Predicta Med

A Novel Tool for Clinical Decision Support in Early Autoimmune Disease Diagnosis

Dreyfuss M, Riesel D, Getz B, Ramni O, Jenudi Y, Steinberg-Koch S, Underberger D

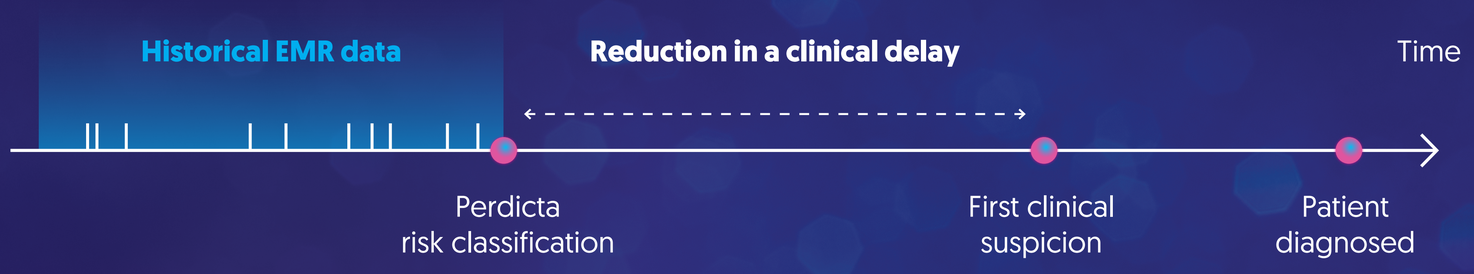
BACKGROUND

Patients with autoimmune disorders such as rheumatoid arthritis (RA), psoriatic arthritis (PsA) and systemic lupus erythematosus (SLE) often experience a delay from presentation to medical providers to diagnosis [1,2,3]. We developed and tested machine learning tools to aggregate and analyze EMR data, and indicate if a patient may be at risk for having an undiagnosed autoimmune disease.

METHODS

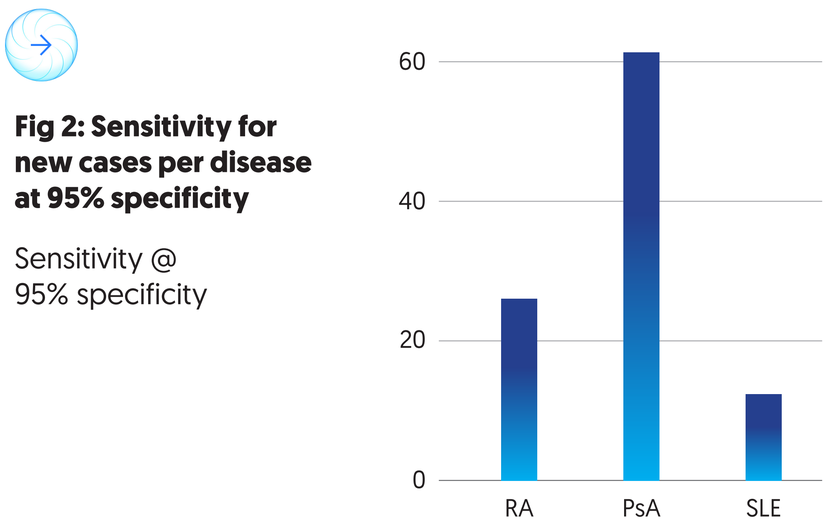
Adult patients with no prior evidence of target who had recorded primary care visits at the Mayo Clinic were split into train (20%) and test (80%) sets. Using diagnoses, symptoms extracted from progress notes, lab results, medical encounters and prescribed medications as input features, models were trained and assessed on their ability to identify cases with first recorded diagnosed in 2018 at 95% specificity (Fig 1).

Fig 1: Model design using historical data to identify patients identified after 2018



Results: The test population consisted of controls (n = 269,291) and incident cases of RA (n = 377), PsA (n = 81) and SLE (n = 29) in 2018. Model performance is displayed in Fig 2. AUCs were 73.6, 82.7 and 73.6 for RA, PsA and SLE respectively.

