Tour 1: COVID and Rheumatic Diseases

TOUR01

Association of Antiphospholipid Antibodies with Thromboembolic Events and Severe Outcomes in COVID-19

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Objectives: The prognostic significance of antiphospholipid antibodies (aPL) in COVID-19 remains unclear. Within a large prospective cohort of individuals with and without COVID-19, our objective was to determine if aPL are associated with thromboembolic events and other severe outcomes.

Methods: Symptomatic individuals undergoing SARS-CoV-2 nasopharyngeal PCR testing at a Quebec tertiary center were enrolled in a prospective biobank cohort between March-July 2020. PCR results, demographics, medical history, hospitalization details and clinical outcomes were collected using a standard form. Subjects were classified as COVID+ (≥1 positive PCR) or non-COVID (all PCR negative). Biobanked plasma (drawn day 0-7 after enrolment) was tested for anticardiolipin (aCL) IgM and IgG, anti-domain I of ß2-glycoprotein I (aD1ß2GP1) IgM and IgG, and anti-phosphatidylserine/prothrombin (aPS/PT) IgM and IgG (Inova Diagnostics, San Diego); and lupus anticoagulant (LAC; Precision BioLogic, Halifax) using manufacturers' cut-offs. Samples were also tested for SARS-CoV-2 IgM and IgG. We compared aPL prevalence (overall and subtypes) between COVID+ and non-COVID subjects. In hospitalized COVID+ patients, we performed multivariate logistic regressions evaluating aPL (and subtypes) and thromboembolic events (arterial and venous), as well as acute kidney injury (AKI), intensive care unit (ICU) stay, mechanical ventilation, and death, adjusting for age and sex.

Results: COVID+ (n=291) and non-COVID (n=365) subjects were similar in age and sex, but more COVID+ subjects were admitted to hospital (83% vs 61%) and had positive SARS-CoV-2 serology (70% vs 3%) compared to non-COVID subjects. At baseline, 43% of COVID+ subjects were aPL+ versus 32% of non-COVID subjects (difference in proportion 11%; 95% CI 3, 18). Among hospitalized patients with COVID+ (n=241), having any aPL+ was independently associated with AKI (OR 1.9; 95% CI 1.1, 3.3), ICU stay (OR 1.8; 95% CI 1.0, 3.5), and mechanical ventilation (OR 3.7; 95% CI 1.7, 7.8). Both aCL IgM and aCL IgG were independently associated with ICU stay and mechanical ventilation. We saw a strong trend for the association of aCL IgG with thrombotic events (OR 2.3; 95% CI 0.9, 6.0), though the CI included the null value.

Conclusion: In this large prospective sample, > 40% of individuals with COVID-19 had aPL early in their clinical course. In hospitalized COVID-19 patients, aPL were associated with increased risk of severe outcomes, with a strong trend for association between aCL IgG and thrombotic events. Our findings suggest that aPL, in particular aCL, might be useful markers for risk stratification in COVID-19.

TOUR02

Evaluating COVID-19 Vaccination in Patients with Systemic Lupus Erythematosus

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Objectives: To evaluate disease flare and post-vaccination reactions (reactogenicity) in patients with Systemic Lupus Erythematosus (SLE) following two-dose SARS-CoV-2 mRNA vaccination.

Methods: We conducted a prospective single-center observational study including patients with SLE who received an mRNA COVID-19 vaccination. Patients met the revised 1997 ACR classification criteria for SLE or had three criteria and a supportive biopsy (skin or kidney). Patients attending the Lupus Clinic are followed at regular intervals (every 2 to 6 months). At each follow up visit clinical, treatment and laboratory information are collected according to a standard protocol, and SLEDAI-2K is calculated and recorded at every visit. For every patient included in the study the SLE activity status, treatment and laboratory data are collected from the closest visit prior to the vaccine and at 2-4 weeks after each dose.

Results: 39 SLE patients who received two-doses of SARS-CoV-2-mRNA vaccination between march 2nd and august 6th 2021 were included. Median age was 40 (20-63) with 90% females (n=35), and 23% non-white (n=9). Median disease duration was 11 years (1-37). 5 patients did not attend their second protocol visit following the second dose. 5 patients (12%) had a disease flare requiring treatment. Most of the flares consisted of arthritis (4/5) (TABLE1). The fifth patient had biopsy proven skin vasculitis. Of the 4 male patients included in the study 2 patients had flares. Among patients who had flares, only one patient had an increase in the level of anti dsDNA antibodies (from 5 to 15 IU/ml) and another patient had a decrease in her previously normal C3 following vaccination (1.02 to 0.89 g/l), both patients had arthritis. 3 out of 5 patients were treated with small dose prednisone and the other two were treated either by increasing the dose of Mycophenolate Mofetil (MMF) or non-steroidal anti-inflammatory drugs. The most frequently reported reactions post vaccination were pain at the injection site (PIS) (n=18), headache (n=6) and arthralgia (n=6). Among patients reporting arthralgia, half of them were found to have clinical arthritis and required treatment. Most patients received Pfizer-BioNtech (n=35) and 4 patients had Moderna. No allergic reactions or SARS-CoV-2 diagnoses were reported.

Conclusion: This small study suggests that SLE patients tolerated the vaccinations well with flares occurring in 12.8%. Patients should be assessed post vaccination to ensure that flares are treated promptly.

TOUR03

"Safety and Immunogenicity of COVID-19 Vaccine in Immunosuppressed Adults with Autoimmune Diseases"

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Objectives: Immunocompromised conditions or a history of autoimmune disease' were exclusion criteria of the initial SARS-CoV-2 vaccines clinical trials. We assessed the safety and immunogenicity of the mRNA-1273 SARS-CoV-2 vaccine following a two-dose regimen in patients with rheumatic diseases.

Methods: We conducted a prospective, non-randomized, open label, comparative clinical trial (NCT04806113) at two academic centers in Canada. Trial participants were adults with either one of the following diagnoses (i) seropositive rheumatoid arthritis (RA) on stable treatment for ≥3 months (ii) systemic lupus erythematosus (SLE) on stable treatment with mycophenolate mofetil (MMF); (iii) other rheumatic disease receiving ≥ 10 mg of prednisone; or age/sex matched adults without rheumatic diseases (controls). The primary outcomes included solicited local and systemic reactogenicity adverse events (AEs) in the 7 days after each dose; and unsolicited AEs in the 28 days following each dose. As secondary outcome, we assessed the effects of age and treatment on seropositivity [presence of serum IgG antibody against SARS-CoV-2 spike protein (IgG-S) and its' receptor binding domain (IgG-RBD)], measured at baseline and 28±7 days after each dose of the vaccine in a custom automated ELISA platform.

Results: We enrolled 220 participants including 131 RA, 23 SLE, 8 other rheumatic disease, and 58 controls. The mean age (±SD) was 60.4±12.2 and 72% were female. Local and systemic solicited AEs were more frequently reported after the 2nd dose (versus the first dose) in all subjects (94 vs. 86.8%; Δ=7.2%, 95%CI: 2.8%-11.7%), with pain at the injection site being the most common. Swollen joints, following both vaccine doses, were more frequently reported by RA patients than controls (22.9 vs. 3.4%; Δ=19.5%, 95%CI: 10.9%-28%); however, there was no increase in disease activity scores post-vaccination. After the 1st dose, seropositivity for both IgG-S and IgG-RBD was 100% in controls, but only 67.7% in RA, 34.8% in SLE, and 87.5% in other rheumatic diseases. After the 2nd dose, seropositivity for both IgG-S and IgG-RBD remained 100% in controls and increased to 88.5% in RA and 78.3% in SLE and persisted at 87.5% in other rheumatic diseases. People on rituximab (9 vs. 88%, Δ= -78.8%, 95%CI: -98.1% to -59.5%) or MMF (39 vs. 58%, Δ= -19.3%, 95%CI: -36.4% to -2.2%) had lower humoral responses than patients not on those drugs post-2 vaccine doses.

Conclusion: In this prospective study, the mRNA-1273 SARS-CoV-2 vaccine was not associated with severe disease flares. MMF and rituximab were associated with a reduction in vaccine-induced humoral responses.

TOUR04

Nivolumab Associated Bone Pain and Hyperparathyroidism: A New Immune Related Adverse Event?

Azin Rouhi (University of Alberta, Edmonton); Carrie Ye (Division of Rheumatology, University of Alberta, Edmonton)

Introduction

Immune checkpoint inhibitors (ICI) have shown great promise in the treatment of multiple malignancies. The use of ICIs has been associated with toxicities that are referred to as immune related adverse events (irAEs). Various toxicities, such as endocrinologic, rheumatologic, and neurologic irAEs have been observed. We report a case of bone pain and hyperparathyroidism that developed shortly after treatment with nivolumab. To our knowledge, this is the first case of hyperparathyroidism developing after ICI initiation.

Case report

A 68 year-old male with malignant melanoma was assessed in the Rheumatology in Immuno-Oncology clinic at the Kaye Edmonton Clinic in June 2021 for widespread arthralgias and bone pain that started in January 2021. There was no history of morning stiffness and physical exam revealed no evidence of joint effusions, tenderness or decreased range of motion.

He was initially diagnosed with stage IIIc malignant melanoma in June 2020, for which he underwent tumor resection and was started on nivolumab in September 2020. He was noted to have persistent hypercalcemia, as high as 2.73 (normal range 2.1-2.6 mmol/L) dating back to October 2020. Calcium levels were last normal in September 2020. Serum albumin and creatinine remained within normal range. He was not on any medications that could contribute to hypercalcemia. On further investigation he was found to have paradoxically elevated parathyroid hormone (PTH) level of 7.1 pmol/L (normal range 1.4-6.8 pmol/L). Total Vitamin D level was 74 nmol/L (normal range 80-200), 24-hour urine calcium was normal at 3.8 mmol/day, with a calcium/creatinine clearance ratio of 0.01. PTH-related peptide was undetectable. Nuclear medicine scan and contrast enhanced CT were negative for parathyroid adenoma. The patient completed one year of ICI treatment with nivolumab in August 2021. Most recent calcium level in September 2021 was 2.66 mmol/L, although his bone pain was starting to improve.

Conclusion

We report a case of bone and joint pain likely secondary to hyperparathyroidism following treatment with nivolumab. Hyperparathyroidism has never been reported as an irAE in the literature. There have been rare cases of hyperparathyroidism associated with autoantibodies against the calcium-sensing receptors (CaSR) with resulting hypercalcemia and often hypocalciuria. These patients frequently have other autoimmune endocrinopathies, such as Type 1 diabetes or Hashimoto's thyroiditis. In our patient, however, there was no evidence of hypocalciuria or other autoimmune endocrinopathies. Rheumatologists should be aware of potential immune-related endocrinopathies in patients on ICI that can present with non-inflammatory bone and joint pain.

Tour 2: Rheumatoid Arthritis

TOUR05

Beliefs and Concerns about RA Medications May Predict Influenza Vaccine Hesitancy: Results from the Canadian Early Arthritis Cohort (CATCH)

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Objectives: As adults with RA are at a higher risk for infections, including influenza and related complications, an annual influenza vaccination is recommended by CRA and others. Despite this, we recently showed that influenza vaccination coverage remains suboptimal in Canadian adults both in the year prior to (37%) and after (42%) a new diagnosis of RA. Here, we explore whether RA medication beliefs and concerns also may play a role in predicting influenza vaccine hesitancy.

Methods: We used data from RA patients enrolled in the Canadian Early Arthritis Cohort (CATCH) between September 2017 and February 2021 who had reported their vaccination status in the previous year and completed the Beliefs about Medicines questionnaire at enrolment. The BAMQ asks about beliefs related to the necessity of taking RA medications, as well as concerns. Clinical data was obtained from medical records. Multivariable logistic regression was used to examine the independent effects of Necessity beliefs, medication Concerns, and the Necessity-Concerns difference scores between vaccinated and non-vaccinated groups while controlling for sociodemographic and RA characteristics.

Results: At enrollment, participants (N=405) were mostly white (80%) women (67%) with a mean (SD) age of 56 years and symptom duration of 5 months. Among 233 patients with vaccination info available post-dx, 68% of those vaccinated post-dx reported having been vaccinated in the year prior to RA diagnosis. Post-diagnosis, participants vaccinated prior to diagnosis (OR 27.57; 95% CI 8.91-85.33), on advanced therapies (OR 6.57; 95% CI 1.70-25.39), and with a higher Necessity-Concerns Differential (OR 1.11; 95% CI 1.02-1.21) had a greater odds, while women (OR 0.24; 95% CI 0.08-0.67), minorities (OR 0.07; 95% CI 0.01-0.40), and smokers (OR 0.09; 95% CI 0.02, 0.45) had a lower odds of influenza vaccination. Participants who were not vaccinated before developing RA but vaccinated in the year after diagnosis had lower mean Concerns and higher mean Necessity-Concerns differential scores compared to those vaccinated at both timepoints, only pre-diagnosis, or neither timepoint (Figure).

Conclusion: In Canadians with early RA, certain individual (male sex, non-white race, smoking, medication beliefs/concerns) and treatment characteristics (advanced therapeutics, prior vaccination) were associated with a greater likelihood of vaccination. Vaccine hesitancy was associated with a higher level of RA medications concerns and low necessity beliefs. Conversations about medication beliefs, concerns and vaccination history as part of the diagnostic workup may help increase influenza vaccine coverage.

TOUR06

The relationship between disease activity measures and work productivity and activity impairment in patients with Rheumatoid Arthritis in the Rheum4U Precision Health Registry patient cohort

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Objectives: To understand the association of work productivity and activity impairment and disease activity in patients with RA in the Rheum4U Precision Health Registry (PHR) at baseline. Affecting approximately 1% of Canadians, rheumatoid arthritis (RA) can lead to irreversible joint damage, functional disability, decreased work productivity, and loss of work. The Work Productivity and Activity Impairment (WPAI) questionnaire is a validated tool for assessing impairment in work productivity and daily activities and an indicator of health status in RA patients. Patient-reported outcomes and disease activity measures have been found to correlate with work productivity and activity impairment using WPAI questionnaire. Precision Health Registry (PHR) is a longitudinal study that uses a web-based platform, Rheum4U, to enrol patients with suspected or confirmed inflammatory arthritis and collects prospective data at two adult rheumatology clinics in Calgary, Alberta. By understanding the relationship between WPAI and disease activity measures in our PHR cohort, we will be better informed in supporting our goal of improving quality of care for our patients.

Methods: Participants complete WPAI at their baseline visit and every 6 months thereafter. Disease activity measures, CDAI and DAS28CRP, are automatically calculated incorporating patient reported outcomes, laboratory markers and physician captured data. Statistical significance was assessed using nonparametric tests.

Results: The PHR cohort consists of 965 participants. Of these, 681 (71%) had an RA diagnosis with 73% females and mean age of 54.69 years (SD 13.65). DAS28CRP and CDAI were available for 85% and 94% of RA participants, respectively. Baseline WPAI was completed by 648 (95%) RA participants, with 348 (54%) reporting employment. The non-employed group was found to have a higher median activity impairment (29% vs 15%, $p<0.001$) than the employed group. Looking specifically at the employed group, the median activity impairment was reportedly larger than the median work impairment (15% vs 10%, $p<0.001$). Both the activity and work impairment were found to positively correlate with disease categories, measured either using CDAI or DAS28CRP [Kendall's τ =0.32, 0.37, 0.38, 0.47, $p<0.001$]. For the employed group, absenteeism was 6% and presenteeism was 22%, on average. Similar to work impairment, presenteeism was found to increase with higher disease categories.

Conclusion: Disease activity measures positively correlated with work productivity and activity impairment. Additionally, presenteeism was more severe than absenteeism and activity impairment was greater than work impairment, for those employed. This suggests that patients are going to work but their disease activity impacts their work productivity and home life.

