Using AI to Predict Progression from Psoriasis to Psoriatic Arthritis in a Real-World Dataset

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Background

Up to 30% of patients with psoriasis (PsO) progress to psoriatic arthritis (PsA), yet understanding which specific patients will develop PsA remains challenging. This lack of predictability hinders early diagnosis and intervention, especially in dermatology settings in which PsO patients are receiving care. Earlier identification can lead to better clinical outcomes and disease trajectories for these patients, including by aiding physicians in focusing attention and resources. Artificial intelligence (AI) methods are well-suited to identify patterns in complex datasets, including isolating digital phenotypes from patient journeys that may signal future diagnoses. In this study, a real-world dataset was analyzed using a digital phenotyping tool to predict PsO patients' future risk of developing PsA.

Methods

This study used a subset of a large, multi-source US dataset drawn from linked electronic health record (EHR) data and medical and pharmacy claims (the OM1 Real-World Data Cloud). Within this dataset, two cohorts of patients were identified. The first (the Positive Cohort) comprised patients with diagnosed PsO and subsequent diagnosed PsA; the second (the Non-Positive Cohort), patients with diagnosed PsO and no diagnoses of PsA in their history. Using these groups' structured health history data, including diagnoses, procedures, labs, medications, and demographic information, an AI-based digital phenotyping tool (OM1 PhenOM®) was calibrated to isolate a phenotype corresponding to PsO-to-PsA progression. The tool's performance in predicting future PsA using data available at patients' first diagnosis of PsO was assessed.

Results

The Positive Cohort comprised 103,589 patients, and the Non-Positive Cohort comprised 1,035,845 patients. The median time interval between PsO and PsA diagnosis in the Positive Cohort was 1.5 years, with more than one quarter of patients receiving their PsA diagnosis more than 4 years after their PsO diagnosis (Figure 1). The digital phenotyping tool performed well in predicting future diagnosis of PsA as of initial PsO diagnosis, with an area under the receiver-operating characteristics curve (AUC) of 0.78 in testing (Figure 2). Patients assessed at elevated risk were significantly more likely than others to develop PsA in the future. For example, patients in the 99th risk percentile – those at greater PsA risk than 99% of PsO patients – were approximately 6.5x more likely to be diagnosed with PsA in the future (Figure 3).

Conclusions

- This study highlights the significant potential of utilizing real-world data and AI-powered digital phenotyping for the prospective identification of PsO patients at elevated risk of developing PsA, potentially years before clinical diagnosis.
- Strong performance was achieved using data known at patients' first PsO diagnosis. Predictions were based on complex, multifactorial risk data profiles.
- These findings can inform strategies for identifying and engaging higher-risk patients, particularly in dermatology practice settings.
- The application of this technology holds promise for achieving improved clinical outcomes and better disease trajectories for PsO patients at risk of progression to PsA.

Figure 1. Time between first PsO and first PsA diagnoses for patients in the Positive Cohort.

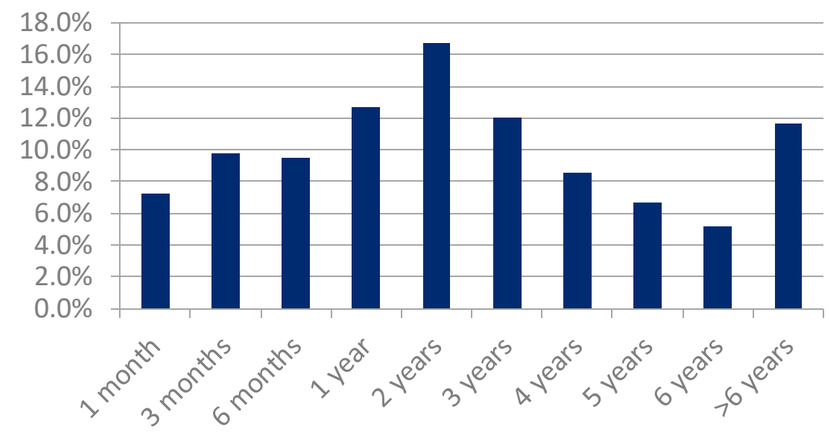


Figure 2. Performance of the AI tool in predicting risk of future PsA diagnosis in PsO patients, using all health information available prior to initial PsO diagnosis.

