A Population-Based Study Evaluating Retention in Rheumatology Care Among Patients With Rheumatoid Arthritis

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**Objective.** The study objective was to assess adherence to system-level performance measures measuring retention in rheumatology care and disease modifying anti-rheumatic drug (DMARD) treatment in rheumatoid arthritis (RA).

**Methods.** We used a validated health administrative data case definition to identify individuals with RA in Ontario, Canada, between 2002 and 2014 who had at least 5 years of potential follow-up prior to 2019. During the first 5 years following diagnosis, we assessed whether patients were seen by a rheumatologist yearly and the proportion dispensed a DMARD yearly (in those aged ≥66 for whom medication data were available). Multivariable logistic regression analyses were used to estimate the odds of remaining under rheumatologist care.

**Results.** The cohort included 50,883 patients with RA (26.1% aged 66 years and older). Over half (57.7%) saw a rheumatologist yearly in all 5 years of follow-up. Sharp declines in the percentage of patients with an annual visit were observed in each subsequent year after diagnosis, although a linear trend to improved retention in rheumatology care was seen over the study period (P < 0.0001). For individuals aged 66 years or older (n = 13,293), 82.1% under rheumatologist care during all 5 years after diagnosis were dispensed a DMARD annually compared with 31.0% of those not retained under rheumatology care. Older age, male sex, lower socioeconomic status, higher comorbidity score, and having an older rheumatologist decreased the odds of remaining under rheumatology care.

**Conclusion.** System-level improvement initiatives should focus on maintaining ongoing access to rheumatology specialty care. Further investigation into causes of loss to rheumatology follow-up is needed.

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SIGNIFICANCE & INNOVATIONS

- Evaluation of system-level performance measures for rheumatoid arthritis demonstrates gaps in ongoing care and treatment, with a trend of improvement seen over time.
- Determinants of health including age, sex, socioeconomic status, and higher comorbidity decreased the odds of remaining under rheumatology care over the first 5 years following diagnosis.
- Rheumatologist age also appears to impact retention in rheumatology care.

INTRODUCTION

The current treatment paradigm for rheumatoid arthritis (RA) requires the frequent reassessment of disease activity by a rheumatologist and adjustment of disease-modifying anti-rheumatic drug (DMARD) therapy to target remission or low disease activity (1). This strategy is associated with improved patient outcomes, including pain, functional status, and radiographic outcomes (2). Once the target has been achieved, patients should continue to be routinely followed at least yearly by rheumatology clinics to ensure optimal treatment and outcomes. Discontinuation of DMARD therapy can be associated with high relapse rates (>50% at 1 year) (3). In the small numbers of individuals in whom discontinuation of therapy is successful, ongoing rheumatologist follow-up is still warranted in case of flare (4,5). Contemporary management of RA therefore underscores the importance of rheumatologists as the principal care provider for RA care needs given the many challenges identified, including monitoring disease activity and treatment in sharing care with primary care providers (6).

Most research to date in Canada and abroad has focused on measuring initial access to rheumatologists among incident patients with RA (7–9). This includes measuring wait times and/or the percentage of patients with RA seen by rheumatologists within specific timeframes (eg, within 6 months or 1 year). Unfortunately, less is known about retention in rheumatology care over time. The concept of ongoing rheumatology care and treatment is captured in Canadian system-level performance measures (10), which report on the percentage of patients seen in yearly rheumatology follow-up. Also included in the measurement set is the percentage of patients on yearly DMARD therapy, which is aligned with a quality measure from the American College of Rheumatology set of electronic clinical quality measures (11). These performance measures have been evaluated in several different Canadian provinces (12,13) and in different datasets (14,15) to date. To our knowledge, an evaluation of patient and system factors influencing measure performance has not been conducted.

The purpose of this study was to perform a longitudinal evaluation of two system-level performance measures addressing yearly ongoing access to (ie, retention in) rheumatology care and ongoing treatment in an inception cohort of individuals with RA in Ontario using health administrative data. In addition, patient and rheumatologist factors associated with remaining under continuous rheumatology care in the first 5 years from time of diagnosis were examined.

