Locomotion status and costs in destructive rheumatoid arthritis

A comprehensive study of 82 patients from a population of 13,000

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Clinical manifestations (locomotion score) and annual costs were studied in a population-based cohort of 82 patients with rheumatoid arthritis fulfilling five to eight American Rheumatological Association's (ARA) criteria.

The total costs were SEK 4.9 million: respectively 56 and 44 percent direct and indirect costs. The costs were correlated with total, as well as subjective and objective, locomotion scores, which assess separately impairment, disability, and handicap from the disease (WHO 1980). Patients below 65 years had higher costs—predominantly as an indirect cost due to loss of work—than older patients. Elderly rheumatoid arthritis (RA) patients had a low score and high costs for medical and social services' care, but they had no indirect costs. Patients with a low locomotion score had received previous hospital treatment averaging 89 days. The need of hospital treatment was strongly correlated with low locomotion score.

The mean annual patient's costs were about SEK 60,000, but above this for younger patients. When compared with patients with a mild affliction (score 91–100), patients with moderate manifestations, i.e., with a score of 70–90, had five times higher costs, whereas those with severe manifestations, with a score below 50, had 20 times higher costs.

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We report the clinical manifestations and economic consequences of destructive rheumatoid arthritis (RA) in an epidemiologically defined total population sample.

Patients and methods

All 82 patients (49 women and 33 men) with definite or classic RA fulfilling at least five of the eight American Rheumatological Association's (ARA) criteria (Rome, 1961 c.f. Kellgren et al. 1963) were included. The 82 patients were identified in a questionnaire survey and clinical study of an epidemiologically representative population of all 12,707 residents of the city of Åtvidaberg, Sweden, in 1986 (Jonsson and Larsson 1990). The mean age of the women was 68 (31–91) years and that of the men 64 (36–89) years, whereas the mean age of both the women and men at the onset of the disease was 46 (7–90) years and the mean duration of the disease 19 (1–65) years (Table 1).

Orthopedic status. Each of the 82 patients had undergone a clinical examination by a specialist in orthopedic surgery in 1987 using our total locomotion score (Larsson and Jonsson 1989). This consists of subjective (assessments of pain, as well as functional ability to perform 10 different categories of ADL tasks) and objective (joint mobility, stability, and alignment) score evaluations of the status of the upper and lower extremities.

Three RA patients (Cases 2, 5, and 6) had become bedridden from cerebrovascular insults necessitating long-term care. They had very low locomotion scores, mainly because of their cerebral paresis. Their costs for RA were low because all of their hospital costs were due to the cerebrovascular lesion. Therefore, data are also given with these patients excluded.

Costs. The costs per patient in 1987 due to RA were determined as direct costs and indirect costs. Direct costs included all kinds of outpatient and inpatient care, and costs for radiographic examinations, as well as various kinds of surgical treatment at the central hospital (Table 1).

From the medical records, all the previous hospital treatments for RA were determined for each patient as the total number of days of hospitalization during the entire disease period. Costs for consultations and treatments at the primary health care center were calculated, as well as costs at units for long-term care. The