TOUR07

Physician and Patient Reported Effectiveness Outcomes are similar in Tofacitinib and TNF Inhibitors in Rheumatoid Arthritis Patients: Data from a Rheumatoid Arthritis Registry in Canada

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Objectives: Tofacitinib (TOFA) is an oral, small molecule drug used for rheumatoid arthritis (RA) treatment as an alternative option to biologic disease modifying antirheumatic drugs (bDMARDs) including tumor necrosis factor inhibitors (TNFi). We aimed to evaluate physician and patient reported efectivness outcomes in TNFi compared to TOFA, using real-world data from the Ontario Best Practices Research Initiative (OBRI).

Methods: RA patients enrolled in the OBRI initiating their TOFA or TNFi (Adalimumab, Certolizumab, Etanercept, Golimumab, Infliximab, and Biosimilars) between 1st June 2014 (TOFA approval date in Canada) and 31st Dec 2019 were included. Patients were required to have physician and patient reported effectiveness outcomes data available at treatment initiation and 6-month (± 2 months) follow-up. These included clinical disease activity index (CDAI), rheumatoid arthritis disease activity index (RADAI), HAQ-DI, sleep problem, and anxiety/depression scores. Multiple imputation (Imputation Chained Equation, N=20) was used to deal with missing data for covariates at treatment initiation. To deal with confounding by indication, we estimated propensity scores for covariates with an absolute standard difference greater than 0.1 between the two treatment groups.

Results: A total of 419 patients were included. Of those, 226 were initiating a TNFi and 193 TOFA, and had a mean (SD) disease duration of 8.0 (8.7) and 12.6 (9.6) years, respectively. In the TNFi group, 81.9% were female and mean age (SD) at treatment initiation was 56.6 (13.4) years. In the TOFA group, 85% were female and mean (SD) age at treatment initiation was 60.3 (11.2) years. The TNFi group was less likely to have prior biologic use (21.7%) compared to the TOFA group (67.9%). At treatment initiation, physical function measured by HAQ-DI was significantly lower in TNFi compared to the TOFA group (1.2 vs.1.4). The rate of CDAI LDA/remission at 6 months was 33.6% and 26.4% in TNFi and TOFA group, respectively. The generalized linear mixed models (GLMM) adjusting for propensity score quantile, showed that there was no significant difference in CDAI LDA/remission (ORs: 0.85, 95% CI: 0.51, 1.43), RADAI (β-coefficient: 0.48, 95% CI: -0.18, 1.14), HAQ-DI (β-coefficient: -0.01, 95% CI: -0.18, 0.16), sleep problems (β-coefficient: -0.25, 95% CI: -0.95, 0.45), and anxiety/depression scores (β-coefficient: 0.12, 95% CI: -0.35, 0.58) between the two treatment groups (TOFA used as reference).

Conclusion: In this real-world data study, we found that, physician and patient reported effectiveness outcomes are similar in the TNFi and TOFA groups 6 months after treatment initiation in patients with RA.

TOUR08

Discontinuation rate of Tofacitinib is similar when compared to TNF inhibitors in Rheumatoid Arthritis Patients: Pooled Data from two Rheumatoid Arthritis Registries in Canada

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Objectives: Tofacitinib (TOFA) is an oral, small molecule drug used for rheumatoid arthritis (RA) treatment as the first or an alternative option to biologic disease- modifying antirheumatic drugs (bDMARDs), including tumor necrosis factor inhibitors (TNFi). The similarity in retention of TNFi and TOFA was previously reported separately by the Ontario Best Practices Research Initiative (OBRI) and the Quebec cohort RHUMADATA. To increase the study power, we propose to evaluate the discontinuation rate (due to any reason) of TNFi compared to TOFA, using pooled data from both these registries.

Methods: RA patients enrolled in the OBRI and RHUMADATA initiating their TOFA or TNFi between 1st June 2014 (TOFA approval date in Canada) and 31st Dec 2019 were included. Time to discontinuation was assessed using adjusted Kaplan-Meier (KM) survival and Cox regression models. To deal with confounding by indication, we estimated propensity scores for covariates with a standard difference greater than 0.1. Models were then adjusted using stratification and inverse probability of treatment weight (IPTW) methods.

Results: A total of 1318 patients initiated TNFi (n=825) or TOFA (n=493) with mean (SD) disease duration of 8.9 (9.3) and 13.0 (10.1) years, respectively. In the TNFi group, 78.8% were female and mean age (SD) at treatment initiation was 57.6 (12.6) years. In the TOFA group, 84.6% were female and mean (SD) age at treatment initiation was 59.5 (11.5) years. The TNFi group was less likely to have prior biologic use (33.9%) than the TOFA group (66.9%). At treatment initiation, the mean (SD) CDAI was significantly ($p<0.05$) lower in the TNFi group [20.0 (11.7)] compared to the TOFA group [22.1(12.4)]. Physical function measured by HAQ-DI was also significantly lower ($p<0.05$) in the TNFi compared to the TOFA group (1.2 vs.1.3). Over a mean follow-up of 23.2 months, discontinuation was reported in 309 (37.5%) and 182 (36.9%) of all TNFi and TOFA patients, respectively. After adjusting for propensity score deciles across 20 imputed datasets, there was no significant difference in discontinuation between treatment groups (adjusted HRs: 0.96, 95% CI: 0.78-1.18; $p=0.69$). The results were similar for two propensity adjustment methods.

Conclusion: In this pooled real -world data study, we found that TNFi and TOFA retention is similar in patients with RA. In the next step we will analysis the data for specific reasons of dicontinutaion. We will also repeat analysis comparing discontinuation in the first users versus those after one or more biologic failure.

Tour 3: Psoriatic Arthritis/ Rheumatoid Arthritis

TOUR09

Prediction of Psoriatic Arthritis in Patients with Psoriasis Using DNA Methylation Profiles

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Objectives: Psoriatic arthritis (PsA) is an immune-mediated inflammatory arthritis, associated with psoriasis, that significantly increases morbidity and may increase mortality risk. However, we currently lack the means of predicting which psoriasis patients will develop PsA, and a large number of patients remain undiagnosed. Regulation of gene expression through DNA methylation can be altered by stochastic events or environmental factors and can potentially trigger and maintain PsA pathophysiological processes. With this research, we identified DNA methylation changes that can predict which psoriasis patients will develop PsA at an early stage of the disease.
Methods: In a nested case-control study design, we obtained blood samples from 60 psoriasis patients that developed arthritis (converters) and 60 psoriasis patients that did not (biologic naive, matched for age, sex, psoriasis duration and duration of follow up). Genome-wide DNA methylation was assessed using Infinium Methylation EPIC BeadChips (Illumina, San Diego, CA, USA). Array data preprocessing, normalization and correction for technical sources of variation were performed in the R programming environment as recommended in the ChAMP package pipeline. Methylation differences between converters and non-converters were identified by a multi-variate linear regression model including clinical covariates (age, sex, BMI, smoking) and conversion status using the Limma package. Predictive performance of methylation markers was assessed by developing machine learning classification models. Support vector machine models were trained using 75% of samples, keeping the other 25% as testing set for evaluating the prediction of conversion or non-conversion. Models were built using methylation data with and without the addition of clinical variables.
Results: We identified a set of 36 highly relevant methylation markers (with FDR-adjusted p-values lower than 0.05 and a minimum change in methylation of 0.05) found across 15 genes and several intergenic regions. Enrichment analysis of the 15 genes with highly relevant methylation markers showed no significantly enriched functional pathways. A classification model using only these 36 markers correctly identified 28 out of 30 samples as converters or non-converters, achieving an accuracy of 93%. The addition of clinical information to DNA methylation data did not increase the performance of the classification models.
Conclusion: We identified a set of 36 highly significant methylation markers associated with the development of PsA in psoriasis patients. This work shows that DNA methylation patterns at an early stage of psoriatic disease can distinguish between psoriasis patients that will develop PsA from those that will not.

TOUR10

Responsiveness of the CDAI When Scored with Patient-Reported vs. Clinician Assessed Joint Counts: Results from the Canadian Early Arthritis Cohort (CATCH) Study

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Ontario, London); Susan Bartlett (McGill University, Montreal); CATCH Canadian Early Arthritis Cohort (CATCH) Investigators (Toronto)
Objectives: While the CDAI is frequently used in routine care settings to guide target-based treatment decisions, traditional in-person clinician assessed joint counts needed to calculate the CDAI are not available to help guide treatment decisions during remote telehealth visits. The objective of the present study was to compare responsiveness in CDAI scores when derived using patient-reported vs clinician assessed joint counts that can be collected in the context of virtual care consultations.
Methods: Data were from 937 early RA patients enrolled in CATCH between Nov 2011 and July 2020. Patient reported and clinician assessed TJC28/SJC28 were simultaneously collected using a homunculus at 2 consecutive visits at 3- and 6- months follow up, along with MD- and patient- global assessments (NRSs 0-10). CDAI and PtCDAI calculated with patient-reported joint counts were scored at each visit (0-76). Descriptive statistics were used to compare sensitivity to change in CDAI when scored with patient-reported vs clinician assessed joint counts across different levels of disease control over time defined as: 1) Improved from active to controlled (HDA/MDA to LDA/REM); 2) Worsened from controlled to active (REM/LDA to MDA/HDA); 3) Remained active (HDA/MDA), and 4) Remained controlled (REM/LDA).
Results: At baseline, the sample of 937 pts had a mean (SD) age of 56 (15), symptoms of 5.5 (2.9) mths, 70% were female, 81% were white, all were treated with csDMARDs (73% methotrexate) and CDAI scores were consistent with high disease activity (CDAI 25.0 (14.1), PtCDAI 27.5 (15.9)). CDAI scored with patient-reported and clinician-assessed joint counts both changed in the same direction and by a large magnitude when disease activity levels changed over time (Improved to Controlled and Worsened to Active), though the mean change in traditional CDAI was slightly larger than the PtCDAI when patients improved to controlled disease (Table). There was little change in either CDAI score when disease activity levels were unchanged (remained active or remained controlled) (Table).
Conclusion: Results from this large sample observational study suggest that both versions of the CDAI scored with clinician-assessed and patient-reported joint counts were sensitive to change over time and provide further evidence that a PtCDAI may provide useful information about changes in patient disease control that can help inform treatment decision-making in virtual care.

TOUR11
miRNA Biomarkers for Methotrexate Response in Psoriatic Arthritis Patients
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Objectives: Psoriatic arthritis (PsA) is an immune-mediated inflammatory arthritis that develops in up to 30% of psoriasis patients. PsA, greatly increases morbidity and may increase mortality risk. Early diagnosis and prompt management of inflammation are essential for preventing joint damage and disability. Methotrexate (MTX) is often the first line treatment in PsA patients. However, many patients are unresponsive to therapy. Micro RNAs (miRNAs) regulate gene expression and have been associated with the pathogenesis of immune-mediated disorders. We aimed to identify miRNAs associated with articular and cutaneous response to MTX in PsA

patients.
Methods: We obtained serum samples from 70 biologic-naive PsA patients (CASPAR criteria) before initiation and 6 months after MTX treatment. Articular response to MTX was defined as achieving a treatment target of low disease activity ($4 \leq DAPSA < 14$) or remission ($DAPSA < 4$) and cutaneous response to MTX was defined as a reduction of 50% in Psoriasis Area Severity Index (PASI). miRNA expression was assessed through next-generation sequencing. Total RNA was isolated from serum samples before and after MTX treatment. miRNA sequencing libraries were prepared and sequenced on an Illumina HiSeq2500 following the 75 base-pair single read protocol, at a depth of 12-13 million reads/sample which allows detection of low expressed transcripts. After quality control, reads were aligned to known human miRNA sequences (miRbase version 22). Differential expression was assessed by linear modelling with empirical Bayes moderation as implemented in the Limma R package. Models were corrected for sequencing batch, age, sex, ethnicity, BMI, MTX treatment duration, smoking, and use of NSAIDs.
Results: Articular response to MTX treatment was observed in 20 patients and cutaneous response was observed in 24 patients. Pretreatment expression levels of miR-127-3p were significantly lower in patients showing an articular response to MTX ($p < 0.01$). Amongst the genes targeted by miR-127-3p is MAPK4, a member of the mitogen-activated protein kinase family implicated in the pathogenesis of psoriasis and PsA. We also identified a set of 8 miRNAs (miR-155-5p, miR-140-3p, miR-432-5p, miR-382-5p, miR-660-5p, miR-532-5p, miR-139-3p and miR-379-5p) associated with cutaneous response to MTX ($p < 0.05$).
Conclusion: We identified miR-127-3p and a set of 8 miRNAs as potential biomarkers for articular and cutaneous response, respectively, to MTX treatment in PsA patients.

TOUR12
Sex-related Disparities in Healthcare Access and Utilization in adult patients with Rheumatoid Arthritis, Ankylosing Spondylitis and Psoriatic Arthritis in Ontario
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Objectives: Our aim was to describe sex-related disparities in healthcare access and utilization in patients with rheumatoid arthritis (RA), ankylosing spondylitis (AS) and psoriatic arthritis (PsA) in Ontario.
Methods: We assembled 3 inception cohorts of adult RA, AS and PsA patients diagnosed between April 2010 and March 2017 using Ontario health administrative data. Healthcare utilization was assessed per year for 3 years before and 3 years after the date of diagnosis on a rheumatology billing claim (index date) and compared between male and female patients in each cohort. We evaluated healthcare access in terms of visits to physicians (primary care, rheumatologist, other musculoskeletal (MSK) specialist and dermatologist), diagnostic laboratory tests and musculoskeletal imaging. Among individuals ≥ 66 years, prescription

dispensations for rheumatic drugs (NSAIDs, corticosteroids, conventional DMARDs (cDMARDs) and biologic DMARDs (bDMARDs)) and pain control medications (opioids) were ascertained. Standardized difference greater than 0.10 was considered clinically meaningful.
Results: A total of 41,277 patients with RA (69% females), 8,150 patients with AS (51% females) and 6,446 patients with PsA (54% female) were analyzed. While male patients were significantly older than female patients with RA (M 60.4 y, F 57.1 y), mean age at the time of diagnosis of PsA and AS was similar in males and females. Multimorbidity (Aggregated Diagnosis Group ≥10), especially depression and osteoporosis, was more common in female patients whereas cardiovascular diseases were significantly more frequent in males across the 3 cohorts. Healthcare utilization before index date was higher in females in all cohorts but most notable 2 to 3 years prior to index date in PsA and AS. A significantly higher percentage of female patients had at least 1 visit to primary care physicians (Figure 1A), to rheumatologists (Figure 1B), at least 1 MSK-imaging (Figure 1C) and at least 1 diagnostic blood test (Figure 1D) before diagnosis. Following diagnosis, healthcare utilization between male and female patients were comparable. Overall DMARD prescriptions in older male and female patients were similar except more female patients with AS being prescribed cDMARDs. Female patients were also more likely to use opioids in the third year after diagnosis.
Conclusion: MSK-related healthcare utilization was more common in females compared to males prior to the diagnosis of AS and PsA which may suggest prolonged prodromal phase of the disease in females. Interestingly, sex-disparities in RA were not as prominent. More frequent use of opioid medications in older female patients suggest suboptimal control of pain in these patients.

Tour 4: Pediatric

TOUR13
Structural Neural Underpinnings of Low Mood and Anxiety in Childhood Onset Systemic Lupus Erythematosus
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Objectives: Emotional dysfunction in childhood-onset systemic lupus erythematosus (cSLE) impacts clinical outcomes and quality of life, but the relationship to lupus brain inflammation is poorly understood. We aimed to investigate the structural neural metrics and disease activity measures that predict anxiety and depression in cSLE and non-cSLE children.