PATIENTS AND METHODS

Study design and setting. This was a retrospective population-based study involving an inception cohort of patients with RA established from health administrative databases in Ontario, Canada, to evaluate health system performance measures (10). Ontario provides public health insurance to all residents (approximately 14 million people) under the Ontario Health Insurance Plan (OHIP) and pays for prescription drugs for residents aged 65 years and older.

Cohort definition and inclusion criteria. Incident patients with RA were identified from the Ontario Rheumatoid Arthritis Dataset (ORAD), a population-based registry assembled using a validated algorithm (16). Individuals are included in ORAD if they have one hospitalization or at least three physician claims for RA within 2 years, with at least one by a rheumatologist, internist, or orthopedic surgeon (case definition sensitivity 78%, specificity 100%, positive predictive value [PPV] 78%) (17). In the present study, the inclusion criteria were modified to increase PPV by requiring patients to have a rheumatologist as the specialist on the qualifying specialist claim (to ensure all patients had index data of an initial rheumatology visit). Patients were required to have OHIP eligibility in the 5-year period prior to their first RA diagnosis code (to exclude potential prevalent patients with RA moving to Ontario).

We included only incident cases at least 18 years of age or older at the time of their first RA encounter and who were diagnosed between April 1, 2002, and March 31, 2014, to ensure data availability for a full 5-year follow-up period (to March 31, 2019). All patients were required to have 5 years of available follow-up, and those who died before 5 years were excluded from analyses. Study flowcharts are shown in Supplementary Figure 1 (entire cohort) and Supplementary Figure 2 (individuals aged ≥66 years old).

Data sources. Unique encoded identifiers were used to link the following datasets for analysis at ICES (www.ices.on.ca): the OHIP Claims Database (physician visits), the OHIP Registered Persons Dataset (patient demographic and vital statistic information), the Ontario Drug Benefit Program (pharmacy claims), and the Discharge Abstract Database (hospital admissions). Individual rheumatologists’ demographics were identified using the validated ICES physician database. The study was authorized under section 45 of Ontario’s Personal Health Information Protection
Cohort and rheumatologist characteristics. Patient characteristics were determined at time of cohort entry. These included age, sex, socioeconomic status, location of residence, and comorbidity. Rurality was based upon each patient’s postal code and a community population size of less than 10,000 residents (18). Individuals residing 100 km or more (calculated using linear distance from the center of the individual’s postal code) from their index rheumatologist were described as living at a remote distance. Socioeconomic status was defined as the patient’s neighbourhood median household income quintile from the Statistics Canada Census. The Romano adaptation of the Charlson comorbidity index was calculated based on both inpatient and outpatient encounters in the 3 years prior to cohort entry (excluding RA encounters from the index operation (19)). Additionally, the Johns Hopkins ACG® System was used to identify the number of aggregated diagnosis groups (ADGs) to characterize the health status of an individual based on hospital discharge abstracts and physician claims data in the 3 years prior to cohort entry. ADGs were categorized into low (<5), moderate (5–9), and high comorbidity (10+) (20). Rheumatologist supply was calculated as the number of rheumatologists in full-time equivalent (FTE) practice per 75,000 adults living in the patient’s health care region in the year of RA diagnosis. Rheumatologist age and sex were included as variables in analysis (see below).

System-level performance measures. Two measures evaluating ongoing rheumatology care were evaluated in the present study. The first was the percentage of the individuals in the cohort seen by a rheumatologist at least once per year after the initial rheumatologist visit, starting 365 days from the initial visit and measured every 365 days from the previous visit. This measure is 100% in year 1 as a function of inclusion criteria. This measure was assessed separately in the entire cohort and in persons aged 66 and older (to allow 1 year for registration in provincial medication coverage, which starts at age 65). The second measure was the percentage of individuals dispensed a DMARD on an annual basis (starting on the day of their initial rheumatologist visit). This measure was only evaluated in those aged 66 and older (in whom complete pharmacy dispensation data are available). DMARDs included conventional synthetic DMARDs, targeted synthetic DMARDs, and biologic agents as well as other immunsuppressives used to treat complications of RA (see Supplementary Table 1).