Table 1. Observations in 82 patients with rheumatoid arthritis

A	B	C	D	E	F	G	H	A	B	C	D	E	F	G	H
1	72	24	110	102	7.5	0	2	42	79	74	10	10	0	0	0
2	79	30	11	11	0	0	436	43	78	74	117	68	49	0	0
3	71	31	51	0	51	0	238	44	79	74	8.4	8.4	0	0	0
4	81	33	307	307	0	0	203	45	54	75	0.6	0	0	573	0
5	70	42	5.6	5.6	0	0	223	46	39	75	0	0	0	0	0
6	79	46	1.4	1.4	0	0	0	47	77	77	4.0	4.0	0	0	0
7	78	46	421	421	0	0	53	48	62	78	75	3.1	0	72	65
8	73	46	340	340	0	0	188	49	53	78	109	0	0	109	0
9	70	48	15	5.4	10	0	63	50	78	79	61	32	30	0	6
10	55	53	182	8.1	0	174	96	51	37	79	51	51	0	0	0
11	67	54	0	0	0	0	231	52	42	80	121	46	0	75	39
12	69	54	20	2.0	18	0	0	53	57	82	112	3	0	109	43
13	73	54	0.7	0.7	0	0	125	54	76	82	5.5	5.5	0	0	18
14	74	55	25	0	25	0	103	55	50	83	8.2	8.2	0	0	31
15	52	56	213	0.8	103	109	0	56	51	82	60	3	0	57	0
16	76	58	66	3.8	63	0	0	57	61	83	142	33	0	109	36
17	88	58	3.4	3.4	0	0	46	58	84	83	0.7	0.7	0	0	0
18	71	59	9.3	1.2	8	0	37	59	69	83	1.0	1.0	0	0	29
19	65	60	35	35	0	0	130	60	69	84	27	27	0	0	40
20	50	62	216	42	0	174	0	61	66	84	0.8	0.8	0	0	0
21	91	63	27	5.6	22	0	80	62	31	84	0.8	0.8	0	0	0
22	60	63	120	1.4	10	109	64	63	76	84	0	0	0	0	25
23	38	63	0.8	0.8	0	0	89	64	34	84	207	20	0	187	0
24	73	64	28	28	0	0	218	65	80	85	0	0	0	0	0
25	70	64	309	309	0	0	154	66	64	85	116	1.0	0	115	24
26	73	65	11	2.4	8.2	0	26	67	69	86	2.0	2.0	0	0	0
27	85	66	7.3	1.9	5.4	0	0	68	71	87	15	15	0	0	0
28	54	67	129	72	0	57	0	69	59	87	111	1.7	0	109	54
29	71	68	10	0.7	10	0	42	70	50	89	7.5	1.0	0	6.5	0
30	70	68	2.8	2.8	0	0	101	71	60	89	104	5.5	0	99	8
31	61	69	120	3.1	7.5	109	51	72	76	89	14	14	0	0	16
32	77	70	25	2.8	22	0	167	73	35	89	22	17	0	5.3	38
33	66	70	15	5.3	10	0	32	74	28	90	29	20	0	9.3	24
34	68	71	0	0	0	0	0	75	69	91	0	0	0	0	0
35	72	71	2.0	2.0	0	0	0	76	38	91	51	33	0	18	0
36	75	71	50	50	0	0	0	77	52	91	14	2.5	0	12	0
37	68	71	0	0	0	0	0	78	69	92	1.5	1.5	0	0	113
38	58	71	150	52	12	86	41	79	56	93	9.2	2.5	0	6.6	0
39	59	72	196	21	0	174	208	80	50	94	1.9	1.9	0	0	0
40	72	73	10	1.7	8.2	0	57	81	56	95	1.7	1.7	0	0	0
41	50	74	66	1.7	0	6.4	56	82	52	96	0	0	0	0	0

A Case number
B Age
C Total locomotion score
D–G, SEK in thousands
D Total costs
E Medical costs
F Social services' costs
G Production loss
H Total number of previous days of hospitalization

calculations were based on the information extracted from the patient's medical records and costs' data obtained from the local accounting system of Linköping University Hospital. Indirect costs were determined by the production loss due to the disease. Official registers were used for estimating costs of sick leave and early retirement. Social services' costs, i.e., costs of home care and transportation services, were calculated from the information obtained from local authorities. Social services' costs are normally not considered in an economic analysis. Methodologically, these costs can be regarded as a part of the direct costs. Costs of medication, of treatment and care of other accompanying diseases, and that of technical aids (partly subsidized by the local and national governments), as well as support from relatives, were not included in the study. All the costs were referred to the year 1987.

Simple and multiple regression analyses were used for describing relationships between variables, and the different groups were compared using the Student's *t*-test for unpaired samples.

Results

The mean total locomotion score (maximum 100) for all the RA patients was 72 (24–96), with a subjective score (maximum 100) of 62 (4–93) and an objective

Table 2. Distribution of 82 RA patients with five to eight ARA criteria to different scoring categories in relation to age

Total locomotion score	Aged under 65 years	Aged 65 years and over
90–100	6	2
70–89	22	19
50–69	7	17
< 50	0	9
Total	35	47

score (maximum 100) of 82 (23–100). Scores for upper and lower extremities showed no significant differences (Table 1).

The locomotion status was worse ($P < 0.04$) for the women, who had a score of 68 (30–94), than for the men, who had a score of 76 (24–96). Patients aged 65 years and above (n 47) had an average total locomotion score of 66 (24–92), a subjective score of 56 (5–93), and an objective score of 77 (23–95). Patients below aged 65 years (n 35; 65 is the statutory age of national retirement in Sweden) had an average total locomotion score of 79 (53–96), whereas the mean subjective score was 71 (35–93) and the objective score 88 (67–100). The number of patients within each scoring category in relation to age is shown in Table 2.

