Does AI really help me diagnosing RMDs?

**OP0004**

**AUTOMATED RECOGNITION AND MONITORING OF DORSAL SKIN FOLDS AS A POTENTIAL DIGITAL BIOMARKER FOR JOINT SWELLING IN PATIENTS WITH RHEUMATOID ARTHRITIS**

T. Hügel1, L. Caratsch1, M. Matteo Caorsi2, J. Maglione3, D. Dan1, A. Dumusc4, M. Blanchard1, G. Kalweit5, M. Kalweit5.

1Lausanne University Hospital, CHUV, Department of Rheumatology, Lausanne, Switzerland; 2Lausanne University Hospital, CHUV, Department of Rheumatology, Lausanne, Switzerland; 3Lausanne University Hospital, CHUV, Division of Rheumatology, Lausanne, Switzerland; 4University of Freiburg, Department of Computer Science, Freiburg, Germany

**Background**: To monitor rheumatic diseases, digital biomarkers such as wearables are of increasing interest, but they lack disease specificity.

**Objectives**: In this study, we apply convolution neural networks (CNN) to real world hand photographs in order to automatically detect, extract and analyse dorsal finger fold lines as a correlate of proximal interphalangeal (PIP) joint swelling in patients with rheumatoid arthritis (RA).

**Methods**: Hand photographs from 190 RA patients were taken by a smartphone camera in a standardized manner. PIP joints were categorised as either swollen or not swollen based on clinical judgement and ultrasound. Images were automatically preprocessed by cropping PIP joints and extracting dorsal finger folds. Subsequently, metrical analysis of dorsal finger folds was performed and a CNN was trained to classify the dorsal finger lines into swollen versus non-swollen joints. Representative horizontal finger folds were also quantified in a subset of patients before and after resolution of PIP swelling and in patients with disease flares, respectively.

**Results**: In swollen joints, the number of automatically extracted double-contoured, deep skinfold imprints was significantly reduced compared to non-swollen joints (1.3, SD 0.8 vs. 3.3, SD 0.49). The joint diameter / deep skinfold ratio was significantly higher in swollen (4.1, SD 1.4) versus non-swollen joints (2.1, SD 0.6). The CNN model successfully differentiated swollen from non-swollen joints based on finger fold patterns with a validation accuracy of 0.84. A heatmap of the original images obtained by an extraction algorithm confirmed finger folds as the region of interest for correct classification. After significant response to DMARD +/- corticosteroid therapy, longitudinal metrical analysis of eight representative deep finger folds showed a decrease of the mean diameter / finger fold length (finger fold index, FFI) from 3.03 (SD 0.68) to 2.08 (SD 0.57). Conversely, the FFI increased in patients with a flare of joint swelling.

**Conclusion**: Automated preprocessing and the application of CNN algorithms in combination with longitudinal metrical analysis of dorsal finger fold patterns extracted from real world hand photos might serve as a digital biomarker in RA.

**Disclosure of Interests**: Thomas Hügie Shareholder of: Areon SA, Speaker bureau: Multiple. Not relevant for this work.; Leo Caratsch: None declared, Matteo Matteo Caorsi Employee of: MC is an employee of L2F, Jules Maglione: None declared, Diana Dan: None declared, Alexandre Dumusc Speakers bureau: Multiple. Not relevant for this work.; Marc Blanchard Shareholder of: Areon SA., Gabriel Kalweit: None declared, Maria Kalweit: None declared.


How to maintain your quality of life after an RMD diagnosis

**OP0005-PARE**

**DEVELOPMENT OF CONVERSATION AIDS: HOW TO GET THE MOST OUT OF YOUR RMD APPOINTMENT AND ADVANCE YOUR QUALITY OF LIFE**


1National Association ReumaZorg Nederland, Patientexpert and Coordinator at the Department of Patient participation and Communication, Nijmegen, Netherlands; 2National Association ReumaZorg Nederland, Coordinator at the Department of Patient participation and Communication, Nijmegen, Netherlands; 3Bravis Medical Centre, Rheumatology Nurse at the Department of Rheumatology, Rosendaal, Netherlands; 4National Association ReumaZorg Nederland, President of the Board, Nijmegen, Netherlands

**Background**: Having a Rheumatic and Musculoskeletal Disease (RMD) has a big impact on your daily life, work, relationships and quality of life. It can cause various complaints, problems and questions. Research shows that people with an RMD are often insufficiently aware that they can talk about these challenges with their RMD professional. They also don't realize that these challenges matter when making a fitting choice for treatment. It also appears that RMD professionals do not sufficiently take into account the priorities of their patient, when a treatment choice has to be made. This is unfortunate because those people who decide together with their RMD professional make better informed treatment choices. They are also more likely to adhere to their treatment or medication use. A conversation aid can help people to become aware of the most important challenges or problems in their daily lives with an RMD. These uncovered challenges and problems can set the agenda for a good conversation in the RMD consultation room. Together with the RMD professional, the conversation can focus on ways to deal with or treat these challenges or problems.

**Objectives**: To develop a conversation aid for people with an RMD that allows them to become aware of the most important challenges in their life with an RMD and that guides them in how to discuss these aspects with an RMD professional.

**Methods**: In the first step a review was made of all important aspects of a patient's life with an RMD. The outcome measures of ICHOM for inflammatory arthritis1 and hip- and knee osteoarthritis2 formed the starting point for this review. This was complemented with additional outcomes as measured in Dutch RMD apps and patient dashboards of Dutch hospitals. In the second step, the list of outcomes was assessed by means of a survey among Dutch patients with an RMD. The third step was to discuss the complete list with important outcomes with the Dutch rheumatology department of the Bravis Medical Centre. A first draft version of the conversation aids was made. This draft version was evaluated by patientpartners of the National Association ReumaZorg Nederland (RZN) and the Bravis Medical Centre.

**Results**: A total of 4 conversation aids (https://reumazorgnederland.nl/samen-beslissen-gesprekskaarten/) were made. Each aid addressing a main category of challenges with an RMD. Each main category was divided into 5 sub-categories. The 4 conversation aids are:

- **Disease**: Concerning the sub-categories: Disease activity, pain, fatigue, medication & side effects and knowledge about the disease.
- **Daily activity**: Concerning the sub-categories: Work/school, personal care, household & family, mobility, and spare time.