Rheumatology clinic, with variable waiting times causing potential delay in starting treatment such as DMARDs. There is also a cost implication with respect to commissioning of the Radiology scan appointments. In Bolton, an US system was installed in Rheumatology from 2016 to perform in-clinic US, for improving access and reducing referrals to Radiology.

Objectives: We aimed to assess the US usage pattern before and after the new Rheumatology US was installed, with respect to access based on age and gender, the pattern of scanning in-clinic, and rate of synovitis diagnosis, using a quality improvement framework.

Methods: US referral data from the Radiology department from October 2015 to March 2016 were collated as baseline on a MS Access database. Two Consultant Rheumatologists performed US in-clinic. From May to October 2016 Rheumatology in-clinic data, and also Radiology referral data were collated on the database for comparison. Patient demographics and diagnoses were collated from clinic letters. Descriptive statistics were processed in MS Excel 2010.

Results: Between October 2015 and March 2016, 68 patients (median age 52 yrs; 28% male) had scans in Radiology. Between May and October 2016, 59 patients (median age 60 yrs; 21% male) had scans in Radiology, and 78 patients (median age 59yrs; 35% male) had scans in Rheumatology clinic. There was no significant difference in scanned areas amongst the three cohorts with the most common overall being hand/wrist area (n=57, 54 and 61 respectively; total 84%), followed by foot/ankle (n=6, 4 and 4 respectively; total 7%). Between the two time periods, there was an increased trend in final working diagnoses of inflammatory arthritis (28 [41%] vs 36 [61%] and 39 [50%] in the 3 cohorts respectively); and a decreasing trend in the final working diagnoses of non-inflammatory conditions (OA, FM, other non-inflammatory pain: 36 [53%] vs 22 [37.3%] and 28 [35.9%] in the 3 cohorts respectively).

Conclusion: The availability of Rheumatology US was associated with increased propensity for scanning older patients and a greater proportion of men compared to previously, a qualitative improvement as synovitis diagnosis could be delayed in these groups. The introduction of Rheumatology US was also associated with a trend towards higher proportion of inflammatory diagnoses, suggesting potentially increased appropriate clinical use due to availability in-clinic. This is supported by the majority being hand/wrist scans, suggesting Rheumatology use is mainly aimed at diagnosing synovitis. Although there was a modest reduction of 13% in Radiology referrals between the two time periods, there was an overall increase of scans performed by 101% following introduction of the Rheumatology US service. We therefore recommend Rheumatology in-clinic US provision, as in addition to obvious improvement in time to diagnosis, it is likely to increase the range of patients able to access US eg older patients and men, and also likely to increase the pick-up rate of synovitis by improving patient selection.

Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2019-eular.7465

AB1188

AUDIT: IMPACT OF MUSCULOSKELETAL ULTRASOUND USE IN RHEUMATOLOGY CLINICS

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Background: Musculoskeletal ultrasound (MSUS) has assumed a prominent role in rheumatological practice as both a diagnostic and monitoring tool.¹ It has utility in excluding and quantifying active synovitis and can be used to guide adjustments of therapies.^{2,3}

Objectives: We aimed to observe impacts on clinical practice of utilising ultrasound (US) scanners in outpatient clinics in a district general rheumatology service. We were particularly interested to see if this affected treatment choices, follow-up plans and referrals for radiological investigations.

Methods: US scanners were obtained and used by 2 rheumatology consultants with previous ultrasound training. Scanning was performed during standard 20 minute appointments within general rheumatology outpatient clinics. No extra time was allocated. Over 8 weeks, we completed questionnaires for each scan and assessed the impact on management decisions.

Results: Over 8 weeks, data was collected for 36 consecutive patients scanned. Commonly imaged joints were hands (81%, n=29), wrists (75%, n=27), feet (19%, n=7), and ankles (14%, n=5).

Most common patient diagnoses were osteoarthritis (n=13, 36%), rheumatoid arthritis (n=10, 28%) and psoriatic arthropathy (n=6, 17%). The remaining patients had diagnostic labels including undifferentiated inflammatory arthritis or no formal diagnosis. Abnormalities suggesting active

inflammation were seen in 42%. In 33% osteoarthritic changes were observed, erosions were seen in 5%. 20% scans were normal.

US altered the management in 58% (n=21/36) of cases. These alterations to management included: drug added (n=5), drug stopped (n=3), dose increase (n=1), joint injection (n=3), intramuscular injection (n=2). Of the medications added, 3 were DMARDs, 1 was a biologic therapy and one case was not specified. The medications stopped were all DMARDs.

US use in clinic prevented radiological investigation in 72% (26/36) of cases. These were radiology ultrasound (n=23) and MRI (n=3). Hands and wrists scans accounted for 86% of these.

US altered the follow up in 56% (20/36) of cases. Of these, 40% (8/20) were reviewed earlier, and 40% (8/20) of patients were discharged based on ultrasound information.

In 16/36 patients, US did not alter management. The average time taken to scan in clinic was 7 minutes per patient. The median time was 5 minutes, with the average skewed due to a few prolonged scans of multiple anatomical areas.

