Evaluating quality of care for rheumatoid arthritis for the population of Alberta using system-level performance measures

Claire E. H. Barber[1,2,3,4] (Orcid ID : 0000-0002-3062-5488), Diane Lacaille[3,5], Peter Faris[6], Dianne Mosher[1,4], Steven Katz[7], Jatin N. Patel[2], Sharon Zhang[6], Karen Yee[6], Cheryl Barnabe[1,2,3,4], Glen S. Hazlewood[1,2,3,4], Vivian Bykerk[8], Natalie J. Shiff[9], Marinka Twilt[10], Jennifer Burt[11], Susanne M. Benseler[10], Joanne Homik[7], Deborah A. Marshall [1,2,,3, 4] (ORCID ID: 0000-0002-8467-8008)

Key Indexing Terms: Quality Indicator, Access, Quality Improvement

Names of departments and institutions to which work should be attributed:
[1]Department of Medicine, Cumming School of Medicine, University of Calgary, Calgary, Alberta
[2]Department of Community Health Sciences, University of Calgary, Calgary, Alberta
[3]Arthritis Research Canada
[4] McCaig Bone and Joint Health Institute, Calgary, Alberta
[5]Department of Medicine, University of British Columbia, Vancouver, British Columbia
[6]Alberta Health Services
[7]Department of Medicine, University of Alberta
[8]Hospital for Special Services, New York, New York
[9]Department of Community health and Epidemiology, University of Saskatchewan (Adjunct)
[10]Department of Pediatrics, Alberta Children's Hospital, Cumming School of Medicine, University of Calgary, Calgary, Alberta
[11]St Clare's Mercy Hospital, St. John's, Newfoundland

Funding: DM is supported by the Arthur J.E. Child Chair in Rheumatology and a Canada Research Chair in Health Systems and Services Research (2008-2018). DL is supported by the Mary Pack Chair in rheumatology research from the University of British Columbia and The Arthritis Society of Canada. This work was funded by a Partnership for Research and Innovation in the Health System (PRIHS) grant "Optimizing centralized intake to improve arthritis care for Albertans" (#201300472), the Arthritis Society Models of Care grant (MOC-13-007) and a Canadian Initiatives for Outcomes in Rheumatology Care grant (CIORA).

Conflict of Interest: The authors declare no conflicts of interest for this work.

Initials, surnames, appointments and highest academic degrees of all authors:
C.E.H. Barber MD FRCPC PhD Assistant Professor
D. Lacaille MD FRCPC MHSc Professor
P. Faris PhD
D. Mosher MD FRCPC Professor
S. Katz MD FRCPC
J. N. Patel, MBT, Project Manager, Department of Community Health Sciences, University of Calgary, Calgary, Alberta
S. Zhang MSc

K. Yee, MSc, MPH Senior Data Analyst, Alberta Health Services
C. Barnabe MD FRCPC MSc Associate Professor
G.S. Hazlewood MD FRCPC PhD Associate Professor
V. Bykerk MD FRCPC Associate Professor
N. J. Shiff MD MHSc Adjunct
M. Twilt MD MSCE PhD Assistant Professor
J. Burt PT ACPAC program-trained ERP
S.M. Benseler MD PhD Professor
J. Homik MD FRCPC MSc Professor
D. A. Marshall PhD Professor

Running head: Rheumatoid arthritis performance measures in Alberta

Manuscript Details:

Manuscript Type: Brief Communication
Abstract word count: 250/250
Number of tables: 2/3
Manuscript word count: 1497/1500
Number of references: 12/20
Number of figures: 1

ABSTRACT (250 words)

Background: We evaluated 4 national rheumatoid arthritis (RA) system-level performance measures (PMs) in Alberta, Canada.

Methods: Incident and prevalent RA cases ≥ 16 years of age since 2002 were identified using a validated case definition applied in provincial administrative data. Performance was ascertained through analysis of health data between fiscal years 2012/13-2015/16. Measures evaluated were: proportion of incident RA cases with a rheumatologist visit within one year of first RA diagnosis code (PM1); proportion of prevalent RA patients dispensed a disease modifying anti-rheumatic drug (DMARD) annually (PM2); time from first visit with an RA code to DMARD dispensation, and proportion of incident cases where the 14-day benchmark for dispensation was met (PM3); and proportion of patients seen in annual follow-up (PM4).