Methods: A cross-sectional sample of patients with cSLE (meeting ACR and/or SLICC classification criteria for SLE) and healthy controls, aged 10-17 years completed self-reported measures of depression (Beck Depression Inventory-II/ Children's Depression Inventory-2) and anxiety (Screen for Child Anxiety Related Disorders). Elevated depression/anxiety symptoms were determined by established clinical cut-offs. T1-weighted sequences were acquired on a 3T Siemens MRI. MRI scans were spatially normalized using the MNI-152 template, and grey and white matter were segmented to estimate brain volume, surface area and cortical thickness in Freesurfer. Measures of disease duration, activity (SLE Disease Activity Index (SLEDAI) 2000), glucocorticoid use and inflammation were collected. Partial least squares (PLS) analyses were used to investigate the association between structural brain metrics and disease measures with depression/anxiety symptom severity.
Results: Twenty-seven patients with cSLE (mean age=15.4±1.7 years) and median SLEDAI=2.0 (IQR 2-4) and 14 healthy controls were recruited. There were no group differences in age, sex or ethnicity. Mean cumulative glucocorticoid use in this sample was 5.6±6.2g prednisone-equivalent. Eleven cSLE patients had a history of lupus nephritis and one had a history of neuropsychiatric lupus. We did not find group differences in prevalence of clinically elevated depression (cSLE= 12/27, controls=6/14) or anxiety (cSLE= 11/27, controls=7/14). Within group analysis showed that for both cSLE patients and controls, worse mood and anxiety were both predicted by reduced right anterior cingulate thickness. Within the cSLE group, worse mood and anxiety were predicted by higher cumulative steroid use, reduced right fusiform gyrus cortical thickness, and increased left amygdala and right parahippocampal volume and thickness.
Conclusion: This cross-sectional sample of cSLE patients had mild disease activity at the time of the study, and a high but similar prevalence of emotion problems compared to controls. Worse emotional functioning was associated with altered structural changes in regions known to underlie emotion processing in both groups. Emotion difficulties in the cSLE group were related to cumulative glucocorticoid use, but not disease activity or inflammatory markers. Further research is needed to examine the role of glucocorticoid exposure in the setting of psychological stress related to having a chronic illness during the adolescent neurodevelopmental period.

TOUR14

Acceptability and Usability of the JIA Option Map, a Web-Based Patient Decision Aid for Pain Management in Juvenile Idiopathic Arthritis

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City, Kansas City); Jennifer E. Weiss (Hackensack University Medical Center, Hackensack); Sabrina Gmuca (Children's Hospital of Philadelphia, Philadelphia); Simon Décary (Université de Sherbrooke, Sherbrooke); Peter Tugwell (University of Ottawa, Ottawa); Jennifer Stinson (The Hospital for Sick Kids, Toronto)
Objectives: Young people with juvenile idiopathic arthritis (JIA) often experience pain that adversely impacts their quality of life. However, pain is often under-recognized by their health care providers (HCPs), and decision-making for pain management is not optimal. Our team, comprised of patient partners, HCPs and researchers, has developed the JIA Option Map, a web-based patient decision aid that provides personalized evidence-based information on pain management. We aimed to evaluate the acceptability and usability of the JIA Option Map from the perspectives of young people with JIA and parents/caregivers.
Methods: We conducted iterative acceptability and usability testing using face-to-face or virtual semi-structured interviews with a total of five adolescents 13-18 years old with JIA, six young adults 19-30 years old with JIA, as well as five parents of youths and adolescents with JIA. We recruited participants from rheumatology clinics and through social media. Participants navigated the web application using the think-aloud method while sharing their screen, and answered questions about ease of use, content, format, potential use and perceived helpfulness. We audiotaped or videotaped the interviews, and transcribed and analyzed verbatim using simple descriptive content analysis.
Results: All participants felt that the app was easy to navigate and the format was user-friendly. Participants appreciated the following step-by-step layout: (1) assessment of pain and current management; (2) preferences/values clarification exercise; (3) list of pain management options with their evidence to review; (4) plan of the chosen options and readiness to follow the plan; and (5) summary to share with HCPs. All participants felt the content was appropriate and easy to understand, with the suggestion to simplify the information on methodological quality of studies. They mentioned they would use this app frequently, especially shortly after diagnosis or as they transition into adult care. Participants felt the app would help them learn about options, help them engage in decision-making and prepare to have a fruitful discussion with HCPs. Participants liked the wide range of options, the evidence-based summaries presenting their probabilities of benefits, and the links to online resources. They also appreciated the newly added user dashboard which shows pain and disease severity over time, and felt it should be the last step of the app.
Conclusion: The JIA Option Map has good acceptability and usability, showing its potential to improve decision-making for pain management options among young people with JIA. The next step will test the effectiveness of the app over time.

TOUR15

Proton pump inhibitors suppress IL-1 mediated carditis in a murine model of Kawasaki disease

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Objectives: Kawasaki disease (KD), is the leading cause of acquired heart disease in childhood, with a portion of children developing coronary artery lesions (CAL) despite standard of care

treatment, intravenous immunoglobulin (IVIg). Murine and patient data indicate Interleukin-1 (IL-1) contributes to CALs. Calcium mobilization plays a role in inflammasome activation and is key to the immunobiology of KD. Proton pump inhibitors (PPI), a class of medications used to limit gastric acid secretion, have also been shown to have anti-inflammatory properties. This study aims to determine if PPIs inhibit IL-1 production and resulting CALs in the Lactobacillus casei cell wall extract (LCWE) induced coronary arteritis murine model of KD.
Methods: Human monocyte cell line (THP1) derived macrophages and bone marrow derived macrophages (BMDMs) were stimulated with a TLR1/2 agonist Pam3Cys-Ser-(Lys)4 (Pam3Cys) and LCWE, in the presence or absence of PPIs. To exclude toxic effects, viability was tested via flow cytometry and trypan blue exclusion. Calcium flux was measured via fluorescent imaging plate reader on THP-1 macrophages. In vivo, KD was induced by intraperitoneal LCWE injection. Mice were injected with LCWE alone, LCWE+PPI, saline or PPI alone. Coronary artery inflammation was blindly scored by a pathologist.
Results: Following stimulation with either Pam3Cys or LCWE, PPIs inhibited BMDM IL-1 production in a dose-dependent manner. Inflammasome activation is prevented by PPI inhibition of signal two. Stimulated macrophages treated with a PPI, in vitro, had less calcium flux than untreated stimulated macrophages. In vivo, compared to untreated KD diseased mice, those treated with PPI were shown to have significantly reduced coronary artery inflammation based on overall cardiac severity score ($p<0.01$), area of inflammation ($p<0.05$) and elastin breakdown ($p<0.01$)
Conclusion: Our data indicate that PPIs have anti-inflammatory properties: decreasing macrophage IL-1 production in vitro and in vivo, preventing IL-1 induced coronary artery inflammation. The data suggest two novel findings. Firstly, PPIs may inhibit inflammasome activation by preventing intracellular calcium accumulation. Secondly, PPIs have the potential to be a novel inexpensive, oral, and safe adjuvant anti-IL-1 medication to treat KD.

TOUR16
Latent Classes of Early Responses to Biologics Initiation in Juvenile Idiopathic Arthritis: An Analysis of Four Trials
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Objectives: Juvenile idiopathic arthritis (JIA) is the commonest childhood-onset chronic rheumatic disease. Patients with polyarticular disease are more likely to require biologic treatment. However, despite biologic treatment, about 20% will require switching because of ineffectiveness. If we can identify JIA patients who are unlikely to respond early after starting biologics, we can switch them to another agent. This will reduce the burden of chronically active disease symptoms and the risk of chronic joint damage. As polyarticular JIA is a heterogeneous disease, we hypothesize that patients may follow different response trajectories after starting biologics. Objectives: 1) To delineate latent classes of early treatment response to biologics in JIA patients in the first 16 weeks after initiation. 2) To identify predictors of early disease response.
Methods: The study population was drawn from four JIA biologics trials: Etanercept 2000, Abatacept 2008, TRial of Early Aggressive Therapy (TREAT) 2012 and Tocilizumab 2014. Participants have polyarticular course JIA. The primary outcome was active joint counts (AJC) measured in the first 16 weeks after starting biologics. Semiparametric latent class trajectory

analysis with spline modelling was applied to identify latent classes of response to treatment; AJC was transformed for this modelling. We tested baseline disease and treatment characteristics for their abilities to predict class membership of response.
Results: There were 480 participants, 74% females. At baseline, 26% were rheumatoid factor positive. 67% were on methotrexate. Baseline AJC was the sole best predictor of class membership. The three classes were: high baseline AJC (median >30) and slow response (26.5%), low baseline AJC (<10), early and sustained response (29.7%) and moderate baseline AJC progressive response (43.8%); see Figure. Patients were classified into the three classes with a mean class membership posterior probability 0f 0.97. Those on methotrexate were less likely to belong to high baseline AJC class. Those in moderate and high baseline AJC classes were more likely to be on prednisone than those in low baseline AJC class.
Conclusion: Three latent classes of responses were detectable. Those with the highest baseline AJC demonstrated very slow response in this time window; they should be considered for early switch if they do not respond adequately by 16 weeks. Those in the highest AJC group were less likely to be on concomitant methotrexate. Though methotrexate may not be sufficient to control disease activity, they could be helpful in reducing disease activity, allowing patients to follow more timely and earlier response trajectories.

Tour 5: SLE

TOUR17
Trajectories of Depressive Symptoms in Systemic Lupus Erythematosus Over Time
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Objectives: Depression is one of the common psychiatric disorders in SLE with an estimated prevalence between 29.9% and 40.3%, which is twice the prevalence among the general population. The longitudinal trajectories of this heterogeneous mood disorder in SLE, however, remain uncharacterized. We aimed to: 1) determine the trajectories of depressive symptoms in patients with SLE and 2) identify baseline characteristics associated with trajectories.
Methods: Longitudinal data from the Lupus Outcomes Study at the University of California San Francisco, in which adults with SLE were followed over 7 years, were analyzed. Depressive symptomatology was assessed in years 2-7 using the Center for Epidemiologic Studies Depression Scale (CES-D) and the threshold for depression in SLE was scores ≥ 24. Group-based trajectory modeling was used to determine latent classes for CES-D scores over the six waves of observation. Using members with posterior probability > 0.8, univariable and multivariable ordinal logistic regression analyses were also performed to identify baseline characteristics associated with membership in worse classes of depressive symptoms.
Results: 763 patients with two or more waves of CES-D data were included in the analysis. Four trajectories were found to fit the data best (Figure 1). Class 1 (36%) and class 2 (32%) comprised the greatest proportion of the cohort and had average CES-D scores below the threshold for depression over the waves. The mean CES-D score for class 3 (22%) remained near or at the cut-off for depression over time. Class 4 (10%) consisted of the highest scores over the years. There

was no significant movement of patients between class trajectories. From the regression models, lower income (odds ratio [OR]: 1.73, 95% confidence interval [CI]: 1.03-2.92), SF-36 bodily pain score (OR: 1.58, 95% CI: 1.55-1.61), and SF-36 physical functioning score (OR: 1.12, 95% CI: 1.12-1.13) were positively associated with higher CES-D scores. Greater age (OR: 0.97, 95% CI: 0.96-0.99) and higher education level (OR: 0.79, 95% CI: 0.70-0.89) at baseline were negatively associated with higher CES-D scores.
Conclusion: Four trajectories of depression were found in adults with SLE in this novel trajectory analysis. Higher education level and greater age at baseline were determined to be protective factors, while lower income and SF-36 bodily pain and physical functioning scores were risk factors for worse class membership. These mapped trajectories and associated baseline factors provide a tool to improve the screening, treatment, and management of this common psychiatric comorbidity faced by individuals with SLE.

TOUR18

Association of subjective cognitive report using PDQ-20 to a neuropsychological battery in a cohort of SLE patients

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Objectives: Systemic Lupus Erythematosus (SLE) can lead to a number of neuropsychiatric manifestations including cognitive impairment (CI). Comprehensive neuropsychological battery (NB) of tests is considered the gold standard when diagnosing CI. We aim to compare a subjective questionnaire, the perceived deficits questionnaire (PDQ-20) to the NB and also to other patient reported outcomes.
Methods: This is a cross-sectional study of SLE patients, aged 18-65 years, who attended a single center (Jul 2016 – Mar 2019). Each patient completed a comprehensive NB evaluating six cognitive domains. They also completed the 20 item PDQ-20 questionnaire (subjective cognitive function) along with other patient reported outcome questionnaires such as the Beck anxiety score, Beck depression score, fatigue severity score (FSS), Short Form Health Survey (SF-36) domains. The variable of main interest was the total score of 19 tests in NB, along with patients' demographics, lupus disease activity, organ damage, treatment and other PROs. Mean ± std.,

median (interquartile range) and count (%) were calculated for these variables. Univariate and multivariable linear regressions were performed to evaluate the associated factors with total PDQ-20 scores. Least Absolute Shrinkage and Selection Operator (LASSO) method was used in the variable selection in multivariable model building process. Linear model assumptions were tested by residual density plots and quantile-quantile plots.
Results: Data on 238 patients was analysed; 89.9% were females with an average age and SLE duration at baseline visit of 41.1 ± 12.1 and 14.3 ± 10.0 years, respectively. In the univariate analysis, PDQ-20 was associated with the NB, SDI, FSS, BECK anxiety and depression score and all SF-36 domains. In the multivariate analysis, PDQ-20 was significantly associated with female gender, SDI, fatigue, BECK depression and anxiety scores, SF-36 Role Emotional domain and glucocorticoid dosage. PDQ-20 was not associated with the NB. There was also no association with age at first visit, SLE disease duration, ethnicity, education level, SLEDAI score, anti-malarial or immunosuppressive treatment with the PDQ-20 score.
Conclusion: Subjective cognitive report by PDQ-20 was associated with the NB in univariate analysis but not multivariate analysis. While PDQ-20 was associated with all SF-36 domains in the univariate analysis, this association was significant only with Role Emotional in the multivariate analysis. There was a clear association of PDQ-20 with other subjective patient reported outcomes.

TOUR19
Incident and Prevalent Patients with SLE Have Similarly High Symptom Burden, Pain and Fatigue Despite Differences in Disease Activity: Data from the Canadian Network for Improved Outcomes in Systemic Lupus Erythematosus (CaNIOS) National Registry
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Objectives: The CaNIOS national registry is a multicenter longitudinal cohort that collects standardized information on SLE patients, including both prevalent and incident patients. We aimed to describe demographics, disease-related measures, and patient-reported outcomes (PROs) in patients on enrollment in the cohort and compare incident and prevalent patients
Methods: Baseline visit data was extracted, including demographics, clinical manifestations, treatment, disease activity, damage measures, and PROs including the SLE Activity Questionnaire (SLAQ), the SF-36, global activity, pain and fatigue VAS, categorical questions about flares, disease activity and improvement. Descriptive statistics, including the mean and SD for continuous variables and frequency distributions for categorical variables, were produced. Incident cases were defined as disease onset within 15 months of enrolment. Between-group comparisons were conducted with the independent-samples t-test for continuous variables and the chi-square test for categorical variables. Statistical significance was set at 0.05.

Results: There were 681 patients enrolled in the registry from seven Canadian sites as of January 2020; 166 patients (24.4%) were incident cases; with mean age at enrolment 48.1±14.9 years, average disease duration 12.1±11.5 years, 80.6% of patients residing in urban areas, 71.0% white, and 89% female. Mean disease duration for incident patients was 5 months. SLEDAI and Physician Global VAS were higher in incident compared to prevalent patients (5.14±4.85 versus 3.41±3.54; $p<0.001$) and (0.65±0.71 versus 0.30±0.42; $p<0.001$) respectively. Patient Global VAS (in the preceding three months) was higher in incident patients (4.64±3.00 vs. 3.93±2.81, $p=0.026$); incident patients were more likely to report any lupus activity (90% vs. 84%, $p=0.028$), and flares (74% vs 64%, $p<0.001$), but there were no differences in the fatigue and pain VAS scores. Mean SF-36 PCS and MCS scores on initial presentation were 39.5±11.8 and 45.3±11.8, respectively, and mean SLAQ symptom scores were 10.1±5.4 and global scores were 12.3± 8.1; these did not differ between incident and prevalent patients. However, incident patients were more likely to report improvement in their lupus over the preceding month (52% vs. 22%; $p<0.001$).
Conclusion: Incident patients had higher physician and self-reported disease activity compared to prevalent patients; however, symptoms, pain, fatigue and SF-36 scores did not differ from prevalent patients. This suggests that symptom burden is high and quality of life is low from disease onset and does not improve with either time or reduced disease activity. Future work will aim to analyze the evolution of PROs in SLE patients over time and the relationship between PROs and other disease measures.