Conclusion: This audit has demonstrated that US use has impacted on our clinical practice. We identified patients to be seen earlier and altered management based on US findings.

US use also prevented radiological investigations in 72% of cases. This has positive impacts on staffing, finances, radiology department capacity and patient convenience. Furthermore, we were able to discharge 40% of patients who otherwise would have been recalled.

Overall, we believe this audit shows positive impacts of MSUS on patient care. Challenges include time pressures of scanning in clinic, time and cost implications of ultrasound training and the need to standardise and record ultrasound methods and findings consistently. Costs are offset by savings to radiology resources and increased discharges. We plan to expand ultrasound usage and train our colleagues to employ ultrasound for our patients.

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Disclosure of Interests: Andrew Wilkinson: None declared, Mike Reed Speakers bureau: Paid to speak at meeting by Novartis, Sara Else Consultant for: Contributed to advisory boards for: Abbvie, Novartis, Roche and Chungai Pharma., Speakers bureau: Paid to organise and chair meetings, and speak at educational events by following companies: BMS, Cellegene, Grifols, Janssens, MSD, Novartis, UCB.

DOI: 10.1136/annrheumdis-2019-eular.5310

AB1189

THE IMPORTANCE OF POSITRON EMISSION TOMOGRAPHY-COMPUTED TOMOGRAPHY (PET-CT) IN FEVER OF UNKNOWN ORIGIN (FUO) AND INFLAMMATION OF UNKNOWN ORIGIN (IUO)

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Background: Fever of unknown origin (FUO) and inflammation of unknown origin (IUO) are rare clinical problems but diagnostically challenging for clinicians. Patients are exposed to extensive and expensive medical examinations for the identification of the FUO/IUO. FDG PET-CT can help to identify the underlying disease in these patients.

Objectives: The aim of this study was to evaluate the role of PET-CT in patients with FUO/IUO and to identify FDG uptake sites and patterns

Methods: Total of 286 patients who were performed 18F FDG-PET-CT between Jan 2014 and Dec 2017 were evaluated, retrospectively. There were a total 62 patients scanned by PET-CT for FUO/IUO. Definitive diagnosis, PET-CT patterns, organ involvement and SUVmax values in these patients were reevaluated

Results: Rheumatic disease in 27 patients (43.5%), 20 malignancy (32.3%) and 6 infectious diseases (9.7%) were diagnosed in the FUO/IUO patients performed PET-CT scan. Systemic vasculitis were the most frequently diagnosed rheumatic disease. 11 patients of the 62 patients (17.7%) were diagnosed large vessel vasculitis (9 Takayasu arteritis, 2

Temporal arteritis). Significant vascular FDG involvement was detected (77.7%) in these patients. 4 of 7 patients diagnosed Takayasu arteritis were not seen any pathological finding in the other imaging modalities. Vascular FDG uptake ($p < 0.001$) was statistical significantly higher in the patients diagnosed with rheumatic disease whereas lymph node ($p = 0.013$) and bone ($p = 0.005$) FDG uptake were significantly higher in patients with malignancy. Patients with malignancy had the highest SUV-max mean value ($p < 0.001$).

Conclusion: Our findings reveal that PET-CT is a useful imaging modality in the FUO/IUO patients. Inflammatory diseases, especially large vessel vasculitis, should be considered in addition to malignancies in these patients, and subclinical inflammation in the blood vessel can be visualised by PET -CT

Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2019-eular.7085

AB1190

EXTENDED POLY-DIMENSIONAL IMMUNOME CHARACTERIZATION (EPIC): A WEB-BASED IMMUNE REFERENCE ATLAS OF THE HEALTHY HUMAN IMMUNOME AND A TOOL FOR TRANSLATIONAL MEDICINE

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Background: An atlas of the developing immune system will not only improve our understanding of normal immune ontogenesis but more importantly, aid in our identification of disease-associated cell subsets. However, such a resource is still unavailable despite accessibility to technologies like mass cytometry due to the general focus on specific cell subsets or ages. There is a critical unmet need for standardized datasets depicting at single cell level and with high dimensionality the entire developmental gradient of the healthy immune system from the neonatal to adult age.

Objectives: We aim to provide a detailed depiction of the architecture of the human healthy Immunome across an entire age gradient.

Methods: We have created a high dimensional atlas of the healthy human immunome (EPIC: Extended Poly-dimensional Immunome Characterization) by interrogating the peripheral blood mononuclear cells (PBMC) of over 200 healthy subjects, ranging from cord blood to adult age, with 63 unique mechanistic and phenotypic markers per cell by mass cytometry (CyTOF). The EPIC analytical and visualization pipeline is based on an open source web-based R Shiny bioinformatics toolkit that allows it to be easily accessible to the research community.