Results: There were 31566 prevalent and 2730 incident RA cases (2012/13). Over the analysis period, the proportion of patients seen by a rheumatologist within 1 year of onset (PM1) increased from 55 to 63%; however, the proportion of RA patients dispensed DMARDs annually (PM2) remained low at 43%. While the median time to DMARD from first visit date in people who received DMARDs improved over time from 39 to 28 days, only 38-41% of patients received treatment within the 14-day benchmark (PM3). The percentage of patients seen in yearly follow-up (PM4) varied between 73-80%.

Conclusion: The existing Alberta health care system for RA is suboptimal, indicating barriers to accessing specialty care and treatment. The results inform quality improvement initiatives required within the province to meet national standards of care.

INTRODUCTION

Early access to care and treatment initiation for patients with rheumatoid arthritis (RA) helps optimize outcomes. Delays in access to specialty rheumatology care and treatment are commonly reported (1-3). To evaluate the timely diagnosis, treatment and evidence-based care for patients with inflammatory arthritis conditions, the Arthritis Alliance of Canada (AAC) (4) developed six system-level performance measures (PM) that benchmark optimal care (5). The measures have been tested in five Canadian provinces using different data sources including clinic data (6), a longitudinal early arthritis cohort study (7), and administrative databases in the province of British Columbia (BC) (8). The study aims to expand knowledge on health system performance in RA care to the publicly funded healthcare system in the province of Alberta, Canada.

MATERIALS & METHODS

Study design & Data Sources

We conducted a population-based retrospective cohort study using administrative health data from Alberta, acquired from Alberta Health (Ministry of Health) and Alberta Health Services (AHS) (9). The Canadian healthcare system has both public and private service mixture; however, the present study captures publicly funded specialist services and dispensed medications in the province. Datasets accessed were hospital discharge abstracts (using International Classification of Diseases, ICD-10 codes), practitioner claims (using ICD-9 Clinical Modification (CM) codes) and the population registry from the Alberta Health Care Insurance Plan and prescription dispensing from the Pharmacy Information Network (includes information on all pharmacy dispensed medications).

Ethics approval for the study was provided by the University of Calgary Conjoint Health Research Ethics Board (Ethics ID REB13-0822).

Cohort definition

Incident and prevalent RA cases ≥16 years of age between the dates of April 1st 2002 and March 31st 2017 were identified using the 2016 Public Health Agency of Canada's surveillance case definition for RA (10-12) which included either 1 hospitalization separation (ICD-10, M05.X-M06.X) or 2 or more physician claims (ICD-9 CM 714.X) for RA at least 8 weeks apart and within a 2-year period (sensitivity of 83%, a specificity of 99% a positive predictive value of 52% and a negative predictive value of 100% (13)). Exclusion criteria were applied subsequent to qualifying: cases with at least 2 physician visits (separated by at least one day) within 2 years for the same non-RA inflammatory arthritis (such as systemic autoimmune rheumatic diseases (SARDs, 710.X), polyarteritis nodosa and related conditions (446.x), polymyalgia rheumatica (725.x), psoriasis (696.x), ankylosing spondylitis and other spondyloarthritides (720.x). A run-in period from 2002/03 to 2010/11 was used to allow enough time to capture all prevalent cases and appropriately classify incident cases (12).

Calculation of the Performance Measures

Performance of four PMs from the AAC set (5) were estimated through the linked datasets for fiscal years 2012/13 through 2015/16. To evaluate access to rheumatologist care (PM1), we measured the proportion of incident RA cases seen by a rheumatologist, defined as having at least one rheumatologist visit within one year of their first RA code.

There is no rheumatologist identifier in the provincial administrative datasets, thus providers listed as internists who had at least 20% of their entire billings submitted for RA services were considered to be rheumatologists, along with rheumatologists who explicitly consented to have their personal physician identifiers included for the analysis. This method correctly identified 93% of known rheumatologists (personal communication with AHS). For PM2, the proportion of prevalent RA patients dispensed a disease modifying anti-rheumatoid drug (DMARD) at least once during each measurement year was calculated. DMARDs included conventional DMARDs (e.g., methotrexate, hydroxychloroquine, sulfasalazine, leflunomide), other immunosuppressant agents used for rare complications of RA, biologic agents and small molecule inhibitors (see Appendix for complete list). PM3 reports the time from the first visit with an RA code by any provider to first DMARD dispensation, and is reported in the fiscal year of RA incidence. For PM2 and PM3, patients were excluded from the denominator for the measurement year if they were pregnant, had HIV or had a new malignancy diagnosis as treatment decision-making in these conditions is more nuanced and not well captured using this measure (see Appendix for definitions). The proportion of cases meeting the 14-day benchmark from first RA visit to DMARD dispensation was also estimated (5, 14). For PM4, the proportion of patients under the care of a rheumatologist seen in follow-up by a rheumatologist during the measurement year was calculated. We defined "under rheumatologist care" as RA patients who previously had a minimum of 2 rheumatologist visits prior to the year of reporting, to avoid including cases referred for RA where the diagnosis was not confirmed.