TOUR20

SLE Phenotypes Formed from Machine Learning and Their Associations with Cognitive Impairment

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Objectives: Cognitive impairment (CI) in SLE is a significant problem with limited treatment options due to uncertainty around the multifaceted cause. Factors associated with CI include depression, pain, fatigue, medications, as well as more specific SLE factors such as disease damage, autoantibodies and inflammation. We aimed to phenotype CI in SLE using machine learning techniques.

Methods: SLE patients aged 18-65 years completed the ACR Neuropsychological Battery (ACR-NB) cognitive assessment. Age and gender matched normative data were used to obtain z-scores on all 19 tests of ACR-NB. The ACR-NB tests were reduced using principal component analysis (PCA) to generate a factor score (CI Factor Score). Demographic, and clinical data, and patient reported outcomes including, SF-36, LupusQoL, the PDQ-20 (perceived cognitive deficits), Beck Depression Inventory-II, Beck Anxiety Inventory, and the fatigue severity scale (FSS) were analysed using similarity network fusion (SNF) to identify patient subtypes. Differences between the SNF identified subtypes were evaluated using Kruskal-Wallis tests and chi-square tests.
Results: Of the 301 patients, 89% were women, mean age 40.9 ± 12.1 and disease duration 14 ± 10.1 years at study visit. The CI Factor Score accounted for 28.8% of the variance. The SNF analysis defined three subtypes with distinct patterns in health-related quality of life (HRQoL), depression, anxiety, fatigue, fibromyalgia, medication usage, and disease damage (Figure 1). The CI Factor Score was significantly different between the subtypes ($p=0.008$). Subtype 3 performed worst on the majority of the different cognitive domains. Further exploration revealed statistical differences with depression, anxiety, fatigue, and fibromyalgia between the subtypes (all $p<0.00002$). Differences were also found relating to organ involvement within the last ten years and damage within specific organs (musculoskeletal $p=0.0002$ and cardiovascular $p=0.001$). No differences were found for SLE disease activity ($p=0.24$). Subtype 3 had higher levels of all conditions and disease damage, Subtype 2 had lower levels and Subtype 1 mixed levels.
Conclusion: The subtype with the greatest psychiatric and disease burden and reduced HRQoL performed worse on cognitive testing and had more musculoskeletal and cardiovascular involvement. Musculoskeletal involvement affects pain levels, which can impact cognition. Cardiovascular damage may be linked to cerebral small vessel disease, which is known to affect cognitive function in SLE patients. Overall, these results aid with phenotyping CI in SLE and provide a baseline for our future longitudinal results. This will then help to determine personalised CI trajectory and treatment options in SLE.

Tour 6: PsA/SPA/RA

TOUR21

Analysis of Referrals by Primary Care Physicians to Rheumatology: A First Step in the Development of a Rheumatologist-led Curriculum for Community Providers

Alan Zhou (University of Ottawa, Department of Medicine, Ottawa); Antonio Cabral (University of Ottawa, Department of Medicine, Division of Rheumatology, Ottawa); Julie D'Aoust (University of Ottawa, Department of Medicine, Division of Rheumatology, Ottawa)
Objectives: Unacceptable delays in the recognition and treatment of rheumatic diseases exist in Ontario. Educational interventions aimed at Primary Care Providers (PCPs) may reduce delays by improving PCP confidence in the identification of rheumatic disorders and ensuring appropriate referral of those who would benefit from specialty care. This study sought to characterize local PCP referral patterns and knowledge gaps as a first step in the development of a rheumatologist-led curriculum for community providers in the Ottawa region.
Methods: Patients who were first assessed between September 1 and October 31, 2019 at The Ottawa Hospital's Arthritis Centre were identified. Pre-pandemic dates were chosen to avoid confounders related to virtual visits and potential changes in referral patterns. Referrals from

non-PCPs and for transfer of care were excluded. First and second visits were reviewed to identify reason for referral, suspected diagnosis by PCP (if any), rheumatologist-established diagnosis, procedures performed, and consults requested by the treating rheumatologist. Two rheumatologists (JD, AC) independently analyzed and compared the reasons for referral and the consulting rheumatologists' final diagnoses, to identify possible PCP knowledge gaps. Full review by the Ottawa Health Science Network Research Ethics Board was waived as this study was deemed a quality improvement initiative.
Results: 106 new consults were reviewed. Among the 106 new consults, 85 (80.2%) were given a diagnosis by the second visit. The most common rheumatologist-established diagnoses were rheumatoid arthritis (17/85, 20%), osteoarthritis (15/85, 17.6%), and seronegative spondyloarthritis (13/85, 15.3%). Forty-four (42%) of referring PCPs provided no suspected diagnosis or a diagnosis that differed substantially from the rheumatologist's final diagnosis. Fourteen new consults (13.2%) resulted in procedures (13 aspirations/injections, 1 skin biopsy) and 17 (16%) resulted in referrals to other specialties. The most common identified knowledge gaps included 'differentiating inflammatory arthritis from non-inflammatory pathology' (27/106, 25%), 'management of an established rheumatic disease' (22/106, 21%), and 'approach to peripheral joint pain' (15/106, 14%). Sixty-three patients (59.4%) required ongoing follow-up in rheumatology while 43 (41%) did not.
Conclusion: The results of this study provide insight into regional PCP referral patterns to an academic rheumatology clinic, as well as possible PCP knowledge gaps in the identification and care of patients with rheumatic diseases that will inform the creation and implementation of a rheumatologist-led, local webinar series.

TOUR22
Virtual Assessment in Axial Spondyloarthritis: Validation of Video Observed Spinal Metrology
Laura Passalent (Toronto Western Hospital, Krembil Research Institute, University of Toronto, Toronto); Robert Inman (Toronto Western Hospital, Toronto); Nigil Haroon (Division of Rheumatology, Toronto Western Hospital, University Health Network; University of Toronto, Toronto, Toronto)
Objectives: A shift to virtual clinical encounters was required as a result of the COVID-19 pandemic. A core aspect in the evaluation of axial spondyloarthritis (axSpA) is the spinal physical exam, which includes the assessment of mobility and potential structural damage. To date, there have been very few studies exploring the utility of virtual examination of the spine for patients with axSpA with varying reports of validity and reliability. The purpose of this study was to evaluate the validity of observed spinal mobility measures over live video in the assessment of patients with axSpA.
Methods: Adult patients diagnosed with axSpA based on ASAS criteria, attending an urban academic Spondylitis Program and registered in the program's longitudinal research cohort were scheduled for a virtual video follow-up visit. Patients conducted spinal mobility maneuvers based on standardized verbal direction by the attending clinician. Spinal measures were visually estimated by the clinician observer and included tragus to wall distance, cervical spinal rotation, lumbar lateral flexion and intermalleolar distance. The modified Schober's maneuver to assess degree of lumbar flexion was estimated based on observed finger to floor distance. Spinal measures were compared to patients' last in-person visit within a 24-month period. Concurrent validity of the virtual spinal measures were estimated based on correlation (Pearson's correlation

coefficient) to previous in-person Bath Ankylosing Spondylitis Metrology Index (BASMI) scores (10-step analysis) and its individual components. Construct validity was assessed against the previous Bath Ankylosing Spondylitis Functional Index (BASFI), reflecting constructs of mobility and function.
Results: A total of 31 patients underwent virtual examination of spinal mobility. Approximately half were male (51.9%) with a mean age of 41.2 years (± 15.1); mean disease duration 11 years (±9.4); mean Bath Ankylosing Spondylitis Disease Activity Index was 2.4 (±1.7), indicating low disease activity; 55.2% were receiving biologic treatment and 48.3% were receiving non-steroidal anti-inflammatories. Clinician observers included rheumatology fellows, rheumatology residents and an advance practice physiotherapist. Average time between the last in-person measure and virtual measure was 21.5 months (±6.5). Virtual BASMI scores were highly correlated with previous in-person BASMI scores (r=0.75). Virtual component BASMI scores ranged from r=0.62 (lumbar lateral flexion) to r=0.84 (cervical rotation) when compared to in-person measures. Virtual BASMI scores were moderately correlated with the BASFI (r=0.61).
Conclusion: The results of this study suggest spinal mobility measures conducted over live video by an experienced clinician in rheumatology assessment are a valid substitution for in-person measurement.

TOUR23
Persistent Disease Activity Impairs Work Productivity and Non-work Activity Outcomes in Recent Onset Rheumatoid Arthritis.
Carol Hitchon (University of Manitoba, Winnipeg); Marie-France Valois (McGill University, Montreal); Orit Schieir (McGill University, Montreal); Susan Bartlett (McGill University, Montreal); Louis Bessette (Laval University, Quebec City); Gilles Boire (Université de Sherbrooke, Sherbrooke); Glen Hazlewood (University of Calgary, Calgary); Edward Keystone (University of Toronto, Toronto); Diane Tin (Southlake Regional Health Centre, Newmarket); Carter Thorne (The Arthritis Program Research Group, Newmarket); Janet Pope (University of Western Ontario, London); Vivian Bykerk (Hospital for Special Surgery, New York); CATCH Canadian Early Arthritis Cohort (CATCH) Investigators (Toronto)
Objectives: Reduced work and activity productivity are significant contributors to personal and societal costs associated with rheumatoid arthritis (RA). We sought to describe work productivity in newly diagnosed RA patients and to identify predictors of impaired productivity over time.
Methods: Data were from working age, early RA patients (18-64 years; < 1 year of symptoms at baseline) treated with DMARDs according to Treat-2-Target guidelines. Between Nov 2011 and March 2020, participants reported baseline work status (employed, unemployed, retired). Annual work productivity was assessed using the Work Productivity and Activity Index (WPAI). WPAI scores for overall work productivity loss with subscores for absenteeism (time away from work) and presenteeism (reduced productivity at work) and scores for reduced general activity are expressed as impairment percentages (%) with higher numbers indicating greater impairment and less productivity. We used generalized estimating equations (GEE) to estimate associations between change in WPAI scores over the first five years of follow-up with time-varying lagged disease activity (DAS28 at previous visit predicting WPAI at the next visit), while adjusting for baseline age, sex, work commitment (full time; part-time) and comorbidity [Rheumatic Disease Comorbidity Index (RDCI; range 0-9); depression], and time-varying lagged therapy use (Methotrexate (MTX), biologic DMARDs/ JAKi, prednisone) at the previous visit.

Results: At baseline, of 673 working age RA patients, 434 (65%) were employed [352(82%) full time], 159(24%) were unemployed and 74(11%) were retired. Employed RA patients were mainly female (75%), Caucasian (81%), had education beyond high school (68%) and had active RA with mean(SD) baseline DAS28 4.7(1.4). At baseline, employed RA patients reported on average 39.8% (29.8) overall work impairment of 39.8% (29.8) [absenteeism 8.4% (18.6); presenteesim 37.0% (28.0)] and non-work activity impairment of 43.5% (28.5). Work productivity scores improved after 1 year follow-up but remained stable thereafter (Figure). In lagged multivariable GEE models, higher DAS28 was associated with more work impairment over time; mean change (95% confidence interval (CI) in overall work impairment 7.1% (6.2, 7.9), absenteeism 1.9% (1.4, 2.5), presenteeism 6.6% (5.8, 7.4) and activity impairment 7.8% (7.1, 8.6). Baseline comorbidity was associated with overall work impairment over time [RDCI mean change 1.9 % (0.1, 3.6); depression mean change 8.0 % (0.4, 15.7].
Conclusion: Patients with early RA report 40% reduced work productivity, mainly from reduced effectiveness while at work. Persistent disease activity contributes to productivity impairment. Interventions to optimize continued engagement in work and addressing RA activity may improve productivity for RA patients and their employers

TOUR24

Clinical and Economic Burden of Herpes Zoster in Patients with Rheumatoid Arthritis: A Retrospective Cohort Study Using Administrative Claims

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Objectives: The incidence of herpes zoster (HZ) is higher in patients with rheumatoid arthritis (RA) than in the general adult population. With the increased incidence of HZ in patients with RA, it is important to understand the clinical and economic burden associated with HZ in this population.
Methods: This was a retrospective cohort study using an administrative claims database with commercial and Medicare Advantage with Part D data from October 2015 - February 2020. Patients with HZ+RA were identified using ICD-10 diagnosis codes in medical claims. The first HZ diagnosis was the index date. A confirmed RA diagnosis was required as defined by ≥2 RA diagnoses on medical claims ≥6 weeks apart and ≥3 months of continuous DMARD treatment. A comparator cohort was identified based on the same criteria for RA but was required not to have HZ. Index date in this cohort was based on the distribution of timing of the HZ+RA cohort index dates. All patients were required to have at least 12 months of continuous medical and pharmacy benefit enrollment before and after index. Outcomes included healthcare resource use (HCRU) and costs after index. Generalized linear models were used to estimate differences in outcomes between cohorts, adjusting for propensity scores and key baseline variables.
Results: The study included 1,866 and 38,846 patients in the RA+HZ and RA-only cohorts, respectively. Mean ± standard deviation (SD) age in the RA+HZ cohort was 68 ± 12 vs 66 ± 13 in the RA-only cohort. Higher proportions of patients in the RA+HZ cohort used JAK inhibitors or systemic steroids at index compared to the RA-only cohort. Baseline mean ± SD total costs were $52,625 ± 67,774 and $46,332 ± 65,480 in the RA+HZ and RA-only cohorts, respectively.

During the 12-month follow-up, hospitalizations and emergency department (ED) visits occurred more often in the RA+HZ cohort than in the RA-only cohort with an adjusted incidence rate ratio (95% confidence interval [CI]) of 1.16 (1.04, 1.30) for hospitalizations and 1.34 (1.21, 1.47) for ED visits. Medical costs were higher in the RA+HZ cohort during the 12-month follow-up compared to the RA-only cohort, with an adjusted cost difference (95% CI) of $3,428 (446, 6,781) (Tab. 1).
Conclusion: Patients with RA+HZ had higher HCRU and medical costs than patients with RA-only in the year following an HZ diagnosis after adjusting for baseline difference between cohorts. These findings provide evidence of the added burden of HZ in patients with RA.

Tour 7: RA/JIA/APHA

TOUR25
Development of a New 'Resource of Resources' to Support Physical Activity in People Living with Chronic Conditions
Marie Westby (Vancouver Coastal Health Research Institute, Vancouver); Alison Hoens (University of British Columbia/Arthritis Research Canada, Vancouver)
Objectives: Although the evidence endorsing physical activity (PA) for people living with chronic conditions including arthritis is substantive, both patients and health care providers (HCPs) struggle with the quantity and quality of resources available to support PA. The objectives of this project were to: (1) identify, evaluate and recommend resources for patients and HCPs that support PA in people living with chronic conditions (including arthritis) and (2) augment the HealthLink BC website to incorporate the recommended resources.
Methods: Over 100 patients, clinicians and researchers contributed to a rigorous process including surveys and appraisal of existing resources to recommend the 'best of the best resources' supporting PA in chronic conditions. Surveys included baseline needs assessments of both patients and HCPs as well as preferred websites and formats. After training and practice sessions, evaluators assessed each patient resource using the Patient Education Materials Assessment Tool (PEMAT) and each HCP resource using a 'purpose-built' assessment tool incorporating key features of the PEMAT, AGREE II Instrument and the 2009 National Health and Medical Research Council (NHMRC) Evidence and Grades Tool. Two people independently evaluated each resource and, when discrepancy in scores was greater than 20%, a third person served as the tie breaker. An independent research expert reviewed the top scoring resources for alignment with current evidence.
Results: The baseline survey of 487 patients (85% female; 78% 50+ years of age) representing all regions of BC, revealed that most lived with 3 or more chronic diseases (65% with arthritis) and 65% reported they were less physically active than prior to their chronic condition. Seventy-five percent desired access to a 'toolkit' that outlined what and how much PA they should undertake. Less than 45% of the 443 HCP survey respondents (85% female; 46% physiotherapists; 60% community settings) reported using published guidelines to inform the PA support they provide to patients. The majority of the 381 people (48% HCPs; 43% patients) who completed the survey on preferred formats/locations, favored websites linked to professional associations or disease specific organizations (60% and 44% respectively). In partnership with the BC Ministry of Health the resources were loaded onto a custom-built extension of the HealthLink BC website, launched in the fall of 2021, and evaluated at 3 months.

