Early consultation with a rheumatologist for RA: does it reduce subsequent use of orthopaedic surgery?

Debbie Ehrmann Feldman1,2, Sasha Bernatsky3, Michelle Houde2, Marie-Eve Beauchamp3 and Michal Abrahamowicz3

Abstract

Objective. Optimal care in RA includes early use of DMARDs to prevent joint damage and hopefully decrease the need for costly surgical interventions. Our objective was to determine whether a reduced rate of orthopaedic surgery was evident for persons with RA who saw a rheumatologist early in the disease course.

Methods. We studied persons who had a diagnosis of RA based on billing code data in the province of Quebec in 1995, and for whom the initial date of RA diagnosis by a non-rheumatologist could be established before the confirmatory diagnosis by the rheumatologist. We followed these patients until 2007. Patients were classified as early consulters or late consulters depending on whether they were seen by a rheumatologist within or beyond 3 months of being diagnosed with RA by their referring physician. The outcome, orthopaedic surgery, was defined using International Classification of Diseases (ICD) procedure codes ICD9 and ICD10. Multivariate Cox regression with time-dependent covariates estimated the effect of early consultation on the time to orthopaedic surgery.

Results. Our cohort consisted of 1051 persons; mean age at diagnosis was 55.7 years, 68.2% were female and 50.7% were early consulters. Among all patients, 20.5% (215) had an orthopaedic surgery during the observation interval. Early consulters were less likely to undergo orthopaedic surgery during the 12-year follow-up period (adjusted hazard ratio 0.60, 95% CI 0.44, 0.82).

Conclusion. Persons with RA who consult a rheumatologist later in the disease course have a worse outcome in terms of eventual requirement for orthopaedic surgery.

Key words: health services, RA, referral, orthopaedic surgery.

The importance of early referral of patients with RA to specialists is underscored by the evidence that early therapy with DMARDs (usually administered under the direction of a rheumatologist) is associated with improved outcomes in RA patients [1–3]. Compared with specialists, family physicians are less likely to make correct or timely diagnoses of musculoskeletal diseases and are not as likely to manage them appropriately [4–6]. Quality of care and health outcomes are better for RA patients who have contact with a relevant specialist such as a rheumatologist [4] than for those who do not consult with one. However, there are problems regarding access and prompt treatment for RA [6, 7].

Demonstration of long-term benefits of early consultation will generate awareness and highlight the necessity of finding solutions to the problems of access to rheumatologists for those with RA. Although early use of DMARDs is associated with less joint damage, long-term outcomes such as orthopaedic surgery have not been examined in the context of earlier consultation with a rheumatologist. Orthopaedic surgery, and in particular joint replacement, is costly [8] and may be considered as an indicator of failure of medical treatment [9]. Successful medical treatment of RA would target progression of joint destruction and ideally lead to a decrease in the need for orthopaedic surgery.
The objective of this study was to determine whether a reduced rate of orthopaedic surgery was evident for persons with RA who saw a rheumatologist early in the disease course compared with those who were seen later. Specifically, we hypothesized that early vs late rheumatology consultation may reduce the need for orthopaedic surgery in persons with newly diagnosed RA.

**Methods**

We studied administrative health data covering the province of Quebec (population ~7.5 million; entire population covered by provincial health insurance), identifying all persons who had a diagnosis of RA, based on billing code data, in 1995. At least one diagnostic code for RA had to be contributed by a rheumatologist; we considered this as confirmation of the disease. We excluded those who had a visit for RA in the preceding 5 years (prevalent cases) and established our cohort of persons with a new diagnosis of RA in 1995. The physician billing and hospitalization records of these confirmed RA patients were followed until 2007, i.e. 12 years of follow-up. All patients who see a rheumatologist in the province of Quebec require a referral. Thus, among these patients with RA, there were those who were first diagnosed by another physician and then referred to the rheumatologist (presumably for confirmation of the diagnosis). Patients were classified as early consulters if they were seen within 3 months of being diagnosed with RA by their referring physician, and late consulters if they were seen by a rheumatologist beyond 3 months of the initial RA diagnosis. We also calculated the time from first diagnosis until consultation and used time as a continuous variable in a second analysis.