All the scoring categories were worse for patients aged 65 years and above than for younger patients ($P < 0.001$).

The total annual costs for all 82 RA patients in this population were SEK 4.9 million, which is an average cost per patient of about SEK 60,000 (Table 3); there were no significant cost differences as regards the two sexes. The total patient costs were ($P < 0.004$) correlated with the total locomotion score (subjective, as well as objective), as higher costs were recorded with increasing disability from the disease. This was not an effect of age. The correlation was found to be better ($P < 0.001$) when costs were adjusted for age differences using multiple regression analysis (Figure 1). A strong relationship between costs and total locomotion score prevailed especially when patients of similar age were compared.

Direct costs (for medical care and social services) represented 56 percent and indirect costs (mainly early retirement) 44 percent of the annual costs. On the average, direct costs were larger than indirect costs for severely disabled patients (Figure 2). In contrast, indirect costs dominated for patients that were less disabled (Table 3). These differences were significant ($P < 0.01$). Patients with mild manifestations of the disease had low costs, representing only 4 percent of the total costs for all the RA patients (Table 3). In comparison, patients with a score of 50 and below had

Table 3. Score and costs (SEK in thousands) in RA for all 82 patients, for patients under 65 years, and for patients 65 years and above

Total locomotion score	Number of patients	Total costs	Average total costs per patient	Multiplication factor[b]	Direct costs[a]		Indirect costs[a]
					medical care	social services	
All 82 patients							
90–100	8	80	10	1	5.4	0	4.5
70–89	41	2,017	49	5	13	2.4	34
50–69	24	1,574	66	7	22	13	31
< 50	9	1,262	140	14	133	7.5	0
< 50[c]	(6)	(1,243)	(207)	(20)	(207)	–	–
Total	82	4,932	60		28	5.8	26
Patients under aged 65 years							
90–100	6	78	13		7.0	0	6.0
70–89	21	1,688	80		14	0.6	66
50–69	8	1,015	127		20	15	92
< 50	0	–	–		–	–	–
Total	35	2,781	79		14	3.8	62
Patients aged 65 years and over							
90–100	2	1.5	0.8		1.5	0	0
70–89	20	329	16		12	4.4	0
50–69	16	559	35		23	12	0
< 50	9	1,262	140		133	7.6	0
Total	47	2,151	46		38	7.3	0

[a]Costs per patient.
[b]Cost comparison (index) between different locomotion score groups.
[c]Three of the 9 patients with a score less than 50 were excluded because of a cerebral insult.

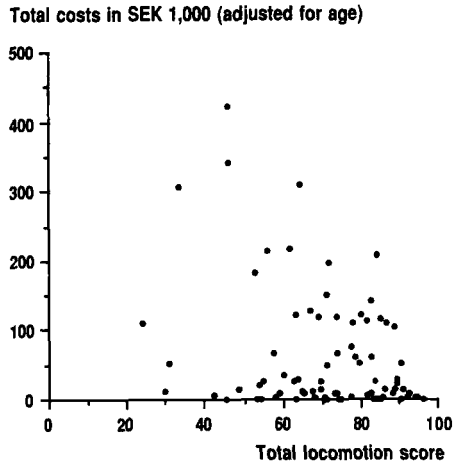

Figure 1. Costs in relation to total locomotion score adjusted for age differences.

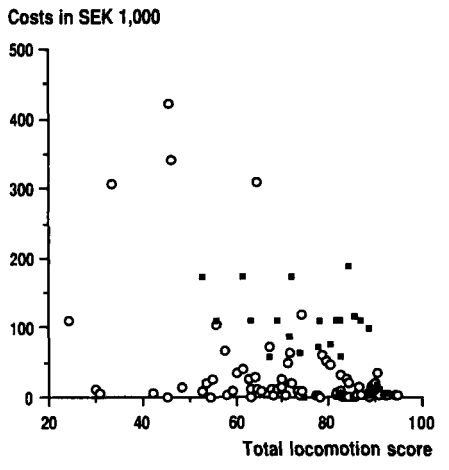

Figure 2. Direct costs (medical care and social services; n 71; ○) and indirect costs (production loss and sick leave; n 26; ■) in relation to score.

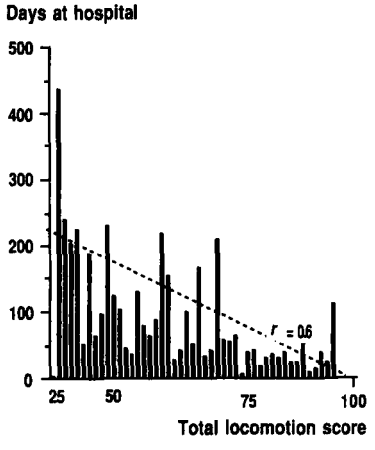

Figure 3. Total previous hospital care (days) in relation to score.