RESULTS

PM1: The proportion of incident RA cases seen by a rheumatologist increased over the analysis period, from 55% in the 2012/13 fiscal year to 63% by the 2015/2016 fiscal year (Figure 1).

PM2: The proportion of prevalent RA cases who were dispensed a DMARD during the measurement year was suboptimal and remained low over the course of follow-up at only 42-43% (Table 1).

PM3: For incident RA cases, the median time between the first RA visit and DMARD dispensation, amongst those who received a DMARD, is shown in Table 3. By fiscal year 2015/16, the median time to DMARD dispensation was 28 days, with a 90th percentile of 288 days and 41% of cases met the 14-day benchmark for DMARD start.

PM4: The number of prevalent RA cases under the care of a rheumatologist seen in yearly follow-up was between 73-80% for all fiscal years (Table 1).

DISCUSSION

Our analysis of system-level PMs for Alberta RA care revealed suboptimal performance against national standards. Among RA patients who sought assessment for their symptoms, only 2/3rds were able to access a rheumatologist within 1 year of their disease. This improved over time, perhaps reflective of increasing Alberta rheumatologist numbers (38 in 2012 and 50 by 2016)(15). There is a regional shortage of rheumatologists which likely contribute to delays to access (16) and further study of this is ongoing. Delays in rheumatologist consultation have also been observed in Ontario using EMR-data (2, 3) and in Quebec using administrative data (17).

The measures are also useful for understanding cross-provincial comparisons of RA health systems. We have recently completed a similar analysis in the province of BC (8), although over a different time period. Similarly, suboptimal rates of DMARD use were observed provincially (43% of patients in Alberta vs 37% in BC in 2014) when looking at all RA patients from any care provider. Of importance, in the Alberta analysis we did not examine rates of DMARD use for those under rheumatologist care. This analysis in BC revealed substantially higher DMARD dispensing rates (87% in 2014) for RA patients under current rheumatologist care (defined as having a rheumatologist visit during the measurement year). Time to DMARD start in incident RA cases did not meet the Wait Time Alliance (14) 14-day benchmark in either province.

Similarly low rates of DMARD use in RA have been shown in other Canadian provinces such as Ontario (18), with most delays in initiation of DMARD starts occurring prior to rheumatologist consultation (3). Potential reasons for delay could include patient and/or system-related reasons for not filling DMARD prescriptions immediately including awaiting baseline lab results to gauge safety of DMARD start, patient financial situation, or patient attitudes to DMARDs (19).

While our study provided a comprehensive population-based assessment of these PMs and allowed us to make important comparisons with measurement results in a neighboring province, there remain some limitations. Unlike the BC dataset, the Alberta dataset does not contain a rheumatologist identifier, which necessitated the development of an algorithm by AHS to identify rheumatologists based on the frequency of claims for RA diagnosis in that practitioner's billings, which could have impacted results. Due to

the inherent limitations of administrative data, it is possible that case misclassification impacted our results; however, we used a validated case definition to mitigate this possibility. We also did not have any linkage to lab results and it is possible that the seropositive status of our patients could have impacted our results on the performance measures.

CONCLUSIONS

Provincial analysis for Alberta indicates that RA patients experience difficulty in accessing specialty care, but once seen by a rheumatologist, ongoing follow-up rates were good over the time period evaluated. When evaluating treatment at the population level a large proportion of RA patients are not receiving DMARDs, considered essential in the treatment of RA, suggesting suboptimal management. This work contributes to a growing body of literature reporting on the System-Level Performance Measures (5) in different provinces and using different data sources. This work highlights important areas for planned quality improvement initiatives within the province and offers a baseline for the PMs that can be tracked over time as new models of care are implemented to improve access to care and early treatment. It also highlights that further work is necessary to investigate predictors of the lower than expected rates of DMARD and explore perspectives of this from patient and provider perspectives. We also have future plans to assess the impact that the performance on these measures has on long-term patient outcomes.