Conclusion: An integrated knowledge translation initiative was undertaken to develop an online toolkit of resources to help persons with chronic condition(s) to be more physically active.

TOUR26

Neuro-QOL Upper Extremity Function Scale: Better Ways to Measure Perceived Function and Self Care in RA in the Era of Virtual Medicine

Susan Bartlett (McGill University, Montreal); Orit Schieir (McGill University, Montreal); Marie-France Valois (McGill University, Montreal); Janet Pope (University of Western Ontario, London); Gilles Boire (Université de Sherbrooke, Sherbrooke); Edward Keystone (University of Toronto, Toronto); Diane Tin (Southlake Regional Health Centre, Newmarket); Carter Thorne (The Arthritis Program Research Group, Newmarket); Carol Hitchon (University of Manitoba, Winnipeg); Louis Bessette (Laval University, Quebec City); Glen Hazlewood (University of Calgary, Calgary); Vivian Bykerk (Hospital for Special Surgery, New York); CATCH Canadian Early Arthritis Cohort (CATCH) Investigators (Toronto)

Objectives: Brief self-assessment tools that can reliably and precisely quantify hand/wrist function are needed to assess inflammatory activity when a physical exam is not feasible and to capture day-to-day experiences of living with RA. Neuro-QoL, part of the PROMIS family of measures, was created using a patient-centred approach and IRT methodology. The Neuro-Qol Upper Extremity Function (UEF) scale measures ability across fine motor tasks and ADLs that rely on hand function. Our goal was to compare the performance of the 8-item Neuro-QoL UEF in adults with RA with legacy physical function measures. We hypothesized scores would be: 1) strongly (r >0.70) correlated with MHAQ, MD-HAQ, and PROMIS PF; 2) moderately (r=0.4 to 0.7) correlated with symptoms, disease activity, and QoL; and 3) responsive to change.

Methods: Data were from the 0 and 6-month visits of adults enrolled in CATCH. Participants completed the Neuro-QoL UEF, MHAQ, MDHAQ, PROMIS-29, and PT Global at each visit. Rheumatologists recorded joint counts and MD Global. To evaluate content validity, we examined descriptive statistics across CDAI disease activity levels, and Pearson correlations between the Neuro-QOL UEF, legacy measures, CRP & ESR. Responsiveness was assessed by correlating change scores between Neuro-QoL, disease activity and legacy PF scores.

Results: The 262 participants were mostly white (83%) women (71%) with a mean (SD) age of 55 (13). Neuro-QOL UEF was moderately-strongly correlated with MHAQ, MDHAQ, PROMIS-PF (|r|=0.63-0.75); moderately correlated with pain and stiffness, (|r|=.59, -.64); and CDAI, SDAI, PT&MD Global, TJ & SJ (|r|=0.39-0.58). Neuro-QOL was moderately correlated with PROMIS QoL domains Pain, Fatigue, Anxiety, Depression, Sleep & Participation (|r|=0.39-0.60). Neuro-QOL scores decreased in a dose-response manner across worsening CDAI states. Persons with HDA reported the highest disability, scoring nearly 0.5 SD lower on the Neuro-QoL than PROMIS. Change from 0-6 months in Neuro-QoL UEF was moderately correlated with changes in PROMIS, MHAQ, PT Global, and CDAI (|r|=0.44-0.65). The mean change and range in Neuro-QoL was significantly larger than in PROMIS (8.9 [95% CI 7.5, 10.4] vs. 5.4 [95% CI 4.4, 6.4])(Figure).

Conclusion: During the COVID-19 pandemic when virtual/telemedicine visits are common, clinicians, researchers, and patients can benefit from practical self-report tools that reliably and precisely quantify aspects of physical function most impacted by RA inflammation. Our results offer initial evidence of robust psychometric properties and support use of the 8-item Neuro-QoL UEF scale to self-assess inflammatory activity in the hands and day-to-day experiences of living with RA.

TOUR27

Experiences Using Wearable Technology by Persons with Rheumatoid Arthritis Participating in a Physical Activity Counselling Intervention Study: A Relational Ethics Analysis

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Objectives: Using physical activity wearables is a promising approach to support arthritis self-management. Questions remain, however, about benefits and downsides that may be experienced by persons with arthritis in relationships with themselves (i.e., self-perception) and others when using a wearable. Relational ethics is a suitable conceptual lens to explore positives or negatives encountered in these relationships. Our aim was to use this ethics lens to better understand how persons with rheumatoid arthritis (RA) experience their use of a wearable as part of a physical activity counselling intervention study involving a physiotherapist (PT).

Methods: Constructivist grounded theory and a relational ethics lens guided data collection and analysis. A sample of persons with RA took part in an initial and follow-up interview following participation in an 8-week randomized controlled trial. Participants used a Fitbit-Flex-2 paired with a new web-based application to self-monitor physical activity and received 4 biweekly calls from a study PT. We took a systematic approach of coding transcripts and forming concepts and key categories underpinned by concepts of relational ethics.

Results: Initial interviews took place with 14 participants (12 female; 2 male) aged 29-71 years. Of these, 11 took part in a follow-up interview. Key categories describe positive and negative influences of using a wearable with the PT on how participants constructed a valued moral identity: 1) Participants expressed how being active intertwined with moral values placed on self-control within cultural norms in which they lived. For some, using a wearable helped to “do something right” by reaching step goals or sitting less. Some, however, felt ambivalent (feeling both justified and at fault) when they could not reach a physical activity goal; 2) Participants described how their distrust of wearable data raised moral tensions in their relationship with the PT, which had implications for how mutual trustworthiness was negotiated; 3) Participants conveyed being active as a means of preserving or regaining respect for themselves as an independent and productive person. Some described how interpreting wearable data with the PT helped them to affirm this valued sense of self.

Conclusion: The study contributes empirical evidence to sparse literature on how persons with arthritis experience their use of a physical activity wearable positively or negatively. It brings to light salient ethical issues pertaining to autonomy, mutual trust, and respect. It is a key step to informing how to incorporate wearable-enabled programs that support physical activity participation in ways that are ethically aware.

TOUR28

Development and Preliminary Acceptability of JIActiv, a Social Media-Based Program Promoting Engagement in Physical Activity among Young People Living with Juvenile Idiopathic Arthritis

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Objectives: Young people with juvenile idiopathic arthritis (JIA) are at greater risk for adopting chronic sedentary behaviours and not meeting national physical activity (PA) guidelines compared to healthy peers, which can have an important impact on their health, daily function, and quality of life. To our knowledge few appealing, educational and interactive options exist to promote PA among young people living with JIA. We aimed to develop and evaluate the preliminary acceptability (i.e., how well the program is received by users, and how it meets their needs) of the JIActiv program, a 12-week educational and interactive social media-based program promoting PA from the perspectives of young people with JIA and parents, and to refine program format and content.

Methods: The JIActiv prototype was developed based on our earlier work which included three systematic reviews, as well as a needs assessment with key stakeholders. The JIActiv program aims to promote PA in young people with JIA through the delivery of evidence-based information and use of behavior-change strategies. A descriptive qualitative study design was used to assess the acceptability of the JIActiv prototype. Two adolescents 13 to 17 years of age, 13 young adults 18 to 26 years with JIA, and 2 parents were recruited from arthritis patient groups and a Canadian rehabilitation center. The individual virtual interviews were audiotaped, transcribed verbatim, coded, and categorised into emerging themes using simple content analysis. Findings reported on the format, content, and potential usefulness of the program.

Results: Most participants preferred Instagram as the platform for the program and appreciated the presented functionalities. All participants felt that the proposed length of the program and the number of activities per week were appropriate. The informational videos, individual educational and interactive group activities were thought to be pertinent and helpful to motivate young people to engage in physical activity. Participants found that the esthetics of the program could be improved by choosing one color scheme for all postings. Most participants thought that having a mentor and access to a HCP would be very helpful to help answer their questions and offer social support. The group format (size and age range of participants) was well accepted by participants.

Conclusion: The JIActiv program has good preliminary acceptability and is potentially useful for promoting engagement in PA among young people with JIA. Participants proposed ideas on how the program could be improved. Additional interview cycles will help to further refine the program. Supported by a CIORA grant

Tour 8: Vasculitis

TOUR29

Ocular Manifestations of ANCA-Associated Vasculitis

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Objectives: ANCA-associated vasculitides (AAV) are multisystem diseases that can have multiple ophthalmic manifestations. Although there are some data on ocular disease in granulomatosis with polyangiitis (GPA), even less are available for microscopic polyangiitis (MPA) and eosinophilic granulomatosis with polyangiitis (EGPA). Further, there also few reports differentiating symptoms seen at disease onset versus later in the disease or the ocular complications of AAV.

Methods: Patients with GPA, MPA, or EGPA enrolled in a longitudinal study between April 2006 and April 2021 were included in this study. Data concerning diagnosis, demographics, cranial disease manifestations and their time of onset, treatment, and ocular complications were extracted. Prevalence of ophthalmic manifestations at disease onset and incidence of manifestations over the course of follow up, median time to onset of new manifestations and complications of disease were calculated.

Results: Data from 1389 patients were included for analysis which included 6392.8 patient-years of follow up. There were 852 cases of GPA, 165 cases of MPA, and 372 cases of EGPA; with 258 (30.3%), 7 (4.2%), and 13 (3.5%) ocular manifestations present at baseline, respectively (Table 1). The most common manifestations seen were conjunctivitis/episcleritis and scleritis; multiple ophthalmic manifestations were seen in 79 (9.3%) of patients with GPA, 3 (1.8%) patients with MPA, and none with EGPA. During follow up, 56 (6.6%) patients with GPA had incident ocular manifestations (of which 53.6% were new manifestations), while such events were rare in MPA (n=1) and EGPA (n=2). Frequent manifestations seen during follow up were conjunctivitis/episcleritis and dacrocystitis and/or lacrimal duct obstruction. The most common complication seen across all 3 diseases was cataracts, seen in 9.1-15.3% of patients. Non-cataract complications followed a similar pattern to other manifestations: 67 (7.9%) patients with GPA experienced such complications (of whom 31 experienced vision threatening complications) followed by 10 (2.7%) of those with EGPA, and 7 (4.2%) of those with MPA. Optic Neuritis (n=8) and orbital wall destruction (n=12) were only seen in those with GPA; 8 individuals with GPA experienced blindness as well as one with MPA.

Conclusion: Among patients with AAV, ophthalmic manifestations and complications are common in GPA, but rare in MPA and EGPA. Inflammatory eye conditions are the most

common ophthalmic manifestation seen, and cataracts are the most common complication. New ophthalmic manifestations after disease onset are rare. These data are informative for clinicians caring for patients with AAV and investigators studying this spectrum of vasculitis.

TOUR30

Frequency and patterns of lipid and glucose measurements patients with giant cell arteritis

Kaylin Bechard (University of Alberta , Edmonton); Uday Chauhan (University of Alberta Faculty of Medicine & Dentistry, Edmonton); Shabnam Hamidi (University of Alberta , Edmonton); Stephanie Keeling (University of Alberta, Division of Rheumatology, Edmonton); Alison Clifford (University of Alberta, Edmonton)

Objectives: Giant cell arteritis (GCA), a large vessel vasculitis treated with high dose prednisone, is associated with an increased risk of cardiovascular (CV) death. In rheumatoid arthritis (RA), another inflammatory disease with increased CV risk, approximately 70% of patients undergo the recommended lipid and glucose screening as per Canadian guidelines. We aimed to determine whether GCA patients are screened more or less frequently for dyslipidemia and hyperglycemia as compared to RA patients.

Methods: A retrospective chart review was performed to identify GCA patients seen at the University of Alberta between 2012-2019. GCA patients were age- and sex-matched to RA patients from the same institution. For inclusion, patients were required to have at least 3 years clinical follow up available, and no prior history of dyslipidemia or hyperglycemia. Fasting glucose, hemoglobin A1C, and lipid levels obtained following the diagnosis of GCA or RA were recorded. Blood tests were analyzed to assess the frequency of insulin resistance and presence of inflammatory lipid profiles. Frequency of adherence to the 2016 Canadian Cardiovascular Society (CCS) lipid and 2018 Canadian Diabetes Association (CDA) glucose recommendations were compared between GCA and RA patients. Data was analyzed using Chi-square and student t-tests as applicable. P-values < 0.05 were considered statically significant.

Results: Of 50 GCA patients meeting ACR 1990 criteria, 20 were excluded due to pre-existing hyperglycemia or dyslipidemia. 30 GCA patients were compared to 30 age- and sex-matched RA patients. See Table 1 for baseline patient demographics. During follow up, 8 GCA patients (27%) developed incident diabetes, compared to 1 (3%) RA patient ($p=0.011$.) Adherence to CDA screening guidelines was 63% in GCA and 70% in RA ($p=0.50$.) With respect to lipids, GCA patients had significantly lower triglycerides (1.4 vs 1.3, $p<0.0001$) and higher total cholesterol (4.9 vs 3.1, $p<0.0001$) levels than RA patients. Adherence to CCS lipid screening recommendations was similar between the 2 groups (67% each, $p=1.0$). The median 10-year CVD risk of GCA patients was 14.6%.

Conclusion: Although 1 in 4 GCA patients developed incident diabetes following their diagnosis, adherence to the CDA screening recommendations was low (63%) and similar to that seen in RA patients. Adherence to CCS lipid screening recommendations was similar (67%) to that previously described in RA patients. Pathways to facilitate awareness, screening, and management of CV risk factors in GCA patients is needed

TOUR31

Duration of Steroid Therapy and Temporal Artery Biopsy Positivity in Giant Cell Arteritis: A Retrospective Cohort Study

Katherine Majerovich (University College Dublin, Dublin); Mats Junek (McMaster University, Hamilton); Nader Khalidi (McMaster University, St Joseph's Healthcare Hamilton, Hamilton); Stephanie Garner (McMaster University, Hamilton)

Objectives: Temporal artery biopsy (TAB) is an important investigational tool in the diagnosis of giant cell arteritis (GCA). Glucocorticoid therapy is also often used upon suspicion for GCA to prevent irreversible vision loss. It has been classically recommended to complete a TAB within 14 days of glucocorticoid initiation. However, data has conflicted as to how long biopsies remain abnormal, with one study demonstrating positivity of 44% up to 1 year. The aim of this study was to investigate how duration of glucocorticoid exposure affected TAB positivity in a cohort of patients with suspected GCA.

Methods: Data were extracted from two sources: the McMaster GCA Database (n=52) and those enrolled in a trial evaluating imaging in the diagnosis of GCA (n=171). Diagnosis of GCA was made clinically using all available material including features on history and exam suggestive of GCA, inflammatory markers, temporal artery magnetic resonance angiography, and temporal artery ultrasound. Individuals who underwent TAB as part of their diagnostic evaluation were included. Data concerning demographics and other investigations were extracted. Individuals were stratified by duration of glucocorticoid pre-treatment by weeks of therapy; those receiving six or more weeks of therapy were pooled due to low numbers. Descriptive statistics were performed and the impact of the duration of glucocorticoid therapy on TAB positivity was assessed using a two-sided Cochran-Armitage Trend test.