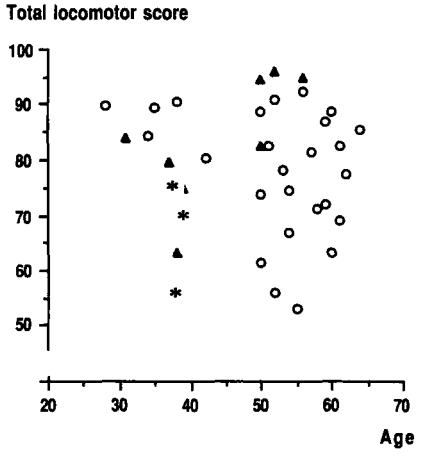

Figure 4. Locomotion score for RA patients in working age in relation to age. ○ not working, ▲ working, * working half-time.

approximately 20 times higher costs. These were up to 95 percent direct medical costs even though some of the patients were living in their homes with the aid of family members. Most of the patients were dependent on treatment at long-term care units. Patients with a score above 50 had less than 30 percent of their total costs as direct costs and 70 percent as indirect costs, i.e., for sick leave or a disability pension. Most disabled patients had high direct costs and the less disabled high indirect costs ($P < 0.05$; Table 3).

The influence of the age factor was studied by analyzing the costs in relation to the total locomotion score in the 35 patients aged 65 years and below (Table 3) and in the 47 patients aged 65 years and above (Table 3). The former had average total costs of SEK 79,000: viz., SEK 18,000 as direct costs and SEK 61,000 as indirect costs. As a comparison, patients over 65 years of age had average total costs of about SEK 46,000, all as direct costs.

Over the years, the patients have needed an average of 50 (0–436) days of hospital treatment (Table 4), with the highest number of hospital days being used

Table 4. Distribution of our patients as to days of hospitalization and current total locomotion score (TLS; mean, range) in relation to age

	No hospitalization			Hospitalization			Overall hospitalization	
	n	TLS	*P*-value	n	TLS	*P*-value	Days (range)	*P*-value
Aged under 65 years	17	81 (56–96)	NS	17	77 (53–89)	0.01	31 (0–208)	0.01
Aged 65 years and over	18	73 (45–90)		30	61 (24–92)		65 (0–436)	
All the patients	35	77 (45–96)		47	67 (24–92)		50 (0–436)	

by those who had the most severe disease manifestations (low locomotion score; Figure 3). Among the previous operations for RA were 18 joint replacements, 30 other reconstructive operations (synovectomies, arthrodeses, joint resections), and 59 hand surgical operations.

Patients with very severe disease manifestations, i.e., with a total score below 50 (9 of 82 patients), had used 35 percent of all the hospital care received by all our patients, and predominantly for conservative treatment. Patients with a score of 50–69 (24 of 82 patients) had consumed 50 percent of all the days of hospitalization used by our patients' population, and mainly for reconstructive surgery.

Eight of the 34 RA patients below aged 65 years were working, 3 of them only half-time, while the rest were working full-time, and all of them were white-collar workers (Figure 4).

Discussion

The mean RA patient's costs were around SEK 60,000 for the year 1987. Excluding social services' costs, i.e., for home care and transportation services, the average patient's costs were SEK 54,300. Our patients represent a prevalence of 0.65 percent of destructive RA in the whole population (Jonsson and Larsson 1990). On the basis of these data, the total costs on the national level can be estimated at SEK 2,970 million, i.e., somewhat higher than the SEK 2,033 million in 1987 arrived at in a study (Swedish Health Authorities 1987) based on national aggregate data. This difference can be attributed to higher costs for production loss due to early retirement in our patient population, but also to somewhat higher costs for long-term care. As a comparison, the total costs of health care in Sweden were estimated at SEK 162,000 million in 1983, which would correspond to SEK 24,000 per inhabitant in 1987 (Lindgren et al. 1989). In the United States, the medical costs in 1978 (Meenan et al. 1978) of 50 RA patients (Stage III) were three times the national average, as compared with two and a half times in our present study.