Statistical analysis. We used descriptive statistics (mean or median depending on normality of the data and frequencies) to characterize the population. We compared baseline characteristics of individuals seen by a rheumatologist in all 5 years with those who did not meet the measure in all 5 years of follow-up. Results for measure performance were reported graphically over time by calendar year of cohort entry. The Cochran-Armitage Trend test was used to look for linear trends over time in measure performance. Univariate and multivariable logistic regression were used to evaluate potential predictors of remaining under rheumatologist care throughout the entire first 5 years following index date. Variables included in the adjusted model included the following: patient age (in 10-year intervals), sex, income quintile, year of diagnosis, Charlson score (Romano adaptation) (19), number of ADGs (categorized as 5-9 or ≥10), rurality, FTE rheumatologist supply per population (benchmark of 1/75,000 adults), distance (per 10 km) to the rheumatologist, living at a remote distance to the rheumatologist, and rheumatologist sex and age (per 10 years). All regressions were adjusted for clustering within the first rheumatologist seen by the patient. All analyses were performed using SAS version 9.3 (SAS Institute Inc.).

RESULTS

The study included 50,883 individuals with incident RA; 70.8% were female. The mean (SD) age of the total cohort was 55.4 (14.8), and 26.1% were aged 66 years and older at the time of diagnosis. Over half of the cohort (n = 29,350 [57.7%]) saw a rheumatologist annually over the 5 years following their index rheumatologist visit. The characteristics of individuals seen in all 5 years by a rheumatologist compared with those who did not meet the measure in all years are reported in Table 1. While the groups had no difference in mean age, there were more individuals aged 18 to 30 years, 61 to 70 years, and 81 years and older who did not meet the measure in all 5 years. Individuals residing at a remote distance were less likely to remain under care over time.

The percentage of patients with RA seen by a rheumatologist in yearly follow-up is shown by year since diagnosis in Figure 1. All patients were seen by a rheumatologist in year 1; in each subsequent follow-up year, there was a decline in the number of patients returning for follow-up. A linear trend to improvement by calendar time was seen in the proportion of individuals who saw a rheumatologist in all 5 years over the study period (P < 0.0001). There were also significant trends over time in the proportion of individuals who met the measure in each year (all P < 0.0001). For example, in individuals diagnosed in 2002, only 63.0% remained under yearly follow-up by year 5. In contrast, for individuals diagnosed in 2013, 70.3% remained under yearly follow-up by year 5. Overall, 82.2% of patients were seen in year 2, and this declined to 66.1% in year 5; 77.4% had a follow-up in at least three of five measurement periods (Figure 2).

A similar decline in the proportion of individuals with yearly follow-up was seen over the 5 years following diagnosis in individuals aged 66 and older with RA (data not shown). The decline in yearly follow-up was associated with declines in yearly DMARD dispensation as shown in Figure 3. As with annual follow-up visits,
Table 1. Comparison of characteristics of individuals with RA (all ages) seen by a rheumatologist yearly over the first 5 years following the index rheumatologist visit, compared with those who did not see a rheumatologist in all 5 years

