Medical and Productivity Costs of Rheumatoid Arthritis in The Czech Republic: Cost-of-Illness Study Based on Disease Severity

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A B S T R A C T

Objective: International pharmacoeconomic studies suggest that functional impairment can be a significant predictor for the evaluation of direct and productivity costs for rheumatoid arthritis (RA). We calculated the direct and productivity costs for five Health Assessment Questionnaire (HAQ) groups of patients (HAQ scores <0.6, 0.6 ≥ 1.1, 1.1 ≥ 1.6, 1.6 ≥ 2.1, and ≥2.1) in the Czech Republic. **Methods:** This was a retrospective cross-sectional study. We included 261 patients with RA, aged 18 to 84 years. We applied a bottom-up method by retrospectively reviewing individual patient medical records. Patients' demographic characteristics, patient-reported outcome, and clinical parameters were gathered at the time of data collection. For the calculation of productivity costs, we used the friction cost approach, based on patient absenteeism with a friction period of 130 workdays, with average monthly income used as the denominator. Costs were expressed as a mean value per patient with RA in each HAQ group. **Results:** Mean patient age was 56.4 years.

average time from diagnosis was 14.5 years, the mean HAQ score was 1.15, and the Disease Activity Score in 28 joints was 3.45. A total of 47.5% patients were treated with biologics. Mean annual direct medical costs for each HAQ group were €5315, €7357, €7697, €7716, and €8968, respectively. The mean annual indirect costs associated with productivity loss were €1414, €1459, €1610, €1876, and €2307, respectively. **Conclusions:** Direct costs and productivity costs for patients with RA are closely related to the value of the HAQ score. The annual mean total (direct plus productivity) costs per patient 1) treated with biologics, 2) without biologic treatment, and 3) from the overall cohort were €14,763, €3,559, and €8,882, respectively.
Keywords: cost-of-illness, health economics, quality of life, rheumatoid arthritis.

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Introduction

Rheumatoid arthritis (RA) is a chronic progressive autoimmune disease associated with gradual destruction of bone and articular structures and loss of function and sometimes requires joint replacements, all of which can result in significantly reduced quality of life and premature death. RA affects 0.7% to 1.0% of the adult population [1–3], and it represents a substantial cost to both public health insurance and societal resources, making it a significant economic issue [4–6].

The results of international pharmacoeconomic studies suggest that functional impairment measured by the Health Assessment Questionnaire (HAQ) is an important predictor of direct costs (health care–related or medical) as well as indirect costs (related to loss of work productivity) [7–9].

The HAQ is a specific questionnaire or instrument used to measure the quality of life of patients with RA that is straightforward and easy to complete. Therefore, the HAQ is one of the most widely used questionnaires for patients with RA [10]. For the purpose of this study, we used the Czech version of the HAQ, which was validated in 2010 [11].

In contrast to Western European countries, there have been few published studies in central and eastern European countries describing costs (direct and productivity) in relation to patient functional impairment and disease status (severity) for the diagnosis of RA [12,13]. These cost studies are crucial for understanding the burden of the disease, which should be of particular importance to policymakers, and simultaneously offer the presteps for cost-effectiveness modeling of RA, which are usually based on health states relative to disease severity/functional impairment (i.e., HAQ states).

Methods

We performed a bottom-up cross-sectional cost-of-illness study [14] retrospectively reviewing individual medical records of

patients undergoing treatment for RA at the center for treatment of rheumatic diseases in the Czech Republic (Institute of Rheumatology, Prague, which is the biggest and the most specialized center for the treatment of RA in the Czech Republic). Patients consecutively coming for regularly scheduled outpatient visits in turn of the year 2012 and 2013 were evaluated. According to the study protocol, 50 patients (±10) in each of five HAQ categories were intended to be included, summing up to approximately 250 patients in the whole study.

Demographic data (including the date when RA was first diagnosed, employment status, and work disability) and clinical and patient-reported outcomes were reported by participating physicians. Functional impairment (HAQ scores) data were obtained from patients after completing the HAQ, representing time 0 month of the study. These data were gathered at time 0 month (i.e., time of data collection) together with data for all resources used during the previous 6 or 12 months (the 12-month period refers to biologic treatment only). All resources used and cost data were annualized. Hence, the value of patients' HAQ score was attributed to health and productivity resources and costs of the previous year. Patients were divided into five categories on the basis of HAQ scores measured at time 0 month: 1) <0.6, 2) $0.6 \geq 1.1$, 3) $1.1 \geq 1.6$, 4) $1.6 \geq 2.1$, and 5) ≥ 2.1.

For the data recording, we used an online electronic case report form to ensure availability of all data required.

