)	0.064
Cost-effectiveness (social perspective)	176	29,473 ± 24,867	30,102 (4638–47,480)	176	25,216 ± 20,184	27,262 (4775–35,106)	0.097

Comparison between groups

RD rheumatic disease, *SD* standard deviation, P25–P75 Percentile 25-Percentile 75, *DCs* direct costs, *IC* indirect costs, the *p* value was calculated using the Mann–Whitney *U* test

[a] Information missing for 6 Non-NCR patients and in 2 NCR patients

the availability of an NCR in the department could be one of the determining factors that make rheumatologists more inclined to establish and maintain this type of therapy.

No significant differences were observed in the number of consultations with rheumatology specialists, but there was a significant drop in the number of visits to the healthcare centre due to rheumatic disease. Recent works corroborate the finding that less clinical consultation resources are consumed by patients treated at an NCR [8]. The NCRs, through telephone consultations and other mechanisms for resolving patients' clinical queries, probably stop patients from consulting their general practitioner [10]. Several years ago Hughes et al. [21] demonstrated that the availability of a telephone line for patients managed by nursing staff was a cost-effective way of reducing costs at a primary care level and rheumatology consultation times. In our study, we could not corroborate this finding, but it is reasonable to think that the time spent by the nurse could affect the rheumatologist's work with less time for consultation. In addition, tight monitoring and knowledge of patients might improve adherence to therapeutic regimen and outcomes of the rheumatic disease.

Our results show that the patients treated at departments with a NCR were less affected by the disease in terms of work, particularly with regard to work productivity indicators. However, no statistically significant differences were found with regard to the social costs in both groups, which may be because one of the patients in the NCR group was on sick leave for the whole year of the study, with this being a decisive factor when calculating this type of costs. The study by Ndosi [8] also found no differences in indirect costs.

For van den Hout [7] and Ndosi [8], nursing clinics in rheumatology are a cost-effective option for the basic treatment of RA patients, with results that are similar to the non-NCR option but with lower costs. Our results also show that it is a cost-effective option, due to the better results and similar costs.

Conclusion

- Nursing clinics improve clinical results and the quality of life of patients with rheumatic disease.
- They reduce the use of primary care clinics.
- They have direct and indirect costs, including the use of biologics, which are not significantly different when compared to the costs of non-NCR departments.

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Compliance with ethical standards

Conflict of interest Santiago Muñoz-Fernández, M.ª Dolores Aguilar, Amparo Rodríguez, Raquel Almodóvar, Laura Cano-García, Luís Antonio Gracia, José A. Román-Ivorra, J. Ramón Rodríguez, Teresa Navío and Pablo Lázaro declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 19634 Helsinki declaration and its later amendments or comparable ethical standards.

Informed consent Informed consent was obtained from all individual participants included in the study.