| Characteristics at cohort entry | Seen by a rheumatologist across all 5 years | Multivariable analysis predicting the odds that an individual with RA will be seen yearly by a rheumatologist |
|--------------------------------|---------------------------------------------|-----------------------------------------------------------------------------------------------------------|
|                                | Yes (n = 29,350)                            | Crude OR (95% CI)                                                                                       | Adjusted\(^a\) OR (95% CI) |
| Patient demographics           |                                             |                                                                                                          |                             |
| Age (y), mean ± SD             | 55.9 ± 13.9                                 | N/A                                                                                                      | N/A |
| Age strata, n (%)              |                                             |                                                                                                          |                             |
| 18-30 y old                    | 1272 (4.3%)                                 | 1.32 (1.21-1.44)                                                                                         | 1.33 (1.22-1.46) |
| 31-40 y old                    | 2796 (9.5%)                                 | 1.66 (1.53-1.81)                                                                                         | 1.69 (1.55-1.83) |
| 41-50 y old                    | 5802 (19.8%)                                | 1.97 (1.78-2.18)                                                                                         | 2.01 (1.82-2.22) |
| 51-60 y old                    | 8309 (28.3%)                                | 2.07 (1.88-2.28)                                                                                         | 2.13 (1.93-2.34) |
| 61-70 y old                    | 6538 (22.3%)                                | 1.60 (1.42-1.80)                                                                                         | 1.66 (1.47-1.87) |
| 71-80 y old                    | 3832 (13.1%)                                | 0.90 (0.80-1.02)                                                                                         | 0.92 (0.81-1.04) |
| 81+ y old                      | 801 (2.7%)                                  | 0.90 (0.83-0.91)                                                                                         | 0.84 (0.81-0.88) |
| Male sex, n (%)                | 8195 (27.9%)                                | 0.87 (0.83-0.91)                                                                                         | 0.84 (0.81-0.88) |
| Income quintile, n (%)         |                                             |                                                                                                          |                             |
| 1 = lowest                     | 4760 (16.2%)                                | 1.12 (1.06-1.19)                                                                                         | 1.11 (1.05-1.18) |
| 2                              | 5679 (19.3%)                                | 1.11 (1.05-1.18)                                                                                         | 1.10 (1.04-1.16) |
| 3                              | 6056 (20.6%)                                | 1.17 (1.10-1.24)                                                                                         | 1.14 (1.07-1.21) |
| 4                              | 6413 (21.9%)                                | 1.21 (1.14-1.28)                                                                                         | 1.17 (1.10-1.24) |
| 5 = highest                    | 6339 (21.6%)                                | 1.28 (1.10-1.50)                                                                                         | 1.55 (1.34-1.80) |
| Fiscal year of cohort entry    |                                             |                                                                                                          |                             |
| (REF = 2002)                   |                                             |                                                                                                          |                             |
| 2002                            | 1752 (6.0%)                                 | 1.06 (0.95-1.19)                                                                                         | 1.09 (0.98-1.21) |
| 2003                            | 2002 (6.8%)                                 | 1.03 (0.92-1.15)                                                                                         | 1.08 (0.96-1.20) |
| 2004                            | 2061 (7.0%)                                 | 1.13 (0.97-1.31)                                                                                         | 1.20 (1.04-1.40) |
| 2005                            | 2394 (8.2%)                                 | 1.06 (0.91-1.24)                                                                                         | 1.14 (0.97-1.34) |
| 2006                            | 2223 (7.6%)                                 | 1.02 (0.89-1.17)                                                                                         | 1.14 (0.99-1.31) |
| 2007                            | 2423 (8.3%)                                 | 1.04 (0.90-1.20)                                                                                         | 1.17 (1.02-1.35) |
| 2008                            | 2572 (8.8%)                                 | 1.06 (0.91-1.24)                                                                                         | 1.21 (1.05-1.40) |
| 2009                            | 2657 (9.1%)                                 | 1.07 (0.91-1.27)                                                                                         | 1.24 (1.07-1.45) |
| 2010                            | 2987 (10.2%)                                | 1.20 (1.02-1.41)                                                                                         | 1.40 (1.21-1.62) |
| 2011                            | 2396 (8.1%)                                 | 1.27 (1.08-1.50)                                                                                         | 1.53 (1.31-1.77) |
| 2012                            | 3051 (10.4%)                                | 1.28 (1.10-1.50)                                                                                         | 1.55 (1.34-1.80) |
| Comorbidity                     |                                             |                                                                                                          |                             |
| Number of ADGs in the 3 y prior to entry, n (%) (REF ≤5) |                             |                                                                                                          |                             |
| <5                              | 2899 (9.9%)                                 | 0.91 (0.84-0.98)                                                                                         | 0.93 (0.88-0.99) |
| 5-9                             | 12,712 (43.3%)                              | 1.19 (1.08-1.31)                                                                                         | 1.01 (0.80-1.27) |
| 10+                             | 13,739 (46.8%)                              | 1.27 (1.08-1.50)                                                                                         | 1.00 (0.97-1.03) |
| Charlson, mean ± SD             | 0.7 ± 1.2                                   | 0.97 (0.95-0.98)                                                                                         | 0.97 (0.95-0.99) |
| Geographic characteristics      |                                             |                                                                                                          |                             |
| Rural residence, n (%)          | 3850 (13.1%)                                | 0.91 (0.84-0.98)                                                                                         | 0.93 (0.88-0.99) |
| Rheumatology supply\(^e\), mean ± SD | 0.76 ± 0.30                             | 1.19 (1.08-1.31)                                                                                         | 1.01 (0.80-1.27) |
| Distance to index rheumatologist (km), median (Q1, Q3) | 12 (5, 36)                                 | 0.97 (0.95-0.99)                                                                                         | 1.00 (0.97-1.03) |
| Remote distance\(^f\), n (%)    | 1924 (6.6%)                                 | 0.79 (0.70-0.88)                                                                                         | 0.89 (0.77-1.04) |
| Rheumatologist characteristics  |                                             |                                                                                                          |                             |
| Male sex, n (%)                 | 18,808 (64.1%)                               | 0.94 (0.80-1.11)                                                                                         | 0.94 (0.80-1.11) |
| Age (y), mean ± SD              | 48.07 ± 10.05                                | 0.82 (0.90-1.12)                                                                                         | 0.82 (0.77-0.88) |