Resource Utilization and Use

The direct cost analysis was based on records of all resources drawn upon from the public health insurance fund for a particular patient. Only resources directly related to RA were recorded; for example, only medicines and outpatient and inpatient visits directly related to the diagnosis of RA were considered to be relevant for our study. The decision of which resources to include/exclude related to RA was taken by the attending physicians, that is, staff rheumatologists at the clinic.

We also recorded resources use (health care utilization) of treatment. Detailed data for each of several drug groups (anti–tumor necrosis factors, other biologics, disease-modifying antirheumatic drugs, corticosteroids, nonsteroidal anti-inflammatory drugs, etc.), including dosing, treatment pattern, and duration of therapy, were registered; the data also included all changes in treatment. The recall period for all medicines was 12 months to prevent a possible bias that can happen with shorter recall periods, which cannot capture medication changes or discontinuation or changes in dosing schemes.

Apart from medicines, other recorded resources were outpatient visits related to RA (such as the number of office visits), physical therapy, imaging techniques (X-ray, magnetic resonance imaging, sonography, etc.), surgery and inpatient hospital stays related to RA, and spa procedures. Except for spa procedures, all mentioned health care data were obtained with a recall period of 6 months; spa procedures had a recall period of 12 months. Items that were recorded for the previous 6 months were multiplied by 2 (annualized).

Cost Valuation

Costs were calculated for a full year in Czech crowns (CZK) and then adjusted for inflation using the Eurostat's Harmonised Index of Consumer Prices to obtain costs in 2013 CZK. Costs were then converted to the euro using the mean exchange rate for 2013 (€1 = 25.74 CZK; source: Czech National Bank). For 2013, we used the average Harmonised Index of Consumer Prices and the exchange rate valid for the first 10 months in 2013.

According to resource use, monetary values were subsequently assigned. For medicines, we used the official list of

reimbursed medicines established by the State Institute of Drug Control (effective November 2013). With regard to health care procedures including inpatient and outpatient visits, the prices were assigned on the basis of "Public Note of the Czech Ministry of Health no. 134/1998, Coll. of Acts," health care procedure list (amended by later regulations), and "Public Note of the Czech Ministry of Health no. 396/2010, Coll. of Acts" for the determination of point values.

Only resources and costs reimbursed from public insurance were relevant; patient co-payments and out-of-pocket expenses were not included in the study.

Productivity Costs

With regard to the indirect costs of RA, we focused on productivity costs (i.e., costs associated with lost productivity). We used the friction cost approach [15], which is recommended by the Czech Pharmacoeconomic Association [16]. This method assumes that patients—both with disabilities and prematurely deceased—will be replaced in their job positions. Work productivity loss is then calculated as the maximum time necessary to recover full work productivity for a given job position. This time is referred to as the *friction period*, and costs to society are assumed to be equal to zero after this period ends. The friction period also includes the time necessary for training or initiating a new worker [16–18].

The duration of the friction period varies widely in the published literature. The duration often fails to reflect the local characteristics of health care and social systems and rarely takes the unemployment rate into consideration [15–17,19]. In particular, frictional unemployment should be of great interest.

We used a friction period of 6 months, that is, 130 workdays, which was based on recommendations of the Czech Pharmacoeconomic Association [16]. The costs related to work productivity loss were accordingly calculated using this period as the maximum time. We used the mean gross salary in the Czech Republic for 2013 as the denominator in our calculations [20], which we converted to euros (€45.4 per workday).

The calculation of productivity costs included patients of productive or potentially productive age (18–64 years). Unemployed patients, retired pensioners, and students were not included. We included days spent on sick leave (up to a maximum equal to the friction period) and the period of time spent on full disability pension or partial disability pension (again, up to a maximum equal to the friction period). The information about the productivity impairment was obtained by physicians on the basis of their inquiry with patients at time 0 month, simultaneously with the HAQ score determination. Patients were questioned in terms of work/employment status, disability, and number of days on sick leave in the previous 6 months.

The definition of "patient disability pension" was derived from Czech law (Amendment of the Act no. 306/2008, Coll. of Acts, on pension insurance). *Full disability pension* was defined as work productivity reduced by 70% and *partial disability pension* as work productivity reduced by 52%.

Statistical Analysis

Descriptive statistics are presented as means ± standard deviations, and medians. The differences between groups were tested by using the nonparametric Mann-Whitney test (two groups' nominal data), the chi-square test (proportions of patients in groups), and the Kruskal-Wallis test (more than two groups' nominal data comparison). Test results were considered statistically significant at $P \leq 0.05$. Potential predictors of both direct and overall costs were assessed by linear regression analyses on log-transformed costs. The logarithmic transformation for costs was