The outcome of interest was undergoing orthopaedic surgery, defined using the International Classification of Diseases (ICD) procedure codes ICD9 and ICD10 for joint-sacrificing surgery, such as arthroplasty and arthroplasty revision surgery and arthrodesis, and non-joint-sacrificing surgery, such as synovectomy, releases and repairs, resection of nodules and osteotomy.

Descriptive statistics were used to characterize the study population. Simple (unadjusted) \( \chi^2 \) tests and t-tests were used to compare subjects who had an orthopaedic surgery during their follow-up with those who had no surgery.

The main analyses aimed at assessing whether persons in the early consultation group had a lower risk of orthopaedic surgery, i.e. a longer time until such surgery, than those in the late consultation group. Time to first occurrence of orthopaedic surgery was analysed using time-to-event methods for right-censored outcomes. Time 0 corresponded to the initial RA diagnosis, and subjects who had no surgery by the end of their follow-up were censored at that time. Kaplan–Meier curves were used to describe and compare the distributions of time-to-surgery in early vs late consultants.

To adjust the effect of time to consultation with a rheumatologist for several potential confounders (see later in the text), we used two multivariate Cox proportional hazards (PH) regression models. Both models represented time to consultation by time-dependent covariates to account for the fact that the consultation time could be established and could have affected the outcome only after the patient had seen a rheumatologist [10]. The first model used two binary time-dependent indicators: (i) early consulters, seen by a rheumatologist within 3 months of being diagnosed with RA; and (ii) late consulters seen >3 months after the initial diagnosis. The indicators were initially assigned a value of 0 and then their value was changed to 1 as needed at the time corresponding to a given patient’s first visit to a rheumatologist. Accordingly, at any time during the follow-up, the reference group consisted of all patients who have not yet seen a rheumatologist. The adjusted hazard ratio comparing early with late consulters was then estimated based on the difference between the regression coefficients for the two binary indicators, and the corresponding 95% CI was obtained using the covariance matrix of the regression coefficients. The second Cox model used (i) a binary time-dependent indicator of having already seen a rheumatologist, and (ii) a continuous time-dependent covariate that represented the time to consultation (in days). Similar to the first Cox model, these variables switched value from the initial 0 to (i) a value of 1, and (ii) number of days until the consultation, respectively, at the time of the patient’s first consultation with a rheumatologist. The inclusion of the aforementioned binary indicator ensured that, at any time during the follow-up, the effect of the (continuous) time to consultation was estimated using only data on those patients for whom this time was already known [11]. The goodness of fit of the two Cox models was compared using the Akaike information criterion [11]. Flexible extension of the Cox model was used to test the underlying assumptions [12]. Specifically, for each variable related to time to consultation, we tested the PH hypothesis, according to which the effect of the time to consultation remains constant during the entire follow-up period. Furthermore, for the continuous measure of time to consultation (in days), we relied on the flexible model to first test the assumption of the linear relationship with the outcome (here, logarithm of the hazard), and then estimate how the hazard rate for surgery changes with increasing time to consultation [12].

All hypotheses were tested at the two-tailed 0.05 significance level. All the Cox models were adjusted for the following potential confounders: availability of services and patient characteristics, such as age, sex, socio-economic status, co-morbidity, medical care use and RA severity. Availability of services is associated with seeing a specialist, such as a rheumatologist or an orthopaedic surgeon [13]. We defined availability of services as proximity to available services using a validated algorithm and classified availability as high, moderate or low according to the density of primary and secondary care establishments in the region [14]. Patient characteristics such as age, sex, co-morbidity and socio-economic status (based on postal code data) were ascertained from the administrative databases. Factors known to be associated with early consultation with a rheumatologist
TABLE 1 Description of cohort (n = 1051) by consultation category