Results: Data from 223 patients were included. There were 48 TAB-positive and 175 TAB-negative cases. Stratified by TAB positivity, mean ages (standard deviation) of each subgroup were 73.5 (9.5) for positive TABs and 70.7 (10.6) for negative TABs respectively. 35 (72.9%) of the TAB-positive cases, and 123 (70.3%) of TAB-negative cases, were female. Forty-six (95.8%) TAB-positive cases, and 152 (86.9%) of TAB-negative cases, received glucocorticoids pre-TAB. No significant difference in length of glucocorticoid pre-treatment between groups existed. TAB-positive individuals were more likely to have vision loss, jaw claudication, constitutional symptoms, and elevated ESR and CRP ($p<0.01$). When stratified by weeks of treatment, there were fewer TABs performed with longer duration of therapy ($p<0.01$) (Table 1). The Cochran-Armitage Trend test did not demonstrate a temporal trend between weeks of treatment and TAB positivity ($p=0.11$).

Conclusion: The results of this analysis suggest that glucocorticoid therapy does not affect TAB positivity to at least 6 weeks, with inconclusive data thereafter. These results suggest the recommendation of obtaining a TAB within 14 days of glucocorticoid initiation is unnecessarily conservative.

TOUR32

Characterization of patients with normal inflammatory markers in giant cell arteritis

Michael Zeeman (University of Alberta, Edmonton); Uday Chauhan (University of Alberta Faculty of Medicine & Dentistry, Edmonton); Alison Clifford (University of Alberta, Edmonton)

Objectives: Giant cell arteritis (GCA) is the most common form of vasculitis in people over the age of 50 years old. Inflammatory markers, erythrocyte sedimentation rate (ESR) and C-reactive protein (CRP), are typically elevated at the time of diagnosis and prompt suspicion for this

disease. Given the severe potential consequences of a missed diagnosis, we aimed to study the frequency and clinical correlation of normal inflammatory markers in patients with confirmed GCA.
Methods: Electronic medical records of patients diagnosed with GCA by rheumatologists at the University of Alberta between April 2012 and December 2017 were retrospectively reviewed. For inclusion, patients must have 1) met ACR 1990 classification criteria for GCA, 2) had confirmed disease by either temporal artery biopsy or advanced imaging (PET/CT, MRA, CTA) and 3) had ESR and/or CRP measurements prior to glucocorticoid administration available. Patients were grouped according to the presence of either normal or elevated ESR or CRP (normal ESR defined as ≤25mm/hour, normal CRP as ≤8mg/L). Groups with elevated versus normal inflammatory markers were compared with respect to demographics, symptoms, comorbidities, medications, and clinical outcomes.
Results: Of 81 total GCA patients, 42 met above study inclusion (38 with available ESR, 41 with available CRP, and 37 with both). Among confirmed cases, 21.6% of patients had either a normal ESR or CRP pre-treatment (21.1% with normal ESR, and 9.8% with normal CRP), while 5.4% of patients had both normal ESR and CRP. See Table 1 for distribution of inflammatory markers observed. Upon limiting the sample to the 34 patients with biopsy-confirmed disease, 20.0% had either normal ESR or CRP and 6.7% had both normal markers. No significant differences in age, sex, comorbidities, or symptoms were observed between patients with elevated versus normal inflammatory markers. Patients with normal ESR were less likely to receive steroid-sparing agents than patients with elevated ESR (0.0% vs 50.0%, p=0.013), however, and were less likely to relapse (12.5% vs 56.7%, p=0.045).
Conclusion: Twenty percent of biopsy- or imaging-confirmed GCA patients have either a normal ESR or CRP at diagnosis, and both tests are normal in 5-7% of patients. No clinical features reliably distinguish cases with normal inflammatory markers, but normal ESR may predict a lower risk of future relapse. These findings highlight the importance of routinely checking both ESR and CRP in cases of suspected GCA and maintaining a high index of suspicion in those with typical symptoms or signs.

Tour 9: Industry

TOUR33
Effect of Guselkumab a Selective IL-23p19 Inhibitor, on Axial-Related Endpoints in Patients with Active PsA: Results from a Phase 3, Randomized, Double-blind, Placebo-controlled Study Through 2 Years
Philip Mease (University of Washington, Seattle); Philip Helliwell (University of Leeds , Leeds); Dafna Gladman (Krembil Research Institute, Toronto Western Hospital, Toronto); Denis Poddubnyy (Charite Universitatsmedizin Berlin Campus Benjamin Franklin, Berlin, Germany and German Rheumatism Research Centre, Berlin, Germany;, Berlin,); Xenofon Baraliakos (Rheumazentrum Ruhrgebiet, Ruhr-University Bochum, Herne); Soumya Chakravarty (Janssen Scientific Affairs, Horsham); Alexa Kollmeier (Janssen R&D US, La Jolla.); Lillian Xu (Janssen Research & Development, LLC, San Diego); Shihong Sheng (Janssen R&D US, Spring House); Stephen Xu (Janssen Research & Development, LLC, Spring House); May Shawi (Janssen Inc, New Jersey); Désirée van der Heijde (Leiden University Medical Center, Leiden); Atul Deodhar (Oregon Health and Science University, Portland)
Objectives: Guselkumab (GUS), resulted in greater mean improvementsin BASDAI scores vs

placebo (PBO) at W24 among patients (pts) with active PsA and imaging-confirmed sacroiliitis in pooled post-hoc analyses of data from two phase 3 trials, DISCOVER-1&2; improvements were maintained through 1 year. We aimed to further assess maintenance of GUS effect on symptoms of axial involvement among biologic-naïve PsA pts with imaging-confirmed sacroiliitis through 2 years of DISCOVER-2.
Methods: In this phase 3, double-blind, PBO-controlled study, 739 bio-naïve pts with active PsA (≥5 SJC, ≥5 TJC, CRP ≥0.6mg/dL despite standard therapies) were randomized 1:1:1 and treated with GUS 100 mg every 4 weeks (Q4W; n=245), GUS 100 mg at W0, W4, then Q8W (n=248), or PBO (n=246), with PBOàGUS 100 mg Q4W at W24. Pts identified by imaging as having axial symptoms and sacroiliitis (prior X-ray/MRI, or pelvic X-ray at screening) were evaluated. Efficacy was assessed by change in BASDAI, mBASDAI (excluding Q3 [peripheral joint pain]), and BASDAI Q2 (Spinal Pain) scores and proportions of pts achieving BASDAI 50 response, Spinal Pain score ≤2, and AS Disease Activity Score (ASDAS) responses through W100. Through W24, pts who met treatment failure criteria or had missing data were considered non responders or to have no change from baseline. After W24, missing data were imputed as nonresponse for binary endpoints or no change from baseline for continuous endpoints. Axial-related outcomes were also summarized by HLA-B27 status (+/-) among 149 pts.
Results: 246 pts had imaging-confirmed sacroiliitis. Baseline characteristics were similar across treatment groups (62% male; mean age 44.4 years); mean BASDAI scores ranged from 6.5-6.6. At W24, LSmean/mean changes in BASDAI (-2.4/-2.6) and ASDAS (-1.3/-1.5) scores were greater in GUS than PBO-treated pts. Mean changes from baseline were maintained through W100 in GUS-treated pts for BASDAI (-3.1), Spinal Pain (-3.1), mBASDAI (-3.1), and ASDAS (-1.7) scores. Similar response patterns were observed for BASDAI 50 response rates among GUS-treated pts (W24 38-40%; W100 49-54%). At W24, GUS-treated pts had higher response rates for achievement of ASDAS inactive disease, major improvement, and clinically important improvement vs. PBO; response rates were maintained, in some cases further increased, at 2 years. GUS-related improvements in axial symptoms through W100 were consistent across pts who were HLA-B27+/-.
Conclusion: In bio-naive pts with active PsA and imaging-confirmed sacroiliitis, GUS provided durable improvements in axial symptoms through W100, with substantial proportions of pts achieving and maintaining clinically meaningful improvements.

TOUR34

Long-term Safety of Guselkumab in Patients With Active Psoriatic Arthritis: Pooled Results from 3 Randomized Clinical Trials through up to 2 years

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Objectives: Guselkumab (GUS) demonstrated significant efficacy in PsA and a favorable safety profile through W24 in one Ph2 and two Ph3 (DISCOVER [D]-1&2) RCTs. In this study, we assess GUS safety by pooling data across the 1-year (Y) Ph2/D-1, and 2-Y D-2.

Methods: Patients (Pts) with active PsA (≥3% BSA affected by psoriasis in Ph2; ≥3 SJC/TJC and CRP ≥0.3 mg/dL in Ph2/D-1; ≥5 SJC/TJC and CRP ≥0.6 mg/dL in D-2), biologic naïve except 13/149 Ph2 and 118/381 D-1 pts who received prior 1-2 TNFi were randomized to GUS 100 mg at W0, W4, and Q8W or PBO in Ph2 or to GUS 100 mg Q4W; GUS 100 mg at W0, W4, Q8W; or PBO in D-1/D-2. At W24, PBO pts switched to GUS 100 mg Q8W (Ph2) or Q4W (D-1 & D-2). In these pooled post-hoc analyses, adverse events (AEs; number standardized for 100 patient-years of follow-up [PY]), laboratory investigations (National Cancer Institute Common Terminology Criteria for AEs [NCI-CTCAE] grade), and injection site reactions (ISRs) were reported through W56 for the Ph2 trial, W60 for D-1, and W112 for D-2.
Results: 1,229 pts received GUS 100 mg (725 Q4W, 504 Q8W) and were followed for an average of 1.5 Y, representing 1871 PY. Incidences of AEs, serious AEs, infections, serious infections, discontinuations due to an AE, malignancies, and major adverse cardiovascular events were similar between PBO and GUS through W24. No increased rates were seen with up to 2 Y of GUS, except for a somewhat higher rate of SAEs and serious infections in the GUS 100 mg Q8W group during long-term follow-up [CIs overlapped with the PBO-controlled period (Table)]. Most of GUS-treated pts with elevated aminotransferases and blood bilirubin had NCI-CTCAE Grade 1/2, with very few Grade 3 and no Grade 4, elevations. The proportions of pts with elevated aminotransferases at W24 were somewhat higher in the GUS Q4W vs Q8W/PBO groups; no unexpected increase with longer treatment. Elevations were more common in pts with vs without methotrexate use at baseline. ISRs occurred in GUS (1%) and PBO (0.5%) pts at W24, with no disproportional increase with up to 2 Y of GUS.
Conclusion: In these pooled pts with active PsA, GUS demonstrated a favorable safety profile through up to 2 Y of treatment; the GUS safety profile in PsA was comparable to that observed through up to 5 Y of GUS in pts with moderate-to-severe psoriasis.

TOUR35

Pharmacovigilance Pregnancy Data in a Large Population of Patients with Chronic Inflammatory Disease Exposed to Certolizumab Pegol

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Objectives: Tumor necrosis factor inhibitors (TNFi) are increasingly being used to treat chronic inflammatory diseases (CID) in women of reproductive age, in line with recent guidelines[1]. Still, limited data on TNFi-exposed pregnancy outcomes are available. Certolizumab pegol (CZP), a PEGylated, Fc-free TNFi, has no/minimal placental transfer from mother to infant during the third trimester[2]. We report outcomes from over 1,000 prospectively reported pregnancies in women with CZP exposure from the UCB Pharmacovigilance safety database.
Methods: Details of CZP-exposed pregnancies from the UCB Pharmacovigilance safety database were reviewed from the start of CZP clinical development (July 2001) to November 1, 2020. To avoid potential reporting bias, analysis was limited to prospectively reported cases with known pregnancy outcomes. Pregnancy outcomes reported: live birth, ectopic pregnancy, abortion (spontaneous, medically-indicated and elective) and stillbirth. We also report congenital malformations, preterm delivery and, where information was recorded, low birth weight.
Results: 1,392 prospective pregnancies (1,425 fetuses) with maternal CZP exposure and known

outcomes were reported (rheumatic diseases [rheumatoid arthritis, axial spondyloarthritis and psoriatic arthritis]: n=951/1,392). Of these, 1,021 (73.3%) had at least first-trimester CZP exposure and 547 (39.3%) were exposed during all trimesters. Mean (SD) maternal age was 31.9 (5.1) years. These pregnancies resulted in 1,259 (88.4%) live births. There were 150 (10.5%) abortions, 11 (0.8%) stillbirths, and 5 (0.4%) ectopic pregnancies. Congenital malformations were present in 35 infants (2.5% of all pregnancies); there was no pattern of specific congenital malformations. 124/1,259 (9.8%) of live births were preterm, and 101/1,259 (8.0%) of infants had low birth weight.
Conclusion: This analysis represents one of the largest cohorts of prospective pregnancies with known outcomes, including over 1,000 with at least first-trimester CZP exposure. Recognizing limitations of the methodology, including lack of a control group and potential underreporting of outcomes, no increase in specific congenital malformations or adverse pregnancy outcomes after CZP exposure, compared to the general population, was observed[3,4]. These findings offer further reassurance for women of childbearing age who are considering CZP treatment. References: 1. Sammaritano LR. Arthritis Rheumatol 2020;72:529-556; 2. Mariette X. Ann Rheum Dis 2018;77:228–233; 3. Ventura SJ. Natl Vital Stat Rep 2012;60: 1–21; 4. Lee H. BMC Pregnancy Childbirth 2020;20:33.

TOUR36

Sustainability of Response Between Upadacitinib and Adalimumab in Patients with Rheumatoid Arthritis: Results Through 3 Years from the SELECT-COMPARE Trial

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Objectives: The primary treatment target for patients with active rheumatoid arthritis (RA) is sustained clinical remission (REM) or low disease activity (LDA). A greater proportion of patients with RA and inadequate response to methotrexate (MTX) receiving the JAK inhibitor, upadacitinib (UPA), achieved REM/LDA compared with adalimumab (ADA), both with background MTX, through 26 weeks in the phase 3, SELECT-COMPARE trial. We assessed sustainability of response over 3 years from the SELECT-COMPARE long-term extension.
Methods: Patients on background MTX received UPA 15 mg once daily, PBO, or ADA 40 mg every other week. Patients who did not achieve at least 20% improvements in tender and swollen joint counts (Weeks 14-22) or LDA (CDAI ≤10 at Week 26) were rescued from UPA to ADA or PBO/ADA to UPA. This post hoc analysis evaluated clinical REM (CDAI ≤2.8; SDAI ≤3.3), LDA (CDAI ≤10; SDAI ≤11), and DAS28(CRP) <2.6/≤3.2 at first occurrence,as well as over 3 years following initial response, in patients randomized to UPA or ADA. Kaplan-Meier was used to define time from when response was first achieved to earliest date at which response was lost, discontinuation of study drug, or losing response at time of rescue.
Results: Through 3 years, a significantly higher proportion of patients receiving UPA + MTX vs ADA + MTX achieved CDAI REM (47% vs 35%, P = 0.001) as well as CDAI LDA (70% vs 60%, P = 0.001). At 30 months after first occurrence of response, CDAI REM/LDA was sustained in 19%/42% of patients randomized to UPA and 10%/30% of patients randomized to

ADA (Figure 1). Time to initial clinical response did not appear to be predictive of sustained disease control. Through the last follow-up visit, 37%/58% of patients receiving UPA and 27%/48% on ADA remained in CDAI REM/LDA, respectively. Of patients who lost CDAI REM, 68% on UPA and 55% on ADA remained in LDA. Similar proportions on UPA and ADA recaptured CDAI REM/LDA (UPA, 40%/17%; ADA, 48%/19%). Similar results were observed for REM/LDA based on SDAI and for DAS28(CRP).
Conclusion: Among patients with inadequate response to MTX, a higher proportion receiving UPA + MTX achieved remission or LDA across disease activity measures vs ADA + MTX. UPA-treated patients demonstrated a consistently higher sustained response rate over 3 years compared to those receiving ADA. Furthermore, significant proportions of patients who lost response on either UPA or ADA were able to recapture remission or LDA.

