MAYO CLINIC

Hospitalization Rates and Utilization Among Patients With Rheumatoid Arthritis: A Population-Based Study From 1987 to 2012 in Olmsted County, Minnesota

C. John Michet III, BA; Katerina Strobova, MD; Sara Achenbach, MS; Cynthia S. Crowson, MS; and Eric L. Matteson, MD, MPH

Abstract

Objective: To examine whether all-cause hospitalization rates for patients with rheumatoid arthritis (RA) differ from those for patients without RA.

Patients and Methods: This was a retrospective population-based cohort study focused on Olmsted County, Minnesota. The RA cohort consisted of patients 18 years and older who first fulfilled 1987 American College of Rheumatology criteria for RA in the 1980 to 2007 period, and was compared with a cohort of similar age, sex, and calendar year without RA. Data on all hospitalizations were retrieved electronically for the 1987 to 2012 period. Analyses used person-year methods and rate ratios (RRs) comparing patients with and without RA.

Results: The 799 patients with RA experienced 2968 hospitalizations, and the 797 patients without RA experienced 2069 hospitalizations. Patients with RA were hospitalized at a greater rate than were patients without RA (RR, 1.51; 95% CI, 1.42-1.59). This increased rate of hospitalization was found in both sexes, all age groups, all calendar years studied, and throughout disease duration. Men with RA were hospitalized for depression at a greater rate than were men without RA (RR, 7.16; 95% CI, 2.78-30.67). Patients with RA were hospitalized at a greater rate for diabetes mellitus than were subjects without RA (RR, 2.45; 95% CI, 1.34-4.89). In patients with RA, the indicators of disease severity (eg, seropositivity, erosions, and nodules) in the first year after RA incidence were associated with higher rates of hospitalization.

Conclusion: Patients with RA were hospitalized for all causes at a greater rate than were patients without RA. Increased rates of hospitalization were true for several disease categories and patient subgroups.

 ■ Mayo Clin Proc. 2015;90(2):176-183

From the Division of Rheumatology, Department of Internal Medicine (C.J.M., C.S.C., E.L.M.), Division of Biomedical Statistics and Informatics, Department of Health Sciences Research (S.A., C.S.C.), and Division of Epidemiology, Department of Health Sciences Research (E.L.M.), Mayo Clinic, Rochester, MN; and Charles University in Prague, Czech Republic (K.S.).

Rheumatoid arthritis (RA) is an autoimmune disorder that is associated with systemic inflammation, but primarily targets synovial joints and the surrounding tissue. Although advances in treatment have improved patient outcomes in recent decades,[1-4] RA still proves quite debilitating, and more than one-third of the patients undergo work disability during their lifetime.[5] Furthermore, numerous extraarticular disease manifestations, such as vasculitis, pericarditis, and rheumatoid lung, complicate treatment and exacerbate patient outcomes, particularly with regard to increased mortality.[6-8] Additional comorbidities, such as infection, depression, gastrointestinal events, and myocardial infarction, occur with greater frequency in patients with RA.[9-11] Although new therapies have improved control of disease manifestations, tumor necrosis factor inhibitors, the most commonly prescribed biologic, are associated with an increased risk of opportunistic infection.

Although RA involves such complex and chronic management issues, hospitalization for select RA manifestations[2] and arthritis-related orthopedic operations[12] has recently decreased. It is unknown, however, whether all-cause hospitalization rates and utilization for patients with RA differ from those for the general population.

Research into this subject is nearly nonexistent. A recent study from Sweden concluded that health care utilization for patients with RA

Mayo Clin Proc. ■ February 2015;90(2):176-183 ■ http://dx.doi.org/10.1016/j.mayocp.2014.12.009
www.mayoclinicproceedings.org ■

has decreased relative to the general population in the recent decade; however, the study only examined rheumatological and orthopedic hospitalizations and the usage of outpatient rheumatological and orthopedic clinics, nurses, and physiotherapists.[13]

The purpose of this study was to examine whether all-cause hospitalization rates and utilization for patients with RA differ from those for patients without RA. We examined whether patients with RA are hospitalized at a greater rate than are patients without RA, and whether patients with RA experience greater lengths of stay and readmission rates than do those without RA.

PATIENTS AND METHODS

This was a retrospective population-based cohort study including residents of Olmsted County, Minnesota. This study was possible because of the resources of the Rochester Epidemiology Project, a medical records linkage system that contains complete medical records of all patients in Olmsted County.[14,15] The previously identified RA cohort consisted of patients who were 18 years and older and who first fulfilled the 1987 American College of Rheumatology classification criteria for RA between January 1, 1980, and December 31, 2007.[16] The earliest date of fulfillment of 4 of the 7 criteria was considered as the RA incidence date. A reference cohort of patients without RA with similar age, sex, and calendar year was randomly selected from the same population, as previously described.[7] Each subject without RA was assigned an index date corresponding to the RA incidence date of the designated patient with RA.

Data on hospitalizations (admission dates, discharge dates, and admission and discharge diagnoses) were retrieved electronically from billing data from Olmsted County medical providers including Mayo Clinic and Olmsted Medical Center and their affiliated hospitals and were available beginning in 1987. Hence, follow-up began with the latter of index date or January 1, 1987, and ended at death, migration from Olmsted County, or December 31, 2012. Of the original 813 patients with RA and 813 subjects without RA, those who died or migrated from Olmsted County before 1987 were excluded (10 with RA and 10 without RA) as were those who declined to authorize the use of their medical records for research purposes per Minnesota statute sometime after their initial inclusion in the cohorts (4 with RA and 6 without RA). Discharge diagnoses were grouped together using the Clinical Classifications Software (CCS) for *International Classification of Diseases, Ninth Revision, Clinical Modification* from the Healthcare Cost and Utilization Project.[17] The CCS groups diagnoses into 18 chapters: infections and parasitic diseases; neoplasms; endocrine, nutritional, and metabolic diseases and immunity disorders (referred to as "endocrine/metabolic" hereafter); diseases of the blood and blood-forming organs; mental illness; diseases of the nervous system and sense organs; diseases of the circulatory system; diseases of the respiratory system; diseases of the digestive system; diseases of the genitourinary system; complications of pregnancy, childbirth, and puerperium; diseases of the skin and subcutaneous tissue; diseases of the musculoskeletal system and connective tissue; congenital anomalies; certain conditions originating in the perinatal period; injury and poisonings (which includes fractures); symptoms, signs, and ill-defined conditions; and residual codes, unclassified. *Readmissions* were defined as hospital admissions occurring within 30 days of a hospital discharge.

For patients with RA, information on RA disease severity was also collected previously via medical record review. These included rheumatoid factor (RF) positivity, anticitrullinated protein antibody (ACPA) positivity, repeatedly high erythrocyte sedimentation rate (ESR) (ie, $\geq$3 ESR measures $\geq$50 mm/h with a minimum interval of 30 days between 2 measurements), and the presence of joint erosions/destructive changes and rheumatoid nodules during the first year after the diagnosis of RA.

Statistical Analyses

Descriptive statistics (means, percentages, etc) were used to summarize the data. Data were analyzed using person-year (py) methods and rate ratios (RRs) comparing those with RA to those without RA. Within the RA cohort, patients with and without certain disease severity characteristics were also compared. Comparisons of py rates were performed using Poisson methods. Poisson regression models with smoothing splines were used to examine trends over time to allow for nonlinear effects. Comparisons of