<table>
<thead>
<tr>
<th></th>
<th>Early consultants, n = 533</th>
<th>Late consultants, n = 518</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean age (s.d.)</td>
<td>55.1 (15.7)</td>
<td>56.3 (15.0)</td>
<td>0.2</td>
</tr>
<tr>
<td>Females, n (%)</td>
<td>365 (68.5)</td>
<td>352 (68.0)</td>
<td>0.9</td>
</tr>
<tr>
<td>Extra-articular manifestations, n (%)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>39 (7.3)</td>
<td>27 (5.2)</td>
<td>0.2</td>
</tr>
<tr>
<td>Has ≥ 1 co-morbidities, n (%)</td>
<td>83 (15.6)</td>
<td>72 (13.9)</td>
<td>0.4</td>
</tr>
<tr>
<td>Low SES, n (%)</td>
<td>201 (39.2)</td>
<td>210 (42.5)</td>
<td>0.3</td>
</tr>
<tr>
<td>Missing</td>
<td>20 (3.8)</td>
<td>24 (4.6)</td>
<td></td>
</tr>
<tr>
<td>Living in urban area, n (%)</td>
<td>413 (77.5)</td>
<td>398 (76.8)</td>
<td>0.7</td>
</tr>
<tr>
<td>Missing data</td>
<td>4 (0.8)</td>
<td>1 (0.2)</td>
<td></td>
</tr>
<tr>
<td>Availability of services, n (%)</td>
<td>455 (85.4)</td>
<td>415 (80.1)</td>
<td>0.02</td>
</tr>
<tr>
<td>High</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Moderate</td>
<td>54 (10.3)</td>
<td>83 (16.0)</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>20 (3.8)</td>
<td>19 (3.7)</td>
<td></td>
</tr>
<tr>
<td>Had orthopaedic surgery, n (%)</td>
<td>92 (17.3)</td>
<td>123 (23.8)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Mean rheumatologist visits in first year after diagnosis (s.d.)</td>
<td>4.0 (2.97)</td>
<td>3.2 (2.97)</td>
<td>&lt;0.0001</td>
</tr>
<tr>
<td>Mean visits with another MD in first year after diagnosis (s.d.)</td>
<td>12.8 (12.90)</td>
<td>14.2 (11.97)</td>
<td>0.07</td>
</tr>
</tbody>
</table>

<sup>a</sup>As defined by the presence or absence of extra-articular features of RA. <sup>b</sup>SES defined by census tract data index: three upper quintiles vs two lower quintiles.

include female sex, younger age, higher socio-economic status and having more co-morbidities [7]. Furthermore, these factors may also be associated with receiving orthopaedic surgery [13, 15]. An index of deprivation (developed and validated using census tract data) [16] was used as an indicator of socio-economic status. Baseline co-morbidity was established using physician billing codes from the first year of diagnosis to establish co-existing morbidity; we used Deyo’s adaptation of the Charlson co-morbidity index [17]. We also used physician billing codes from the first year of diagnosis to establish the number of co-existing morbidities (including cardiovascular disease, osteoporosis, respiratory disease, diabetes, renal disease and cancer). To account at least in part for RA severity (which may be associated with time to consultation as well as need for orthopaedic surgery), we also controlled for the presence or absence of extra-articular manifestations of the disease, and for the frequency of visits to the rheumatologist within the initial 12 months of the first rheumatology assessment. We also adjusted for the number of visits to other physicians in the first year after diagnosis as an indication of medical care use. The extra-articular features of RA include rheumatoid lung (including diffuse interstitial disease and fibrosing alveolitis) and pleurisy, Felty’s syndrome (lowered white blood cell counts and spleen enlargement), rheumatoid carditis (inflammation of the heart), eye involvement (scleritis and episcleritis, including scleromalacia perforans and sicca syndrome), dermatological complications (vasculitis, pyoderma gangrenosum), neuropathies and amyloidosis.

We received ethics approval from the Quebec Commission for Access to Information. All data were denormalized, and identifying health care numbers were scrambled by the Quebec Health Insurance Board before sending us the data.

Results

Of the 11 857 patients who had a first visit for RA in 1995 (i.e. no visit for RA in the previous 5 years), there were 3 890 patients with a confirmed diagnosis of RA by a rheumatologist. Of those, 1 051 patients were first diagnosed with RA by a non-rheumatologist and included in our study. The mean age at diagnosis was 55.7 (s.d. 15.4) years, and 68.2% were female. Of those persons first diagnosed by a non-rheumatologist, 533 (50.7%) saw a rheumatologist within 3 months (Table 1); their median delay to see a rheumatologist was 22 days (interquartile range 7–44 days). Among the 518 who saw a rheumatologist late (i.e. past 3 months), the median delay from first diagnosis by a non-rheumatologist until rheumatology consultation was 719 days (interquartile range 209–1702 days). The patients contributed a maximum of 12 years of follow-up. During this period 210 (20.0%) persons in the cohort died, and 215 (20.5%) had orthopaedic surgery during the observation interval.