Tour 10: Basic Science

TOUR37
Whole Exome Sequencing to Identify Diagnostic Variants in a Cohort of Patients with Systemic Inflammatory Disease.
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Objectives: Systemic Inflammatory Diseases (SID) are rare conditions that can arise from deleterious variants in immunologic genes that disrupt immune regulation. Gene panels containing few genes are often non-diagnostic in SID patients, whereas subsequent whole exome sequencing (WES) may identify genetic variants potentially responsible for disease. We report results from WES of a clinically heterogeneous cohort of patients with suspected monogenic SID.
Methods: We conducted a multicenter cohort study of patients with suspected monogenic SID and non-diagnostic recurrent fever and/or hemophagocytic lymphohistiocytosis (HLH) gene panels. Demographic and clinical data was retrospectively extracted from chart review and entered in a dedicated database. We performed paired end WES with Illumina sequencers. We examined genes from clinical gene panels with established inflammatory, immune deficiency, or cytopenic diseases in two stages. First, we used a limited 'Panel 1' (29 genes) and then an expanded 'Panel 2' (613 genes). We restricted to rare (minor allele frequency <1%) and predicted damaging variants (CADD score > 15). Variants were considered in light of individual patient's disease manifestations. A variant was deemed diagnostic if it was rare, damaging, and associated with a disease consistent with the patient's phenotype and inheritance pattern. Summary statistics were used for the prevalence of demographic and clinical features in the

cohort, as well as the number variants reported from panel 1 and panel 2.
Results: The study included 59 participants, 46% male, 53% European and 34% adults (>18y) at the time of sequencing. The median age of disease onset was 9 years (Q1 =2, Q3=15). The most common organ systems involved were immunologic (96%), mucocutaneous (95%), and musculoskeletal (81%). Most patients (81%) had raised inflammatory markers (ESR/CRP/Serum Amyloid A). Examination of Panel 1 identified 25 variants (15 genes) in 21 individuals yet not were diagnostic. Panel 2 identified 409 variants (244 genes) in 58 individuals, with 3 diagnostic variants. These were homozygous TREX1 variants leading to a diagnosis of Aicardi-Goutières Syndrome, POMP heterozygous frameshift variant accounting for a case of POMP-Related Autoinflammation and Immune Dysregulation Syndrome, and RELA heterozygous frameshift variant contributing to Behcet's-like disease.
Conclusion: In a cohort of suspected monogenic SID patients with diverse clinical features, using expanded clinical gene panels for inflammatory diseases led to additional molecular diagnoses in 5% of the cohort. Our work highlights the diagnostic utility of WES in this population. Next steps include investigation of extended immune genes identified by bioinformatic approaches to further enhance diagnostic yield.

TOUR38
Systemic lupus erythematosus genetic risk and neuropsychiatric lupus manifestations
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Objectives: Neuropsychiatric systemic lupus erythematosus (NPSLE) is clinically heterogeneous and significantly affects the survival and quality of life of SLE patients. Genetics plays a role in SLE pathogenesis, but its role in NPSLE has not been determined. We investigated the association between SLE genetic susceptibility loci and NPSLE in a large, multi-ethnic cohort of adult SLE patients.
Methods: Patients recently diagnosed with SLE using American College of Rheumatology (ACR) classification criteria were recruited from 1999-2011 to the Systemic Lupus International Collaborating Clinics (SLICC) Registry at 31 international centres in Asia, Europe, and North America. Patients were genotyped on the Illumina Infinium Global Screening Array (GSA). Ancestry was genetically inferred using principal components and ADMIXTURE with the 1000 Genomes Project as a referent. Cases were those who ever experienced an NP event, included in the ACR case definitions for NPSLE and attributed to SLE using the SLICC attribution rules (Hanly et al. 2007). Cases were then categorized into mutually exclusive NPSLE groups based on strict (Model A) and less stringent (Model B) attribution criteria. Patients who never developed an NP event or an NP event not attributed to SLE were controls. HLA and non-HLA SLE polygenic risk scores (PRSs) were calculated. Binary and multinomial logistic regressions were conducted, adjusting for genetically inferred ancestry, sex and for covariates significantly associated with NPSLE in the cohort (oral/nasal ulcers, serositis, duration of follow-up, lupus anticoagulant positivity). In binary logistic regression, only Model A patients were cases, and Model B patients were included as controls. Multinomial logistic regressions compared patients in Model A and Model B, to controls.

Results: 896 SLE patients were included in the study; 89% were female and 50% of European ancestry. The median age of SLE diagnosis was 33.4 years (IQR, 23.5-43.3). Median duration of follow-up was 10.5 years (IQR, 6.19-14.9). There were 119 Model A NPSLE cases. We were unable to detect associations between NPSLE and non-HLA SLE PRS (Model A) in marginal nor in multivariate-adjusted binary logistic models (odds ratio, OR 0.86, 95%CI 0.70-1.06). Similarly, we were unable to detect associations in multivariate-adjusted multinomial logistic regressions (Model A vs. controls: OR=0.86, 95%CI 0.70-1.07; Model B vs. controls: OR=1.05, 95%CI 0.82-1.34).
Conclusion: We were unable to detect association between polygenic risk scores for SLE and risk of NPSLE in a multi-ethnic cohort of SLE patients. Future analyses include testing additional genetic loci and gene pathways in association with NPSLE subphenotypes.

TOUR39

Anti-MPP1 Autoantibodies are Associated with Peripheral Neuropathy in Systemic Lupus Erythematosus

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Objectives: Neuropsychiatric systemic lupus erythematosus (NPSLE) affects 17 - 75% of lupus patients and can involve the central (CNS) and peripheral nervous system (PNS). Several autoantibodies have been associated with CNS NPSLE, but there are no known autoantibodies specific for PNS involvement. M-Phase Phosphoprotein 1 (MPP1; also known as kinesin family member 20B, KIF20B) is a protein involved in cell division. Anti-MPP1 autoantibodies were identified in patients with idiopathic ataxia and are possibly associated with autoimmune peripheral neuropathy. The aim of this study was to explore the association between anti-MPP1 and NPSLE in our local SLE cohort.
Methods: Patients fulfilled the ACR or SLICC classification criteria (CC) for SLE. Age, sex, race, SLEDAI-2K, SLICC CC, and sera were collected at the time of enrolment and up to two follow up visits. NPSLE events fulfilling the ACR case definitions were identified from date of SLE diagnosis by medical record review. Anti-MPP1 titers were determined by an addressable laser bead immunoassay (ALBIA) utilizing a purified recombinant protein and results expressed as median florescence units (MFU). A titre of $\geq$1:500 MFU was considered positive. Chi-squared and t-tests were performed to compare demographic and clinical characteristics, including NPSLE manifestations, between patients who were ever anti-MPP1 positive (MPP1+) versus those who were never positive (MPP1-). Multivariable logistic regression analysis was used to determine associations between MPP1+ and variables that were statistically significant in the univariable analysis ($p < 0.05$).
Results: We assessed 301 SLE patients for anti-MPP1 expression. Mean disease duration was 11.4 ± 11.5 years, 92.4% were female and 19.9% participants were MPP1+. 293 patients had available medical records for assessment of NPSLE manifestations. 72.4% of patients met criteria for at least one NPSLE manifestation. When PNS NPSLE manifestations were examined, patients with any peripheral neuropathy (OR 3.2, 95% CI 1.7-6.2), mononeuropathy (OR 8.7, 95% CI 2.1-36.0), or cranial neuropathy (OR 6.5, 95% CI 2.5-17.0) were more likely to be MPP1+ (Table 1). There was no difference between MPP1+ and MPP1- when total and central NPSLE manifestations were compared (Table 1). Multivariable analysis demonstrated that any

peripheral neuropathy (OR 4.8, 95% CI 2.2-10.8) and cranial neuropathies remained significantly associated with MPP1+ (OR 9.7, 95% CI 2.9-32.2).
Conclusion: Conclusions: Anti-MPP1 may be an important biomarker for peripheral neuropathies, in particular, cranial neuropathies in SLE. These findings are being validated in an international cohort and further histologic assessment is needed to uncover the pathophysiologic mechanism. Supported by a CIORA grant

TOUR40
Rethinking the Role of the Synovium in Late-Stage Knee Osteoarthritis: Ultrasound Imaging and Histopathological Features of Synovial Inflammation and Damage
Holly Philpott (Western University, London); Trevor Birmingham (Western University, London); McKenzie Carter (Western University, London); Robert Giffin (Western University, London); Edward Vasarhelyi (Western University, London); Steven MacDonald (Western University, London); Brent Lanting (Western University, London); Tom Appleton (St. Joseph's London Rheumatology Centre and Western University, London)
Objectives: Common chronic diseases associated with chronic inflammation (e.g., liver disease and atherosclerosis) result in tissue remodeling, fibrosis, and damage, marking the transition from early to later stages of disease. The interpretation of clinical imaging findings in any given patient with OA may be markedly different depending on the relative presence of synovial inflammation versus synovial damage. Since synovium is critical for joint health, it is important to understand how the contribution of synovial inflammation and tissue damage, measured by histopathology, contributes to the appearance of synovial inflammation on routine clinical imaging tools such as ultrasound (US). The objective of this study was to investigate the ability of a non-invasive imaging method (US) to assess each histopathological feature of synovial inflammation and damage.
Methods: Patients (n=118) with late-stage knee OA undergoing surgery were included. Musculoskeletal ultrasound (US) was performed pre-operatively. Synovial biopsies were acquired at surgery. Four features of inflammation (synovial lining thickness, sub-synovial infiltrate, vascularization, and fibrin) and four features of damage (synovial lining erosion, fibrosis, vasculopathy, and perivascular edema) were assessed on 5 high powered fields per patient. Mean feature scores were binned into categories for None (< 0.5), Mild (0.5-1.5), and Moderate/Severe (> 1.5). Relationships between histopathological features were assessed by Spearman or Pearson correlation as appropriate. Associations between histopathological features of inflammation or tissue damage (predictors) and US measures of inflammation (outcomes) were assessed using linear or logistic regression, while adjusting for age, sex, and body mass index (BMI).
Results: Patients presented with a range of severity of synovial inflammation and damage. The histopathological features of synovial inflammation were inversely correlated to features of damage. Multivariate linear and logistic regression showed that histopathological features of inflammation such as synovial lining thickness, sub-synovial infiltrate, and vascularization were associated with higher odds of having moderate/severe synovitis and larger effusion-synovitis depth measures on US. Conversely, features of synovial damage such as synovial lining erosion, vasculopathy, and fibrosis were associated with lower odds of having moderate/severe synovitis and smaller effusion-synovitis depth measures on US.
Conclusion: US can reliably assess the presence of histopathological features of synovial inflammation. The inverse relationship between inflammation and synovial damage suggests that

OA-related inflammation may give rise to synovial damage. Taken together, the absence of inflammation on US imaging in patients with symptomatic, late-stage knee OA is not reassuring but instead may be a sign of synovial damage and more severe joint failure.

Tour 11: SSC/SLE

TOUR41

Scleroderma Presentation in the Canadian Scleroderma Research Group Indigenous Population

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Objectives: Given the burden of rheumatic disease in the North American Indigenous (NAI) population, the Canadian Rheumatology Association has highlighted Aboriginal Rheumatology as an area needing greater understanding. Indigenous patients with rheumatoid arthritis (RA) often have worse disease than the general population yet are less likely to see specialized care. While Indigenous populations appear to have earlier onset systemic sclerosis (SSc) than the general population, it is unclear if they experience delayed diagnosis (symptom onset to disease diagnosis), or more/less healthcare utilization during this time. We analyzed data from the Canadian Scleroderma Research Group (CSRG) registry to compare the length of time from symptom onset to disease diagnosis and healthcare utilization between NAI and non-NAI populations. We also determined if these data appeared to be impacted by a person's rural or urban location.

Methods: Data were obtained from the CSRG, a national longitudinal registry of patients >18 years old with SSc. Patients who self-identified as Métis, Inuit and First Nations were included as NAI. All other registry participants were categorized as non-NAI. We characterized the 2 groups at entry into the registry (sex, tobacco use, income, education, location, comorbidities). Location was deemed urban or rural by Canada Post guidelines. Time from first symptom (Raynaud's or 1st other) to SSc diagnosis was compared between those who were and were not NAI. Healthcare utilization by group as it related to SSc presentation (visits specialists, allied health, tests done, hospital admissions) were summarized.

Results: Of 1561 patients, 79 (5.1%) self-identified as NAI. Age, gender and comorbidities appeared similar between the two groups, with NAI having a higher proportion of tobacco use, RA, diabetes and lower level of education and income. Proportionately, more NAI patients lived in a rural area than non-NAI patients. There was no significant difference in time from Raynaud's to diagnosis or 1st other symptom to SSc diagnosis between NAI and non-NAI populations, regardless of location (Figure 1). There were also no group differences in healthcare utilization, including visits to healthcare professionals, tests performed and hospitalizations.

Conclusion: This study suggests that, unlike other rheumatological conditions, SSc appears to be appropriately diagnosed without a time delay in those who are NAI compared to no-NAI patients. NAI SSc patients also access care at the same rate as non-NAI populations prior to SSc diagnosis. It's important to consider that this small NAI population may represent a biased sample given their participation in a registry.

TOUR42

Prediction Tool for Damage Accrual Trajectory in Incident Systemic Sclerosis

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Objectives: Systemic sclerosis (SSc) is an autoimmune disease associated with the accrual of organ damage over time, which can be measured using the Scleroderma Clinical Trials Consortium Damage Index (SCTC-DI). The natural history of SSc is heterogenous and can be associated with a high mortality. The aim of this study was to build a prediction model that could identify newly diagnosed SSc patients at higher risk of accruing damage quickly.

Methods: Incident adult SSc cases were identified in the Australian Scleroderma Interest Group (ASIG) and Canadian Scleroderma Research Group (CSRG) registries. Patients meeting 2013 ACR-EULAR Scleroderma classification criteria were included. Using a combination of group-based trajectory modelling and substantive knowledge, we identified two trajectories of damage accrual (fast, slow) for each of diffuse and limited patients. Baseline variables associated with trajectory membership were entered into logistic regression models. Using backward selection, prediction models for the two cutaneous SSc subset groups were built independently since their actual DI trajectories were very different. ROC curves were analyzed to determine the optimal cut-offs for the predictive variables. The Hosmer–Lemeshow Goodness-of-Fit test was used to determine prediction accuracy.

Results: 402 patients were included. The mean age was 53 years, 20% were men, 85% were Caucasian, and 47% had diffuse disease. For the diffuse subset, the mean length of follow up was 3.0 years (SD ± 1.2) and 60% were in the fast trajectory, whereas the mean length of follow up was 3.1 years (SD ± 1.1) and 23% were in the fast trajectory in the limited subset (Figure 1). The final prediction model included male sex and baseline SCTC-DI for the diffuse subset, and only baseline SCTC-DI for limited. The ROC curves for the limited and diffuse prediction models showed good discriminative abilities (AUC 0.91 and 0.89, respectively). In limited patients, a baseline DI ≥ 5 predicts a fast damage trajectory with a sensitivity of 0.70 and specificity of 0.96. In diffuse patients, a baseline DI ≥ 4 in men and ≥ 6 in women, predicts a fast damage trajectory with a sensitivity of 0.83 and specificity of 0.86. The Hosmer-Lemeshow Goodness-of-Fit test confirmed the prediction accuracy of both models ($p = 0.77$ for diffuse and $p = 0.33$ for limited).