References

1. Alonso-Ruiz A, Vidal-Fuentes J, Tornero-Molina J, Carbonell-Abelló J, Lázaro de Mercado P, Aguilar Conesa MD (2007)

Assistance quality standards in rheumatology. Reumatol Clin 3:218–225
2. Gómez-Reino J, Loza E, Andreu JL, Balsa A, Batlle E, Cañete JD et al (2011) Consensus statement of the spanish society of rheumatology on risk management of biologic therapy in rheumatic patients. Reumatol Clin 7:284–298
3. Eijk-Hustings Y, Tubergen A, Böström C, Braichenko E, Buss B, Felix J et al (2012) EULAR recommendations for the role of the nurse in the management of chronic inflammatory arthritis. Ann Rheum Dis 71:13–19
4. Muñoz-Fernández S, Lázaro P, Alegre J, Almodóvar R, Alonso A, Ballina FJ et al (2013) Quality of care standards for nursing clinics in rheumatology. Reumatol Clin 9(4):206–215
5. Nursing Group of the Sociedad Valenciana de Reumatología [Valencian Rheumatology Society] (GESVR). Propuesta de contenidos de una Consulta de Enfermería en Reumatología. Avanzando hacia una cartera de servicio. Alicante: Consejo de Enfermería de la Comunidad Valenciana [Valencian Community Nursing Board] (CECOVA); ca. 2013
6. Carbonell A, Mínguez M, Panadero G, Bernabeu P (2008) Clinical role for the professional nurse in rheumatology. Reumatol Clin 4(6):228–231
7. van den Hout WB, Tijhuis GJ, Hazes JM, Breedveld FC, Vliet Vlieland TP (2003) 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. Ann Rheum Dis 62(4):308–315
8. Ndosi M, Lewis M, Hale C, Quinn H, Ryan S, Emery P et al (2014) The outcome and cost-effectiveness of nurse-led care in people with rheumatoid arthritis: a multicentre randomised controlled trial. Ann Rheum Dis 73:1975–1982
9. Mazzuca SA, Brand KD, Katz BP, G'Sell PM (2004) Can a nurse-directed intervention reduce the exposure of patients with knee osteoarthritis to nonsteroidals antiinflammatory drugs? J Clin Rheumatol 10(6):315–322
10. Ramelet AS, Fonjallaz B, Rapin J, Gueniat C, Hofer M (2014) Impact of a telenursing service on satisfaction and health outcomes of children with inflammatory rheumatic diseases and their families: a crossover randomized trial study protocol. BMC Pediatr 18(14):151. doi:10.1186/1471-2431-14-151
11. Garcia-Diaz S, Corominas H (2013) Nurse management of cardiovascular risk factors in rheumatoid arthritis. Br J Nurs 22(14):813–817
12. Larsson I, Fridlund B, Arvidsson B, Teleman A, Bergman S (2014) Randomized controlled trial of a nurse-led rheumatology clinic for monitoring biological therapy. J Adv Nurs 70(1):164–175
13. van Hulst LT, Creemers MC, Fransen J, Li LC, Grol R, Hulscher ME, van Riel PL (2010) How to improve DAS28 use in daily clinical practice?—a pilot study of a nurse-led intervention. Rheumatology (Oxford) 49(4):741–748
14. Esteve-Vives J, Batlle-Gualda E, Reig A (1993) Spanish version of the Health Assessment Questionnaire: reliability, validity and transcultural equivalency. Grupo para la Adaptación del HAQ a la Población Española. J Rheumatol 20(12):2116–2122
15. Calin A, Nakache JP, Gueguen A, Zeidler H, Mielants H, Dougados M (1999) Defining disease activity in ankylosing spondylitis: is a combination of variables (Bath Ankylosing Spondylitis Disease Activity Index) an appropriate instrument? Rheumatology (Oxford) 38(9):878–882
16. Calin A, Garrett S, Whitelock H, Kennedy LG, O'Hea J, Mallorie P, Jenkinson T (1994) A new approach to defining functional ability in ankylosing spondylitis: the development of the Bath Ankylosing Spondylitis Functional Index. J Rheumatol 21(12):2281–2285
17. WPAI:GH (General Health) v2.0. Last accessed: April 2015. http://onlinelibrary.wiley.com/doi/10.1002/acr.20633/pdf
18. Hill J, Bird HA, Harmer R, Wright V, Lawton C (1994) An evaluation of the effectiveness, safety and acceptability of a nurse practitioner in a rheumatology outpatient clinic. Rheumatology 33(3):283–288
19. Tijhuis GJ, Zwinderman AH, Hazes JM, Van den Hout WB, Breedveld FC, Vliet-Vlieland TP (2002) A randomized comparison of care provided by a clinical nurse specialist, an inpatient team, and a day patient team in rheumatoid arthritis. Arthritis Rheum 47(5):525–531
20. Primdahll J, Sørensen J, Horn HC, Petersen R, Hørslev-Petersen K (2014) Shared care or nursing consultations as an alternative to rheumatologist follow-up for rheumatoid arthritis outpatients with low disease activity—patient outcomes from a 2-year, randomised controlled trial. Ann Rheum Dis 73:357–364
21. Hughes R, Carr ME, Huggett A, Thwaites C (2002) Review of the function of a telephone helpline in the treatment of outpatients with rheumatoid arthritis. Ann Rheum Dis 61:341–345