Individual cost variations were found to be relatively large within the same scoring category. This was certainly due to variations in age, as well as in disease tolerance, in ability to live at home with the aid of close relatives, as well as to different pension and sick-leave payments. Nevertheless, the economic burden of RA correlates with the disability status, with high direct costs (medical and social services' costs) for the most disabled and high indirect costs for the others. Our finding (Jonsson and Larsson 1990) of increased disability in RA with increasing age may not only be due to the long duration of the disease, with an early onset of the destructive process, but also due to the fact that older patients may have reduced capacity to adjust to the handicap caused by the disease. Subjective, as well as objective, locomotion scores in older RA patients were lower than those of the entire RA group (Jonsson and Larsson 1990). The most disabled patients, i.e., those with scores below 50, had over the years used hospital care totaling, on an average, 175 days. Their locomotion status was, nevertheless, worse than that of the outpatient category. This category still had restricted functional and physical capacity causing high direct costs. It seems that the used hospital resources had, at the most, retarded the disabling process in this patient category. As to the total costs in relation to scoring category (Table 3), individual costs varied considerably within the same scoring category. The mean direct and indirect costs per patient were the same in the present study, whereas in the United States (Stone 1984) the lifetime indirect costs were found to be four times higher than the direct costs. This difference can be explained by the broader disease criteria used in the latter study (all the RA severity levels were included).

Of all the costs for hospital care for musculoskeletal disorders in Sweden, RA patients were found to have consumed over 30 percent; however, they had used only 10 percent of the hospital days intended for surgical care of the musculoskeletal diseases (Swedish Health Authorities 1987).

An important criterion for morbidity in RA is working disability. The patients who had a disability pension or were on long-term sick leave had overall more disability (lower score) and were somewhat older than those who were able to work. The recorded working inability in 75 percent of our cases can be compared to the 68 percent (men) and 91 percent (women) reported for RA in Sweden in 1969 (Berglund and Brattström 1969). In the United States in 1981, 67 percent of the patients with definite or classical RA were not working (Lubeck et al. 1986), and another study showed that only 4 of 27 patients (mean ARA class 2.34) were working after 9 years of observation (Pincus et al. 1984). In Sweden, RA patients were reported in 1970 to have six times as many sick-leave days in a 3-year period as a control group (Allander, Thesis 1970).

Our epidemiologic study of patients with destructive RA thus showed a good correlation between overall locomotion status and costs, as well as consumption of hospital care. The high direct costs for the more disabled patients point to the importance of instituting active conservative treatment, as well as reconstructive surgical treatment, to prevent these patients from becoming functionally incapacitated.

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References

Allander E. *A population survey of rheumatoid arthritis.* Thesis, University of Uppsala, Uppsala, Sweden 1970.

Berglund K, Brattström M. Slutrapport från försöksverksamhet med dispensär för reumatiskt sjuka vid Lassaretet i Lund. Stencil, Lund 1969.

Jonsson B, Larsson S E. Rheumatoid arthritis evaluated by locomotion score. A population study. *Scand J Rheumato* 1990; 19 (3): 223–31.

Kellgren J H, Jeffrey M R, Ball J. *The epidemiology of chronic rheumatism.* A symposium. Blackwell Scientific Publ., Oxford 1963.

Larsson S E, Jonsson B. Locomotion score in rheumatoid arthritis. *Acta Orthop Scand* 1989; 60 (3): 271–7.

Lindgren B, Jendteg S, Palmgren H Å. *Vad kostar sjukdomarna de svenska medborgarna?.* Institutet för Hälso och Sjukvårdsekonomi, Lund 1989.

Lubeck D P, Spitz P W, Fries J F, Wolfe F, Mitchell D M, Roth S H. A multicenter study of annual health service utilization and costs in rheumatoid arthritis. *Arthritis Rheum* 1986; 29 (4): 488–93.

Meenan R F, Yelin E H, Henke C J, Curtis D L, Epstein W V. The costs of rheumatoid arthritis. A patient oriented study of chronic disease costs. *Arthritis Rheum* 1978; 21 (7): 827–33.

Pincus T, Callahan L F, Sale W G, Brooks A L, Payne L E, Vaughn W K. Severe functional declines, work disability, and increased mortality in seventy five rheumatoid arthritis patients studied over nine years. *Arthritis Rheum* 1984; 27 (8): 864–72.

Stone C E. The lifetime economic costs of rheumatoid arthritis. *J Rheumatol* 1984; 11 (6): 819–27.

Swedish health authorities publication (Socialstyrelsen redovisning). *Att förebygga sjukdomar i rörelseorganen.* Juni 1987.