Table 2 summarizes the results of simple unadjusted analyses of the categorical factors potentially associated with an increased need for orthopaedic surgery. Persons who consulted a rheumatologist later (i.e. at least 3 months after being first diagnosed) were more likely to undergo orthopaedic surgery than those who consulted earlier (P < 0.01). Additional unadjusted analyses of continuous variables showed that persons who underwent orthopaedic surgery had an average of 4.0 (95% CI 3.6, 4.3) medical visits to a rheumatologist in the first 12 months after being diagnosed with RA compared with a mean of 3.5 (95% CI 3.3, 3.7) for those who did not undergo orthopaedic surgery (P = 0.03). Similarly the number of visits to other physicians in the first year after diagnosis was higher for those who later underwent orthopaedic surgery [15.0 (95% CI 13.5, 16.6) vs 13.1
Those who underwent orthopaedic surgery tended to be older [57.1 (95% CI 55.2, 58.9)] as compared with those who did not undergo orthopaedic surgery [55.2 (95% CI 54.2, 56.4)] (P = 0.11).

Kaplan–Meier curves in Figure 1 suggest that early consulters had a lower rate of surgery across the entire 12-year follow-up period (P < 0.01 for the unadjusted log rank test). Although there is an increasing rate of orthopaedic surgery during the 12-year period in general, early consulters had a consistently lower rate. Furthermore, as time increases, the rate of increase of orthopaedic surgery is higher among late consulters. Table 3 summarizes the results of multivariate time-to-event analyses, based on two Cox PH models with time-dependent covariates. Both models fitted the data equally well (difference in AIC < 1), and in both models the PH assumption was verified (data not shown). In model 1 (left part of Table 3), patients who consulted with a rheumatologist within the 3 months after being first diagnosed with RA (early consulters) had a shorter time to first orthopaedic surgery than the late consulters [adjusted hazard ratio (HR) = 0.60; 95% CI 0.44, 0.82]. Consistent with this finding, in model 2 (right part of Table 3) the rate of orthopaedic surgery increased significantly with increasing time to consultation. For example, a 3-month delay and a 1-year delay in time to consultation were associated with risk increases of 3.4% (HR = 1.034; 95% CI 1.01, 1.05) and 14.4% (HR = 1.14; 95% CI 1.06, 1.24), respectively. Exploratory analyses, based on the flexible extension of the Cox model, indicated that the effect of time to consultation was non-linear (P < 0.01 for test of linearity). Specifically, the reduction in risk is especially marked while comparing patients who consulted very early (e.g. in the first 3 or 6 months) with others (seen later). On the other hand, there were no systematic differences between those who consulted with a rheumatologist only 4–5 years after the initial diagnosis and those who consulted even later (data not shown).

In both models 1 and 2, older age at diagnosis and having had more visits with other physicians in the first year after diagnosis were associated with an increased rate of orthopaedic surgeries (Table 3). No other patient characteristics had statistically significant associations with time to orthopaedic surgery (Table 3).

Discussion

Approximately 21% of our cohort of 1051 patients newly diagnosed with RA had orthopaedic surgery within 12 years of diagnosis. Those who saw a rheumatologist >3 months after being diagnosed were more likely to undergo orthopaedic surgery (and sooner) than those who consulted with a rheumatologist within 3 months after being diagnosed.

Our study followed a cohort of patients with a new diagnosis of RA, according to our definition. Massardo et al. [18] reported that 34.9% of an incident cohort of 424 RA patients underwent surgery (median follow-up of 14.8 years, but ranging from 0.2 to 42.8 years). The cases were first diagnosed with RA between 1955 and 1985.
**Fig. 1** Time from first RA diagnosis until first orthopaedic surgery.

The figure depicts the failure distribution function for the time until orthopaedic surgery for early consulters (i.e. those who consulted a rheumatologist within 3 months of initial diagnosis) vs late consulters (i.e. those who consulted a rheumatologist after 3 months of being initially diagnosed). The red curve depicts the late consulters; the blue curve portrays early consulters. The y axis indicates the percentage of patients having orthopaedic surgery, and the x axis indicates time (in years). The figure shows that although there is an increasing rate of orthopaedic surgery during the 12-year period, early consulters had a consistently lower rate. Furthermore, as time increases, the rate of increase of orthopaedic surgery is higher among late consulters.