Abbreviations: ADG, aggregated diagnosis groups (John Hopkins ACG\(^\circ\) System); CI, confidence interval; N/A, not applicable; OR, odds ratio; Q, quartile; RA, rheumatoid arthritis; REF, reference.

\(^a\)The following variables were included in the adjusted model: age group (10-y groupings), sex, income quintile, ADG category, Charlson score (continuous), rural location, rheumatologist supply, distance to rheumatologist, remote rheumatologist, sex, and age of rheumatologist.

\(^b\)The effect of age in the model is an inverted U: the probability of seeing a rheumatologist yearly increases with increasing age to around age 60, then decreases again. To capture this, age has been categorized in 10-y intervals.

\(^c\)Reference female.

\(^d\)Reference urban residence.

\(^e\)Rheumatology supply measured in full-time equivalent rheumatologists per 75,000 adult population.

\(^f\)Remote distance defined as ≥100 km to index rheumatologist.
there was a significant linear trend over time in the proportion of individuals aged 66 years and older who had a DMARD dispensed in all 5 years and in the proportion who met the measure in each year (all $P < 0.0001$). In 2002, only 73.2% of individuals aged 66 and older with RA were dispensed a DMARD yearly, and this declined to 55.8% by 5 years. In 2013, 82.5% of the cohort were dispensed a DMARD yearly, and this declined to 62.8% after 5 years. Overall, 79.8% of individuals with RA aged 66 years and older were dispensed a DMARD in year 1, and this declined to 60.0% in year 5 (Figure 4). Only 53.5% had a DMARD dispensed in all measurement years and 66.0% in at least three of five measurement periods (Figure 4). The relationship between annual rheumatologist follow-up and being dispensed a DMARD is shown in Figure 5 for individuals with RA aged 66 years and older.
In year 1, 89.9% of individuals with RA seen by a rheumatologist continuously for the first 5 years were dispensed a DMARD compared with 66.6% of those who were not seen by a rheumatologist. By year 5, 82.1% of those under continuous care were dispensed a DMARD compared with 31.0% who were not retained.

In univariate analysis of the full cohort (all ages), the odds of remaining under continuous rheumatologist care over the first 5 years increased with age up to age 61-70 and declined with older age groups (Table 1). Male patients had lower odds of remaining under continuous care. There was an increase in odds of remaining

Figure 3. Percentage of individuals aged 66 years and older dispensed a DMARD yearly by year of cohort entry. DMARD, disease-modifying anti-rheumatic drug; RA, rheumatoid arthritis.