Results: EPIC can be mined in various ways, for instance to follow developmental changes of any given cell subset or to depict the architecture of the Immunome at any given age range. For example, transition developmental milestones were observed in the TNF α + CD4+ T cells where the size of its memory subset would exceed its naive subset at 8 year old. There was a significant reduction and increase in the frequency of the naive and memory TNF α + CD4+ T cells with a Spearman's correlation coefficient, rho, of -0.4662 and 0.4164 respectively. More importantly, we have built and will keep developing datasets from various immune mediated diseases using the same approach. Consequently, by providing the healthy standard, EPIC enables the depiction and dissection of disease-dependent perturbations of the Immunome architecture.

Conclusion: EPIC provides a transformational conceptual advance in Translational Immunology from individual subset focused to immune architecture based approach for the understating of physiology and pathogenesis of immune mediated mechanisms. We intend to make EPIC available to the entire community in its full capacity.

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None

Disclosure of Interests: Joo Guan Yeo: None declared, Lu Pan: None declared, Martin Wasser: None declared, Pavanish Kumar: None declared, Thaschawee Arkachaisri Speakers bureau: Abbvie Pte, Ltd, Su Li Poh: None declared, Fauziah Ally: None declared, Jing Yao Leong: None declared, Kee Thai Yeo: None declared, Liyun Lai: None declared, Angela Yun June Tan: None declared, Salvatore Albani: None declared

DOI: 10.1136/annrheumdis-2019-eular.4557

AB1191

DIFFERENTIAL DIAGNOSIS OF SERONEGATIVE ARTHRITIS: DIAGNOSIS ONE YEAR FOLLOW UP AFTER FIRST DIAGNOSIS

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Background: The ACR/EULAR classification criteria (AECC) for rheumatoid arthritis (RA) is well known criteria for early diagnosis of RA with high sensitivity. However, the criteria weigh three points for seropositive, thus automatically subtracted 3 points for seronegative arthritis. Recently, elderly onset RA is increasing, that has relatively higher ratio of seronegative than young onset RA.

Objectives: To compare diagnosis of seronegative arthritis between initial and second diagnosis after one year follow up.

Methods: Arthritis patient who are sustained for more than one year since first refer despite his/her ACPA or Rheumatoid Factor were negative, were collected. From these patients, difference from initial diagnosis to second after one year follow up was evaluated statistically with chi square test. Mean EACC score and mean involved joint count for large and small joint (LJC and SJC) at initial diagnosis were compared with each of second diagnosis statistically with Mann Whitney U test (MWU). Clinical course evaluated with 28-joints disease activity score (DAS28) and Health Assessment Questionnaire Disability Index (HAQ-DI) for each diagnosis was compared at every other 3 months with MWU. Comparison between 475 seropositive RA patients treated in the same institute and seronegative RA in the study was also evaluated in a same manner.

These patients' sensitivity and specificity (Sens & Specs) in according with 1987 ACR diagnosis criteria (1987ACR) was also evaluated and compared with Sens & Specs of AECC.

Results: Ninety-six patients were enrolled. In these, RA was diagnosed to 18 patients and 78 were unclassified arthritis as first diagnosis. Second diagnosis of these patients were RA for 41, spondyloarthritis (SpA) for 22, other collagen disease (CD) for 5, osteoarthritis (OA) for 9, hypothyroidism (HTH) for 2, non-tuberculous mycobacterium (NTM) for 1, and unclassified arthritis (UA) for 16. Mean EACC score and range for each second diagnosis was 5.2 and 2 to 7, 4.4 and 3 to 7, 4.4 and 3 to 5, 5.0 and 4 to 6, 4.0 and 4, 4.0, and 4.25 and 3 to 5, for RA, SpA, CD, OA, HTH, NTM, and UA, respectively. There is no significant difference between any pair of second diagnoses. LJC and SJC of each second diagnosis was 3.2 and 9.8, 5.7 and 4.8, 2.4 and 4.8, 2.4 and 8.1, 2.0 and 6, 2 and 2, and 1.8 and 5.9, for RA, SpA, CD, OA, HTH, NTM, and UA, respectively. There is also no significant difference between any pair of second diagnoses (Table).

In clinical course, there is no significant difference between the second diagnoses, and also no significant difference between seropositive and seronegative RA.

In these seronegative arthritis patients, Sens & Specs of RA in accordance with 1987ACR were 75.0% and 43.4%, while 83.3% and 66.7% in accordance with AECC.

Conclusion: Diagnosis of seronegative RA is not uncomplicated, whereas rheumatologist's diagnostic skill is questioned.

Table: Comparison between second diagnosis

Second diagnosis	First diagnosis	N	AECC	Joint point	LJC	SJC
RA	RA(15), UA(26)	41	5.2	3.7	3.2	9.8
SpA	RA(1), UA(21)	22	4.4	3.0	1.9	5.7
CD	UA(5)	5	4.4	2.8	2.4	4.8
OA	RA(2) OA or UA (7)	9	5.0	3.4	2.4	8.1
HTH	UA(2)	2	4.0	3.0	2.0	6.0
NTM	UA(1)	1	4.0	2.0	2.0	2.0
UA	UA(16)	16	4.25	3.0	1.8	5.9

Disclosure of Interests: None declared

DOI: 10.1136/annrheumdis-2019-eular.913