**Table 3** Cox regression models: factors associated with time to orthopaedic surgery (n = 1004)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1, HR (95% CI)</th>
<th>Model 2, HR (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time-dependent indicator of early consultation</td>
<td>1.09 (0.70, 1.70)</td>
<td>1.20 (0.79, 1.84)</td>
</tr>
<tr>
<td>Time-dependent indicator of late consultation</td>
<td>1.82 (1.14, 2.92)</td>
<td>1.0004 (1.0002, 1.0006)</td>
</tr>
<tr>
<td>Age</td>
<td>1.013 (1.004, 1.023)</td>
<td>1.013 (1.003, 1.023)</td>
</tr>
<tr>
<td>Male sex</td>
<td>0.93 (0.68, 1.25)</td>
<td>0.91 (0.67, 1.23)</td>
</tr>
<tr>
<td>Extra-articular manifestations (first year)</td>
<td>0.76 (0.42, 1.38)</td>
<td>0.77 (0.42, 1.40)</td>
</tr>
<tr>
<td>Co-morbidities (Charlson index)</td>
<td>0.99 (0.67, 1.47)</td>
<td>1.00 (0.68, 1.49)</td>
</tr>
<tr>
<td>Higher SES</td>
<td>1.00 (0.75, 1.35)</td>
<td>1.02 (0.76, 1.37)</td>
</tr>
<tr>
<td>Urban region of residence</td>
<td>1.16 (0.76, 1.79)</td>
<td>1.15 (0.75, 1.76)</td>
</tr>
<tr>
<td>High vs low service availability</td>
<td>1.00 (0.44, 2.28)</td>
<td>1.02 (0.44, 2.32)</td>
</tr>
<tr>
<td>Moderate vs low service availability</td>
<td>0.81 (0.34, 1.90)</td>
<td>0.86 (0.37, 2.03)</td>
</tr>
<tr>
<td>Number of visits with rheumatologist (first year after diagnosis)</td>
<td>1.02 (0.99, 1.05)</td>
<td>1.01 (0.98, 1.05)</td>
</tr>
<tr>
<td>Number of visits with another MD (first year after diagnosis)</td>
<td>1.01(1.0002, 1.02)</td>
<td>1.011(1.002, 1.020)</td>
</tr>
</tbody>
</table>

*Forty-seven observations of 1051 (4.5%) were not used in the Cox models because of missing values. *Model 1: early (<3 months) vs late consultation (≥3 months). *Model 2: continuous measure of time to consultation (in days). *HR for early compared with late consulters = 0.60; 95% CI 0.44, 0.82. *Significant with P < 0.05. *Significant with P < 0.01.
and followed until 1998. A quarter of 1600 patients with RA diagnosed beginning in 1974 and followed for a maximum of 23 years underwent joint replacement surgery in Kansas [19]. The lower rate in our study may be a result of improved treatment after 1995 (when our cohort was recruited), which prevented joint destruction, or perhaps the inclusion of less severe RA cases. The length of follow-up in our study was a maximum of 12 years, which was slightly less than in the other two studies. In both Wolfe et al.’s and Kapetanovic et al.’s studies [19, 20], by 12 years the rate of total joint replacement was similar to what we found in our study. Furthermore, there appears to be a trend towards declining use of orthopaedic surgery in patients with RA [21-23] (possibly because of improved medical treatment for RA), which may also explain the lower rate in our study, as our patients were all diagnosed in 1995, later than in the other studies.

Even with the secular trend towards decreased use of orthopaedic surgery in patients with RA, we found that those who consulted a rheumatologist earlier in their disease course had a lower rate of orthopaedic surgery. This supports the notion that persons who consult with a rheumatologist earlier have better outcomes [4, 24].

There is no other information in the literature comparing time of consultation with a rheumatologist and subsequent orthopaedic surgery. However, Verstappen et al. [25] found that patients with RA who started DMARDs early were less likely to undergo joint surgery vs those who had a delayed start on DMARDs. The implication is that early treatment with DMARDs may prevent joint surgery. Early consultation with a rheumatologist likely enhances appropriate treatment with DMARDs for persons with RA.