Figure 4. Percentage of individuals with RA aged 66 years and older dispensed a DMARD yearly in first 5 years of follow-up. DMARD, disease-modifying anti-rheumatic drug; RA, rheumatoid arthritis.
under care for those with higher socioeconomic status and for those diagnosed in later calendar years. Individuals with higher Charlson comorbidity score had lower odds of continuous rheumatology follow-up, but ADG category did not have a significant effect. Individuals living in rural areas had lower odds of continuous follow-up; those living at remote distances to rheumatology care had even lower odds, and the odds decreased with increasing distance from the index rheumatologist. Higher odds of remaining under care were found in regions of higher rheumatologist FTE supply. There were lower odds of remaining under care with male compared with female rheumatologists, but rheumatologist age did not impact the odds of continuous care.

In our multivariable model (Table 1), there continued to be higher odds of continuous care up to age 61-70, with a decline in odds seen in older age groups. Males had lower odds of continuous care. There remained an effect of income, with a gradient seen (higher odds in higher income quintiles). There also remained an improvement seen over time with higher odds seen in more recent calendar years. The odds of being under continuous care decreased with increasing Charlson comorbidity score, but again, ADG category did not impact the odds of continuous care. Of the geographic variables included, only rural residence was associated with decreased odds of continuous follow-up. Rheumatologist sex was not associated with the odds of continuous follow-up in our adjusted model; however, the odds of continuous follow-up decreased with increasing rheumatologist age.

**DISCUSSION**

This population-based evaluation of two system-level performance measures highlights ongoing important gaps in care for individuals with RA. This includes evidence for a continuous decline in the proportion of patients receiving yearly follow-up care and lower receipt of appropriate DMARD treatment in individuals aged 66 years and older. Several patient and geographic characteristics were explored as predictors of continuous rheumatology follow-up over 5 years. Males and older age groups appeared to have lower odds of continuous follow-up. There was also a gradient effect of income, with higher odds of continuous follow-up for those in higher income quintiles. Lower odds of continuous follow-up over 5 years were seen for those in rural locations and for those with higher Charlson comorbidity scores. The odds of continuous follow-up decreased with increasing rheumatologist age.

While we have previously shown that individuals aged 66 years and older have suboptimal dispensation of DMARD therapy within the first year of diagnosis (21), the present study also emphasizes the importance of ongoing rheumatology care.
for appropriate management. Similar findings emphasizing the importance of ongoing rheumatology care were found in British Columbia in a less contemporary general RA population (22). There are several factors that may affect ongoing rheumatology care and treatment in older individuals with RA, which have been summarized in reviews (23–25). Older patients with RA have more comorbidities (26,27), resulting in potential contraindications to DMARDs. Indeed, accumulating more comorbid conditions was independently shown to impact continuous care in our analyses. This may be explained by multiple medical appointments and/or hospitalizations for competing conditions which may impact the use of rheumatology care. Different treatment patterns have also been previously observed in individuals with older-onset RA with lower use of biologic agents and combination therapies (26). Survey-based evaluation of rheumatologists’ treatment practices confirms that their recommendations are impacted by patient age, with less aggressive treatment regimens offered to elderly patients (28). These treatment practices may be related to patient comorbidity and associated polypharmacy and/or frailty.

Patient gender may impact participation in and access to care (29); our study demonstrated lower retention in rheumatology care among male patients with RA. The reasons for this are unknown but are likely complex; they could relate to gender roles or possibly to disease activity and/or disease impact (which were not captured in our study), as these may be lower in male populations (30–32). Interestingly, male sex did not appear to impact losses to RA follow-up in a Taiwanese study (33), but there has been little investigation of this issue in RA populations in other countries, to our knowledge. In Canada, there are gender differences in health-seeking behaviours in the general population, with women more likely to seek care than men for both physical and mental health concerns (34).