1. Firth J, Snowden N, Ledingham J, Rivett A, Galloway J, Dennison EM, et al. The first national clinical audit for rheumatoid arthritis. Br J Nurs 2016;25:613-7.
2. Widdifield J, Paterson JM, Bernatsky S, Tu K, Thorne JC, Ivers N, et al. Access to rheumatologists among patients with newly diagnosed rheumatoid arthritis in a Canadian universal public healthcare system. BMJ open 2014;4:e003888.
3. Widdifield J, Tu K, Carter Thorne J, Bombardier C, Michael Paterson J, Liisa Jaakkimainen R, et al. Patterns of Care Among Patients Referred to Rheumatologists in Ontario, Canada. Arthritis Care Res (Hoboken) 2017;69:104-14.
4. Arthritis Alliance of Canada. Arthritis Alliance of Canada. 2015 [updated 2015; cited April 10, 2015]; Available from: http://arthritisalliance.ca/en/.
5. Barber CE, Marshall DA, Mosher DP, Akhavan P, Tucker L, Houghton K, et al. Development of System-level Performance Measures for Evaluation of Models of Care for Inflammatory Arthritis in Canada. J Rheumatol 2016;43:530-40.
6. Barber CEH, Thorne JC, Ahluwalia V, Burt J, Lacaille D, Marshall DA, et al. Feasibility of Measurement and Adherence to System Performance Measures for Rheumatoid Arthritis in 5 Models of Care. J Rheumatol 2018;45:1501-8.
7. Barber CEH, Schieir O, Lacaille D, Marshall DA, Barnabe C, Hazlewood G, et al. High Adherence to System-Level Performance Measures for Rheumatoid Arthritis in a National Early Arthritis Cohort Over Eight Years. Arthritis Care Res (Hoboken) 2018.
8. Barber CEH, Marshall DA, Szefer E, Barnabe C, Shiff NJ, Bykerk V, et al. A population-based approach to reporting system-level performance measures for rheumatoid arthritis care. Arthritis Care Res (Hoboken) 2020;doi: 10.1002/acr.24178. [Epub ahead of print].
9. Alberta Government. Overview of administrative health datasets. 2017 [updated 2017; cited 2020 March 3]; Available from: https://open.alberta.ca/dataset/overview-of-administrative-health-datasets.
10. Public Health Agency of Canada. Candian Chronic Disease Surveillance System (CCDSS). 2018 [updated 2018; cited 2019 May 17]; Available from: https://infobase.phac-aspc.gc.ca/CCDSS-SCSMC/data-tool/.
11. O'Donnell S, McRae L, Toews J, Pelletier L, CDDSS Arthritis Working Group. National Surveillance of Arthritis in Canada, Results from the Canadian Chronic Disease Surveillance System (CCDSS). Proceedings of the Canadian Rheumatology Association Annual Scientific Meeting 2019.
12. Marshall D, Pham T, Faris P, Chen G, O''Donnell S, Barber C, et al. Determination of Rheumatoid Arthritis Incidence and Prevalence in Alberta using Administrative Health Data. ACR Open Rheumatol 2020;10.1111/ACR2.11158.
13. Widdifield J, Bombardier C, Bernatsky S, Paterson JM, Green D, Young J, et al. An administrative data validation study of the accuracy of algorithms for identifying rheumatoid arthritis: the influence of the reference standard on algorithm performance. BMC Musculoskelet Disord 2014;15:216.
14. Wait Time Alliance (WTA). Time to Close the Gap: Report Card on Wait Times in Canada (2014). 2014 [updated 2014; cited 2015 February 23]; Available from: http://www.waittimealliance.ca/wta-reports/2014-wta-report-card/.