Conclusion: Baseline disease damage as measured by the SCTC-DI, and sex can be used as predictors of future damage trajectories. These prediction models may be useful in the clinical or trial design setting.

TOUR43

Identification of Urinary Biomarkers that Predict Treatment Outcomes in Lupus Nephritis

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Health Policy, Management and Evaluation, University of Toronto, Toronto); Joan Wither (Division of Genetics and Development, Krembil Research Institute; Division of Rheumatology, University Health Network; Department of Immunology, University of Toronto, Toronto)
Objectives: We have previously shown that 15 urine biomarkers (of 129 tested by Luminex), including Clusterin, Cystatin C, NGAL, PF4, vWF, sVCAM-1, GM-CSF, GRO, IL-15, IL-6, MCP-1, Adiponectin, PAI-1, MMP-7 and TIMP-1, discriminate between active Lupus Nephritis (ALN) and non-LN patients. Herein, we aimed to determine the ability of these urinary biomarkers to predict renal response to conventional therapy.
Methods: Our study had a 2-stage approach. In an exploratory cohort, we used Luminex to examine whether our previously identified urinary biomarkers at the time of the renal flare (±3 months) or 12±3 months after treatment of biopsy proven ALN could predict treatment responses. A larger validation cohort was then used to further investigate the utility of the most predictive urinary biomarkers by ELISA, including patients with biopsy proven ALN (±3 months of renal flare), using as controls patients with LN in remission (RLN) or without LN (NLN). Longitudinal outcomes in response to therapy were determined using previously published criteria.
Results: Twenty-one patients were included in the exploratory cohort, 19 (90.5%) of whom had proliferative LN. Twelve (57.14%), 4 (19.06%), and 5 (23.8%) patients had a complete (CR), partial (PR) and no (NR) remission at 24+/-3 months, respectively. At baseline there was no difference in urinary biomarkers levels between CR, PR and NR; however, the drop in levels following 12±3 months of treatment was significantly higher in patients with CR than NR for sVCAM, Adiponectin, MCP-1, PF4, IL-15 and vWF. To validate the clinical utility of these biomarkers, 55 biopsy proven ALN, 65 RLN and 142 NLN patients were studied, of which 233 (88.08%) were women, 139 (52.7%) were Caucasian, with a mean age of 39.5 years and mean disease duration was 10.83 years. sVCAM, Adiponectin, MCP-1 and PF4 discriminated between ALN and non ALN (RLN and NLN) (Figure 1a). In addition, adiponectin (p=0.03) and MCP-1 (p=0.005) were able to differentiate between proliferative and non-proliferative LN, and correlated with markers of disease severity, including baseline serum creatinine, proteinuria, and the activity index on the kidney biopsy. The levels of adiponectin and MCP1 at baseline were also significantly lower in patients who achieved CR at 1 and 2 years in comparison to those that did not (Figure 1b and c).
Conclusion: Baseline and/or decreases in urinary biomarker levels can discriminate between CR, PR and NR following conventional therapy, allowing institution of more aggressive therapy in patients with a high likelihood of a poor prognosis.

TOUR44
Serologic Phenotypes Distinguish SLE Patients With Myositis and/or Interstitial Lung Disease (ILD)
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Objectives: To determine if a serologic phenotype can be identified in SLE patients with myositis and/or ILD.
Methods: Adult SLE patients (without myositis or ILD at baseline) had annual assessments and

provided bio-samples between 2000-2017. Potential new-onset myositis was identified using the SLICC Damage Index (SDI) muscle atrophy/weakness item, the SLEDAI-2K item for myositis, and annual serum creatinine kinase testing. Potential new-onset ILD was identified using the SDI pulmonary fibrosis item. Chart review confirmed cases. Randomly sampled patients from baseline visit (from 2000 onward) became a sub-cohort (N=72). Cases and sub-cohort were compared regarding baseline characteristics. Patients' myositis-related biomarkers were assessed at baseline and one randomly selected follow-up between baseline and end of observation (date of myositis/ILD diagnosis or Dec. 31, 2017). Line immunoassay (Euroimmun AG, Luebeck, Germany) detected autoantibodies to Mi2-α, Mi2-β, MDA5, NXP2, TIF1γ, PM/Scl75, PM/Scl100, Ku, SRP, Jo-1, EJ, OJ, PL7, PL12, Ro52, HMGCR, NT5c1A/Mup44, CENP-A, -B, Scl70, NOR90, RNAP, and Th/To (hPOP1). An addressable laser bead immunoassay was used to detect antibodies to TERF-1. KL-6 levels were determined by ELISA (R&D Systems). Descriptive analyses and hazards ratios (HRs) were generated for myositis and/or ILD incidence, focusing on baseline serology and adjusting for demographic variables (sex, ethnicity, and age at SLE diagnosis) and positive biomarkers.
Results: The median (IQR) SLE duration at baseline was 1.8 (0.41, 5.6) years. Between 2000-2017, 14 SLE patients (12, 85.7% female) developed myositis and/or ILD over an average follow up of 9.2 years (incidence 17.6 cases per 1000 patient-years). Thirteen of these (92.9%) had at least one medium/high positive biomarker at baseline, versus 47 (65.3%) SLE patients who never developed myositis and/or ILD. The most common baseline biomarkers in patients with myositis and/or ILD were KL-6, anti-Ku, anti-Ro52. In multivariate Cox regression analyses, SLE patients were more likely to develop myositis and/or ILD if they had elevated baseline KL-6, anti-Ku positivity, or anti-CENP-B positivity. Potential limitations include the relatively low number of events.
Conclusion: In this SLE sample, KL-6, anti-Ku, and anti-CENP-B at baseline were highly associated with myositis and/or ILD risk. Ours is the first study of this serologic phenotype, identifying SLE patients most at risk of myositis/ILD.

Tour 12: Autoimmune/Immunology

TOUR45
Serious Infections in Offspring Exposed In Utero to Tumour Necrosis Factor Inhibitors with High Versus Low Placental Transfer
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Objectives: Tumour necrosis factor inhibitor (TNFi) subtypes have differential trans-placental passage; infliximab and adalimumab (both monoclonal immunoglobulins) have the highest transfer, reaching higher fetal than maternal blood levels, while certolizumab (a pegylated Fab fragment) and etanercept (a fusion protein) display the lowest passage (less than 0.25% and 4-7% respectively). Thus, depending on the TNFi subtype, the risk of immunosuppression may differ, and some offspring may be exposed to supra-therapeutic doses of TNFi. However, data on serious infections in offspring stratified by TNFi subtype do not exist to the best of our knowledge. We evaluated the risk of serious infections in offspring born to mothers with chronic

inflammatory diseases who used TNFi during pregnancy. We compared offspring exposed in utero to TNFi with high placental transfer to offspring exposed in utero to TNFi with low placental transfer.
Methods: We identified offspring born to mothers with rheumatoid arthritis, ankylosing spondylitis, psoriatic arthritis, psoriasis, and/or inflammatory bowel diseases between 2011 and 2019 in the IBM MarketScan commercial database. Drug exposure was defined as ≥1 filled prescription during pregnancy and separated into high (i.e. infliximab, adalimumab, golimumab) and low (i.e. certolizumab, etanercept) placental transfer. Serious infections were based on ≥1 hospitalization with infection in the offspring's first year of life. We performed multivariable time-to-event analysis using a Cox proportional hazards model, adjusting for maternal demographics, disease type, co-morbidities, pregnancy complications, and drug usage.
Results: We identified 26,088 offspring, among whom 2,902 (11.1%) were exposed to TNFi during pregnancy. The incidence rate (IR) of serious infections in offspring exposed to TNFi with high vs. low placental transfer was, respectively, 2.27 (95% confidence interval [CI] 1.61, 3.12) cases per 100 person-years at risk vs. IR 1.59 cases per 100 person-years at risk (95% CI 0.76, 2.92). In multivariable analysis, we were unable to clearly demonstrate an increased risk of serious infections with the usage of TNFi with high versus low placental transfer (adjusted hazard ratio 1.20; 95% CI 0.54, 2.64), but the confidence interval was wide.
Conclusion: In one of the largest cohorts of TNFi-exposed offspring ever assembled, we were unable to establish a clear excess risk of serious infections in children exposed in utero to TNFi with high versus low placental transfer.

TOUR46

The Canadian Research Group of Rheumatology in Immuno-Oncology (CanRIO): A nationwide multi-center prospective cohort

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Objectives: To describe the clinical presentation, management and early outcomes of patients exposed to ICI with Rh-irAE or PAD recruited and followed prospectively from multiple sites across Canada. Background: Immune Checkpoint Inhibitors (ICI) have altered the landscape of cancer therapy. However, toxicities are common and up to 80% of patients will develop immune-related adverse events (irAE), including rheumatic irAEs (Rh-irAE), which can often limit their cancer treatment. Our knowledge of clinical manifestations and optimal management of patients

with Rh-irAE continues to evolve as these agents are being used to treat a wider variety of cancers. Currently available data is limited to retrospective case series and case reports. There is also scarce data on the use of ICI in patients with pre-existing autoimmune disease (PAD) as these patients are often excluded from clinical trials.
Methods: Adult patients with Rh-irAE from cancer immunotherapy (CTLA-4, PD-1 or PDL-1 inhibitors) or those with PAD exposed to cancer immunotherapy are prospectively recruited across 9 academic sites in Canada. Standardized clinical and biologic data are also collected. We describe clinical characteristics and management of patients recruited between January 2020 and October 2021.
Results: 103 patients were recruited from 9 sites. From those, 92 had Rh-irAE, 47 had pre-existing musculoskeletal and rheumatic diseases, and 20 had other PAD. The most frequent Rh-irAE were joint manifestations (n = 73). Other Rh-irAE included muscle symptoms (n = 7), connective tissue disease (n = 6), vasculitis (n=2) and sarcoid (n = 3). Prednisone was the most common treatment (n = 92). Intraarticular corticosteroids were used in 14 patients. Fifty-eight patients required conventional synthetic disease-modifying anti-rheumatic drugs (DMARD) and only one required biologic DMARD to control the Rh-irAE. The ICI was discontinued due to the Rh-irAE in 22 patients. There were no deaths related to Rh-irAE.
Conclusion: The CanRIO prospective national cohort provides valuable insight into real-world spectrum and management of Rh-irAE secondary to immunotherapy for cancer.

TOUR47
Use, Procurement Cost, and Adverse Events from IVIg Use in Rheumatic Disease
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Objectives: Intravenous immunoglobulin (IVIg) is used in several rheumatic diseases due to postulated immunomodulatory properties. However, IVIg is a scarce and costly resource and poses a risk of adverse events (AEs). We evaluated the safety, effectiveness, and procurement cost of IVIg in an ambulatory rheumatic disease sample.
Methods: We identified tertiary clinic patients receiving IVIg for rheumatic disease between January 2015 and September 2020. We performed retrospective chart reviews from IVIg initiation until 3 months following the last infusion. We evaluated demographic and disease characteristics and clinical effectiveness of IVIg, based on the treating clinicians' assessments. Potential AEs were adjudicated by two independent physicians using pre-established rating scales. Finally, we determined if appropriate (ideal body weight-based) dosing was used and estimated the yearly procurement costs (CAN$).
Results: Of 25 patients receiving IVIg for rheumatic disease over the study period, 22 had sufficient clinical records to be included. Mean age was 53 years and 16 (72%) were women. The treatment indication in 18 patients (82%) was inflammatory myositis (dermatomyositis, antisynthetase syndrome, overlap and necrotizing myositis); the remaining indications were SLE (n=2), Sjogren's syndrome (n=1), and cutaneous vasculitis (n=1). Patients had a mean of 15 infusions (SD 14) spanning 1271 total hours. Of 21 patients with ≥3 months follow-up after IVIg initiation, 18 (86%) showed clinical improvement. Of these, 14 had clinical follow-up at 3 months following cessation of therapy and of these, 10 (71%) had stable or quiescent disease

while 4 (29%) relapsed. We identified 11 potential AEs in 7 patients, representing 3.2 events per 100 IVIg infusions (95% CI 1.8-5.8). AEs included headache (6), urticaria (3), chills with back pain (1), and hypertension (1); none required an emergency room visit or hospitalization. One patient was switched to subcutaneous Ig. The appropriate IVIg dose could be calculated for 15 patients (height not recorded in the remainder); 7 (47%) received > 100 g excess IVIg over their treatment period and the total cumulative excess was 1242g. The cost of IVIg ranged from 61-90$/g, giving a total estimated procurement cost of $1.48 million during the study period.
Conclusion: The majority of our patients received IVIg for inflammatory myositis. Most patients (86%) improved 3 months into therapy and a significant proportion of those (29%) relapsed after stopping therapy. Nearly 1 in 3 patients had a potential IVIg-related AE. A treatment course cost up to 254,964$, and one potential area of improvement is using recommended ideal body weight-based dosing.

TOUR48

Most Patients with Immune Mediated Inflammatory Diseases do not Report Increased Disease Activity Following COVID-19 Vaccination.

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Objectives: COVID-19 vaccines are well-tolerated and reduce COVID-19 infection severity in the general population. Highly immunogenic vaccines may increase risk of disease flare for immune mediated inflammatory diseases (IMIDs) such as lupus, inflammatory arthritis (IA) and inflammatory bowel disease (IBD). We sought to determine early COVID-19 vaccine reactogenicity (common vaccine related adverse events) and IMID disease flares post-COVID-19 vaccination in patients with IMIDs.
Methods: Between March 2021 and Sept 2021, patients with CTD (n=70; 70% lupus) or IA (n= 67; 77% rheumatoid arthritis), and IBD (n= 82;40% crohn's) self-reported disease activity prior to and 1 month post both COVID-19 vaccinations (V1 and V2). CTD and IA also reported flare status. Disease activity was assessed by the Systemic Lupus Activity Questionnaire (SLAQ) for CTD, the RAPID-3 for IA and the IBD Symptoms Inventory-short form (IBDSI) for IBD. Patient reported flare was assessed using the SLAQ ("Have you had a flare?") for CTD and the RA Flare index (calculated index and self report flare: "Are you in a flare?") for IA. Patients reported solicited (those commonly reported in the general population) adverse events for 7 days after each vaccination. Descriptive statistics are presented.
Results: Patients were predominantly female (80%), White (73%), with a mean (sd) age of 55.5(15) years, body mass index 28 (6); 9 had suspected or diagnosed COVID-19 illness. The majority received a mRNA vaccine (V1 76%; V2 96%) and had the same vaccine each dose (73%). Disease activity scores were similar pre and post each vaccine dose for CTD, IA, and IBD [SLAQ median (interquartile range-IQR) pre-V1= 8.0(6.5), post-V1 = 7(7), pre-V2= 6(7), post V2= 5(6); RAPID-3 median (IQR) pre-V1=4(9.7), post V1= 7.7(10.1), pre-V2= 7.5(11), post V2=6.5 (10.2); IBDSI pre-V1 20(24), post-V1 18.5 (22.9), pre-V2 16.5 (22) post-V2 13.5(19)]. The proportion of patients reporting disease flare was similar pre and post each vaccine (any CTD flare: pre-V1=61%, post-V1= 65%, pre-V2= 58%, post-V2=48%; moderate or severe CTD flare pre-V1 19%, post-V1 25%, pre-V2 19%, post2 18%; any IA flare state pre V1=20%, post-V1=25%, pre-V2=21 %, post-V2=17%; RA flare index median (IQR) pre-V1 9(21), post V1 19(22), pre-V2 18(22) post-V2 16(18). Of those with complete solicited reactogenicity data (n=81) 97% had symptoms with a median (range) of 4 (1-12) new symptoms

(not present at baseline) but did not seek medical assessment.
Conclusion: COVID-19 vaccination did not increase disease activity in most patients with IMIDs. New vaccine related side effects were common but were mostly self-managed.