Canada has a universal health care system, and each province and territory has a different health plan which covers the costs for physician visits and hospitalizations (35). Medication is also covered for those over the age of 65. Despite health care coverage, a socioeconomic gradient was observed that impacted continuous rheumatology care. This finding could relate to challenges in transportation or paying for parking, or to an inability to take time off from work and/or lost wages incurred by attending regular clinic appointments. Interestingly, a few Canadian longitudinal studies demonstrated that low socioeconomic status is associated with higher disease activity and pain and worse function at presentation, yet over time this disparity in outcomes resolved (36,37). Given the potential biases inherent in longitudinal cohort studies, further work needs to be done at a population level to determine the impacts of socioeconomic status on outcomes of patients with RA. In the United States, among Medicare enrollees with RA, lower rates of DMARD receipt were observed in those with lower socioeconomic status (38). In other studies, lower socioeconomic status was an independent risk factor for difficult-to-treat RA (39) and was associated with higher comorbidity (40), and further efforts need to be made to understand barriers to accessing care for those in lower socioeconomic groups and to develop solutions to improve health equity. Unfortunately, Canadian health administrative data do not capture detailed patient ethnicity well; however, it should be noted that racial and ethnic disparities exist in access to care and treatment for RA, which impact patient outcomes; this work has recently been summarized (41).

Canada is geographically large, and rheumatologists are mostly clustered in larger urban centers; it is therefore unsurprising that living in a rural location was associated with a lower odds of continuous follow-up. Regional strategies may need to be developed to provide rheumatology care to underserviced communities. Additionally, it is possible that physician practices may influence measure adherence. For example, individuals with RA may be evaluated multiple times in the first year following diagnosis until stable, and then follow-ups may be lengthened, explaining a drop-off in the second year of follow-up.

An interesting finding of our study was that rheumatologist characteristics may impact whether a patient remains under continuous rheumatology care. On univariate analysis, having a female rheumatologist appeared to be associated with higher odds of continuous care, but this finding did not remain significant on multivariable analysis. Previous studies have shown differences in patient outcomes between male and female physicians (42,43), and further investigation may be warranted to determine whether there are differences in treatment and outcomes of patients with RA based on physician gender. Our study did reveal that older physician age was associated with lower odds of continuous care. This may be because older physicians may be transitioning to retirement and discharging patients who are more stable to primary care or potentially limiting follow-up visits. It is also possible that older rheumatologists may have different practice patterns for care that may be less concordant with current treat-to-target guidelines that endorse more frequent follow-ups. Further investigation is required to evaluate the cause and impact of these findings.

The present study highlights important observations about factors impacting continuous RA care and treatment; however, there are some limitations to discuss. We used a validated case definition for RA with a high PPV and included only those patients diagnosed by a rheumatologist. While misclassification is possible, misclassified cases tend to be individuals with another form of inflammatory arthritis or query RA who may require similar follow-up and treatment. Although this approach minimizes misclassification, it should be highlighted that there remain RA cases in the province who never see a rheumatologist and for whom treatment patterns and outcomes are not represented in this study. Medication data are not available in the province for those under age 65, limiting evaluation of the second performance measure in the entire population. Administrative data do not contain disease activity or race and ethnicity, which limited analyses as described earlier. Access to care after the start of the COVID-19
pandemic may be dramatically different and is not captured in the present analyses. Our study results are also not generalizable to individuals who died within 5 years of diagnosis as they were excluded from evaluation.

This study highlights gaps in key care elements in the “care continuum,” analogous to what has been described for other chronic diseases such as human immunodeficiency virus (44). Similarly, the performance measures (10) help track key steps from diagnosis, linkage to care, receipt of care, and retention in care to optimize outcomes. In the present work, despite marginal improvements over time in the retention of patients with RA under follow-up care, there remains a gradual attrition in follow-up care over time that is associated with lower DMARD use in individuals aged 66 and older. Continuous rheumatology care over the first 5 years appears to be independently associated with determinants of health including patient sex, age, socioeconomic status, and residing in a rural location. Future research efforts need to investigate the causes of these challenges to continuously accessing care as well as the degree to which patient outcomes are impacted. This research will contribute to strategies to inform health system design in order to better address patient needs, improve patient access to ongoing care, and improve health equity.

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All authors were involved in drafting the article or revising it critically for important intellectual content, and all authors approved the final version to be published. Drs. Barber and Widdifield had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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