15. Scott's Directories. Scott's Medical Database metadata. 2017 [updated 2017; cited 2019 Aug 23]; Available from: https://www.cihi.ca/en/scotts-medical-database-metadata.
16. Barber CE, Jewett L, Badley EM, Lacaille D, Cividino A, Ahluwalia V, et al. Stand Up and Be Counted: Measuring and Mapping the Rheumatology Workforce in Canada. J Rheumatol 2017;44:248-57.
17. Feldman DE, Bernatsky S, Haggerty J, Leffondre K, Tousignant P, Roy Y, et al. Delay in consultation with specialists for persons with suspected new-onset rheumatoid arthritis: a population-based study. Arthritis Rheum 2007;57:1419-25.
18. Widdifield J, Bernatsky S, Paterson JM, Thorne JC, Cividino A, Pope J, et al. Quality care in seniors with new-onset rheumatoid arthritis: a Canadian perspective. Arthritis Care Res (Hoboken) 2011;63:53-7.
19. Kelly A, Tymms K, Tunnicliffe DJ, Sumpton D, Perera C, Fallon K, et al. Patients' Attitudes and Experiences of Disease-Modifying Antirheumatic Drugs in Rheumatoid Arthritis and Spondyloarthritis: A Qualitative Synthesis. Arthritis care & research 2018;70:525-32.

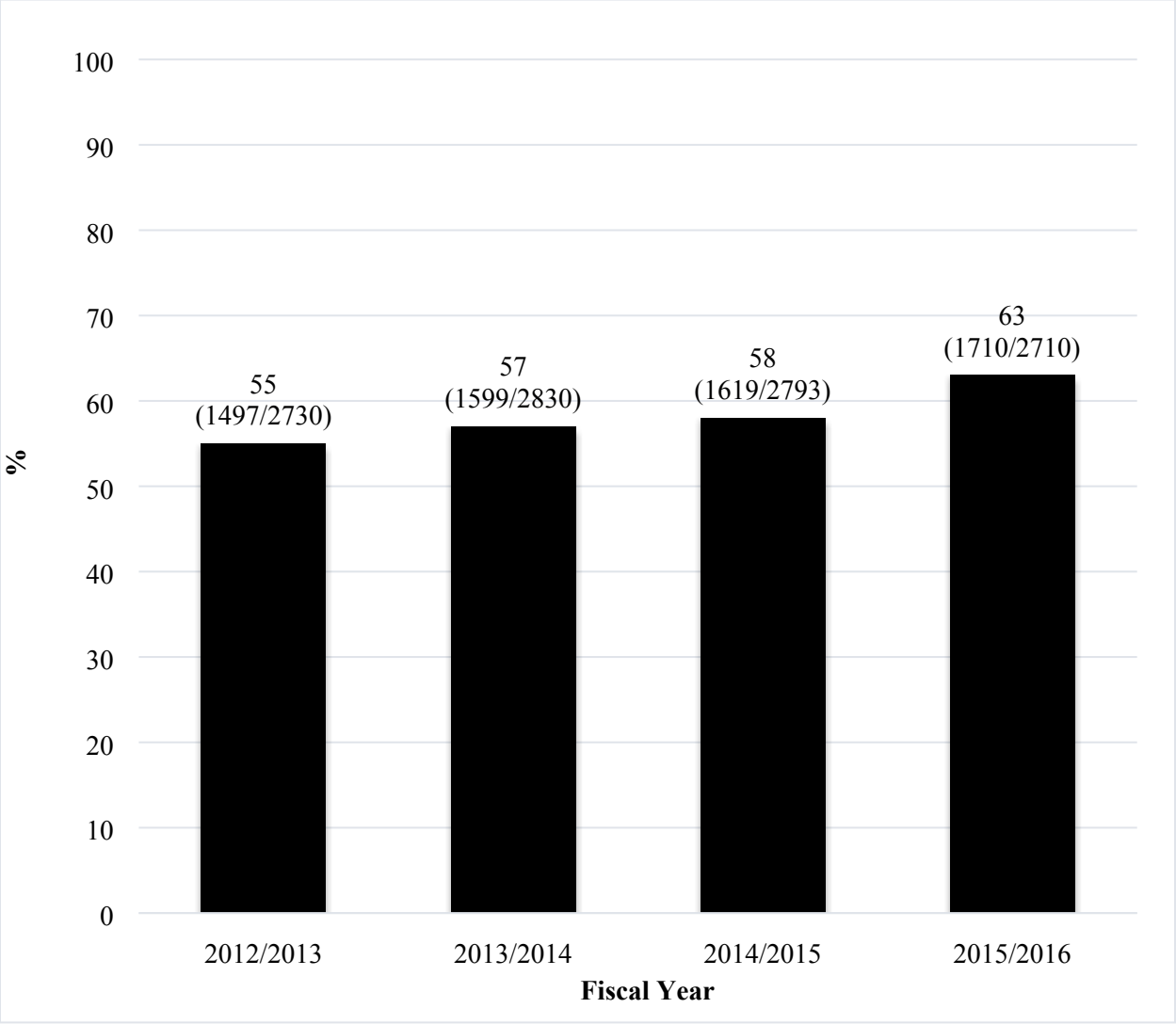

Figure 1: Percentage of incident RA cases referred to and seen by a rheumatologist within the first year of diagnosis[1]

[1]Diagnosis date is the date of first physician billing code or hospital discharge code for RA for those who meet the RA case definition.