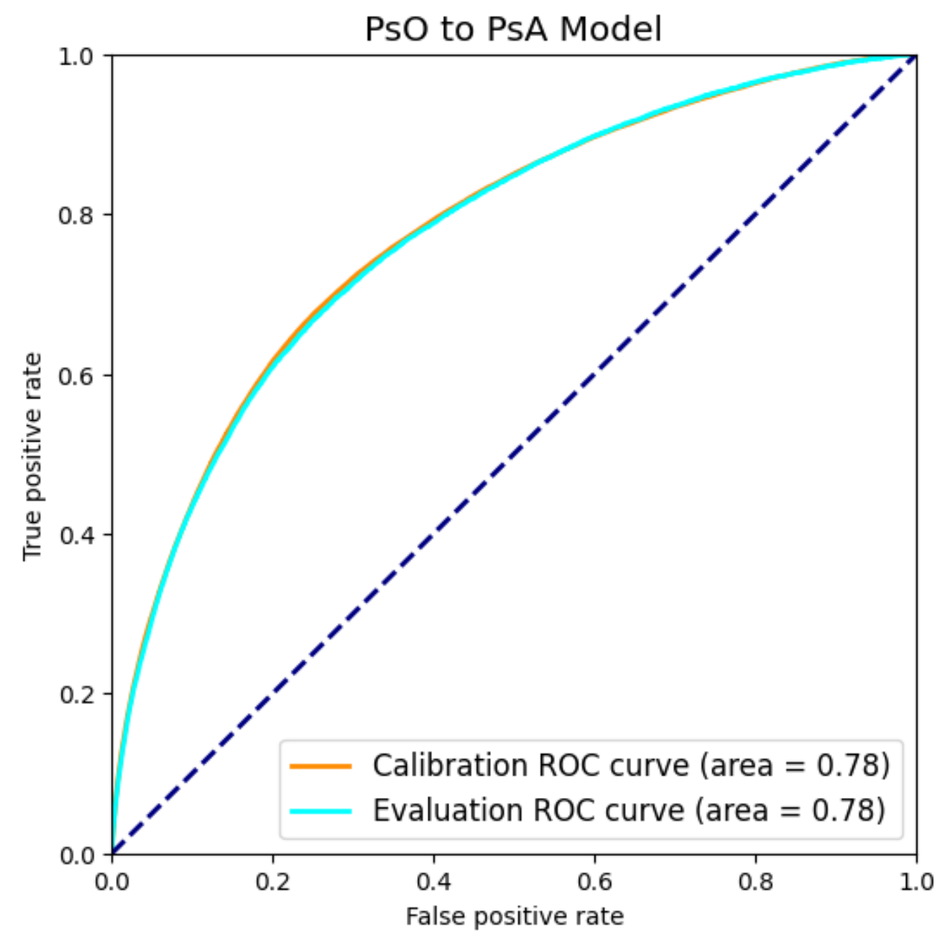
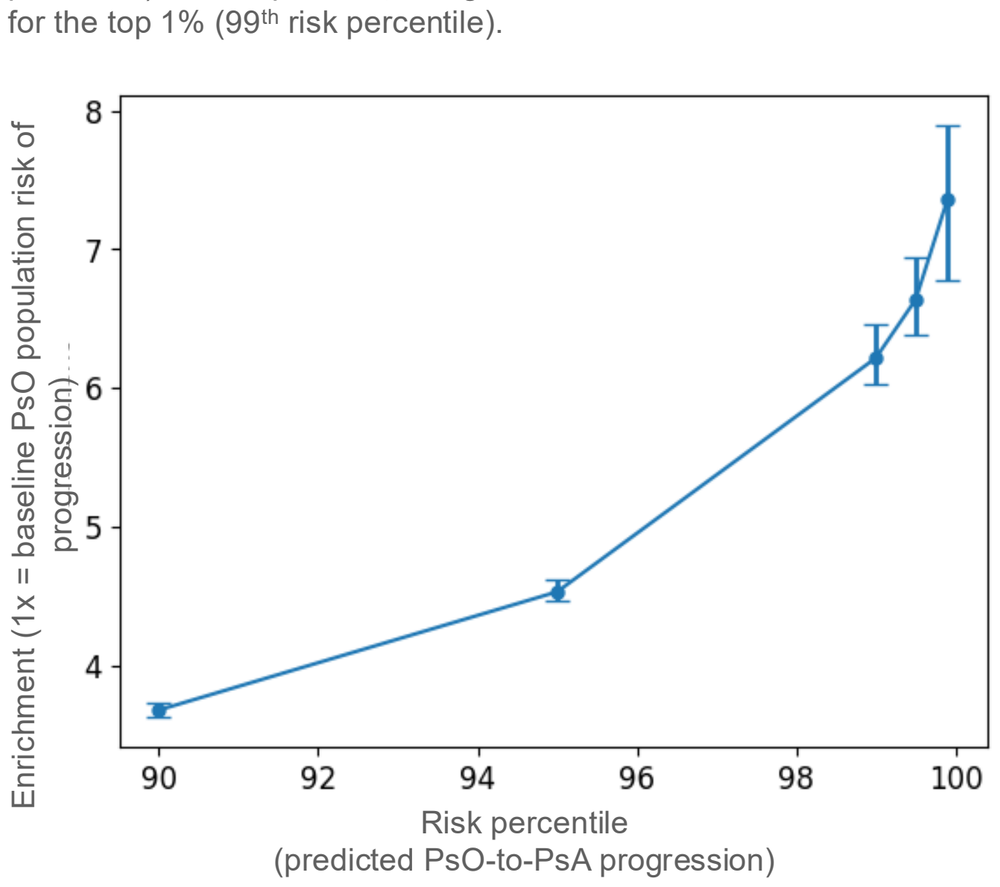


Figure 3. Enrichment plot showing greater than 7x increased likelihood of progression to PsA among the top 0.1% (99.9th risk percentile) of PsO patients, and greater than 6x increased likelihood for the top 1% (99th risk percentile).



Conference

Presented at the European Academy of Dermatology and Venereology (EADV) Congress. September 17-20, 2025. Paris, France

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