We found that older persons were more likely to undergo orthopaedic surgery sooner, which is in contrast to findings by Massardo et al. [18], who reported that younger patients were more likely to undergo orthopaedic surgery. Possibly our results reflect that some surgeons may be more reluctant to perform joint-sacrificing surgery on younger persons because they often require revisions sooner [26]. Also, some surgeries may have been done for reasons other than RA, such as co-existing OA or even avascular necrosis. Patients who had more medical consultations in the first 12 months after diagnosis were also more likely to undergo orthopaedic surgery sooner. This may be a reflection of more severe disease at the time of diagnosis; RA severity is a known risk factor for orthopaedic surgery [9, 18-20, 27].

There are several limitations to our study. First, we relied on administrative data exclusively and do not have clinical data (such as laboratory data or self-reported outcomes such as pain or disability). Instead, we characterized severity by extra-articular manifestations of RA and medical consultation in the first year after diagnosis. However, this approach has been used by other authors and appears to control for disease severity [28]. Also, if persons with more severe disease are more likely to be referred earlier to a rheumatologist and also more likely to undergo orthopaedic surgery, then our results may actually underestimate the beneficial effect of early consultation (and treatment). Second, validity of the RA diagnosis in administrative data may be questioned. However, we only included patients who had an RA diagnosis recorded by a rheumatologist—most likely valid RA cases. Third, we excluded patients who were seen by another physician but not given a diagnosis of RA in the database before being referred to a rheumatologist (who subsequently diagnosed them as having RA). This group may be composed of a mix of both early and late consulters. We excluded this group from our main analyses because of the uncertainty of its composition with respect to time to consultation since suspected diagnosis. This group had a lower rate of orthopaedic surgery (14%). As the diagnosis of RA was not posed by the referring physician, it is possible that these were patients who presented to their referring physician with mild disease and were therefore less likely to eventually require orthopaedic surgery. Our study applies to patients who are first diagnosed by a non-rheumatologist (i.e. those whose physician strongly suspects that they have RA), and this may exclude those with very mild disease. This is in line with findings by Suter et al. [29], who report that having mild disease would be a barrier to referral. Other factors that may influence referral include patient preferences, accessibility (financial, proximity issues, etc.), clinical and administrative leadership, physician confidence and expectations regarding follow-up and interpersonal relationships (both with the patient and rapport with the specialist) [28]. Fourth, the time from symptom onset to first appointment with a general practitioner (GP) is not known in our study; it is crucial to shorten the delay from symptom onset until starting DMARDs. In our study we only have time from diagnosis by a GP until seeing a rheumatologist (and presumably starting DMARDs). Although it is possible that DMARDs may be started by the GP, this scenario has been shown to be unlikely in our context [30]. Finally, orthopaedic surgery is a combination of indications, recommendations and patient preferences. Our data do not take these aspects into account.

The conclusion of our study is that early consultation with a rheumatologist, as compared with later consultation, is associated with a lower rate of orthopaedic surgery for persons newly diagnosed with RA. In addition to improving patient outcomes, appropriate medical treatment under the supervision of a rheumatologist may also decrease the need for costly interventions such as orthopaedic surgery. Our results add more credence to support early treatment guided by a rheumatologist in patients with RA.

**Rheumatology key messages**

- Early consultation with a rheumatologist is associated with a lower rate of orthopaedic surgery.
- Early treatment for RA by a rheumatologist may reduce the need for costly surgical interventions.
Acknowledgements

Dr Ehrmann Feldman is supported by the Fonds de la recherche en santé du Québec and Université de Montréal, School of Rehabilitation. Dr Sasha Bernatsky is a Canadian arthritis network scholar and is supported by the Canadian Institutes of Health Research (CIHR), the Fonds de la recherche en santé du Québec – FRSQ and the McGill University Health Centre Research Institute and Department of Medicine. Dr Michal Abrahamowicz is a James McGill Professor. This work was supported by the CIHR grant entitled Optimal Care Trajectories in Rheumatoid Arthritis: the primary-secondary interface (grant number MOP-68874; PI: D. Feldman), and data analyses were partly supported by CIHR grant MOP-81275 (PI: M. Abrahamowicz).

Funding: This study was funded by the CIHR.

Conflict of interest: The authors declare no conflicts of interest.

References


4 Yelin EH, Such CL, Criswell LA, Epstein WV. Outcomes for persons with rheumatoid arthritis with a rheumatologist versus a non-rheumatologist as the main physician for this condition. Med Care 1998;36:513–22.