Table 1. Treatment and Follow-up care of Prevalent RA cases in Alberta

	Fiscal Years			
	2012/13	2013/14	2014/15	2015/16
Prevalent RA cases dispensed a DMARD[1]	42% (13234/31566)	42% (13999/33248)	43% (14801/34733)	43% (15494/36048)
Prevalent RA cases seen in annual follow-up amongst those under rheumatology care[2]	73% (2029/2788)	78% (2704/3479)	77% (3352/4348)	80% (4055/5087)

Disease modifying anti-rheumatic drug (DMARD); Rheumatoid arthritis (RA)

[1]DMARDs include conventional DMARDs, immunosuppressants used for treatment of RA complications, biologics and small molecule inhibitors (complete list shown in Appendix).

[2]Under rheumatology care defined as 2 or more rheumatologist visits after diagnosis prior to each year of reporting.

Table 2. Time from first RA visit to DMARD dispensation, amongst incident RA cases receiving a DMARD during the measurement year, and percentage meeting 14-day benchmark

	Fiscal Years			
	2012/13	2013/14	2014/15	2015/16
No. treated with DMARDs [1] (N)	1093	1039	1082	1047
Median time between first RA visit and DMARD dispensation (days)	39	34	26	28
90th percentile time between first RA visit and DMARD dispensation (days)	467	423	296	288
% meeting 14 day Wait Time Alliance benchmark	38%	40%	42%	41%

Days (d); Disease modifying anti-rheumatic drug (DMARD); Rheumatoid arthritis (RA)

[1]This represents the number of incident RA cases treated with a DMARD during the measurement year by any provider type

[2]DMARDs include conventional DMARDs, immunosuppressants used for treatment of RA complications, biologics and small molecule inhibitors (complete list shown in Appendix).

Appendix Table 1. Measurement exclusions for Cancer, HIV or pregnancy[1]

Cancer diagnosis[2]	At least one hospitalization or physician visit with codes ICD-9-CM 140-208, or ICD-10-CA C00-26,30-41, 43-58, 60-69, 7A, 7B
HIV[2]	HIV was defined as 3 physician visits or hospital admissions within 3 years ICD-9-CM codes 042, 043, 044 or ICD-10-CM B20-24 (1).
Pregnancy[3]	Pregnancy was defined as at least one physician visit or hospital admission with a pregnancy or delivery code (ICD-9-CM 630-639, 640-648, 670-679, V22, V23, V24.0-V24.2, V27, V30-V39 or ICD-10-CA O00-O99, Z37). If there were multiple visits or hospitalizations with delivery codes within 45 days, the last date was used.

[1]Patients with a cancer diagnosis, HIV or pregnancy during the measurement year were excluded from the denominator for performance measures relating to disease modifying anti-rheumatic drug (DMARD) treatment as these diagnoses may preclude their use.
[2]Exclusions from the denominator due to malignancy or HIV were applied for all the measurement years.
[3]Patients with pregnancy were excluded for 365 days before and after the pregnancy/delivery date to account for potential DMARD discontinuation due to pregnancy planning or breastfeeding.

Appendix Table 2- Complete list of disease modifying anti-rheumatic drugs (DMARDs)

DMARDs and other immunosuppressive agents	Azathioprine Chloroquine Cyclophosphamide Cyclosporine Gold Hydroxychloroquine Leflunomide Methotrexate Minocycline Mycophenolate mofetil Sulfasalazine
Biologic agents	Abatacept Adalimumab Anakinra Certolizumab Etanercept Golimumab Infliximab Rituximab Tocilizumab
Oral small molecule inhibitor	Tofacitinib

1. Antoniou T, Zagorski B, Loutfy MR, Strike C, Glazier RH. Validation of case-finding algorithms derived from administrative data for identifying adults living with human immunodeficiency virus infection. PLoS One 2011;6:e21748.