Fig 2: Sensitivity for new cases per disease at 95% specificity



DISCUSSION

Patients diagnosed early with RA, PsA and SLE tend to have better outcomes, require fewer interventions and medical resources, and report better quality of life measures than patients who experience a delay in diagnosis [5,6,7]. The models reported here were able to identify a substantial portion of incident cases of each disease before first recorded diagnosis in their EMRs. Such models could be useful in assisting providers to identify such patients earlier, which may reduce delays of diagnoses We have designed a platform that integrates model output directly into EMRs to indicate that a patient is at-risk for an undiagnosed immune-related condition (Fig 4), and provides diagnostic work-up and management recommendations based on clinical guidelines. Future directions include enhanced extraction of clinically relevant features from progress notes and prospective studies are needed to assess potential benefit of the system for identification of patients undiagnosed patients, and ultimately in patient outcomes.

Fig 3: The 10 most important contributing features to each model by feature importance

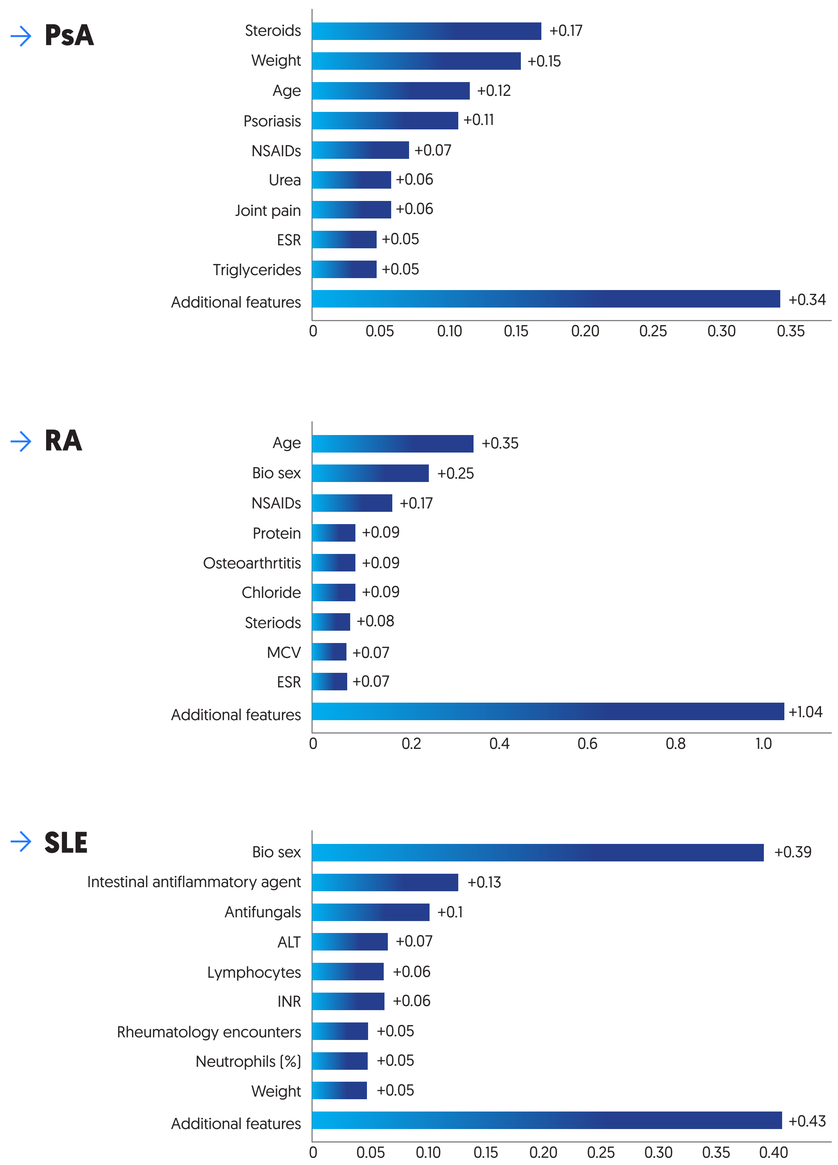


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Fig 4: example screen of a risk flag integrated into an EMR