Supplementary Online Content

Schneeweiss MC, Kim SC, Schneeweiss S, Rosmarin D, Merola JF. Risk of inflammatory arthritis after a new diagnosis of hidradenitis suppurativa. *JAMA Dermatol.* Published online January 22, 2020. doi:10.1001/jamadermatol.2019.4590

This supplementary material has been provided by the authors to give readers additional information about their work.

eAppendix. Methods

Data source

We used longitudinal claims data from a commercial insurance claims database, IBM MarketScan Database, covering 185 million patients in the US between January 1, 2003 and January 1, 2017. Data were drawn from large employers, health plans, and public organizations in the United States. The database contains dated information on plan enrollment, healthcare utilization and expenditures, demographics, and integrated records for inpatient events, outpatient events, and pharmacy dispensing. All patient information was de-identified. The Brigham and Women's Hospital's institutional review board approved this study, and signed data licensing agreements were in place.

Study Cohort

We identified patients of all ages who were diagnosed with HS (ICD-9 705.83 or ICD-10 L73.2) according to the following validated criteria: one HS diagnosis by a dermatologist or three HS diagnoses by any provider.[1] The cohort entry date for the HS group was the first-recorded diagnosis date of HS after at least 180 days of continuous enrollment. Given the left censored nature of claims data from commercially insured patients this definition may not be truly newly diagnosed HS patients. For the non-HS group (reference), we risk-set sampled 2 non-HS patients from all plan enrollees who were not diagnosed with HS matched on the HS patient's cohort entry date.[2] The non-HS group was also required to have at least 180 days of continuous enrollment before the matched cohort entry date. Either HS or non-HS patients were excluded if they had a diagnosis of rheumatoid arthritis, connective tissue disease (systemic lupus erythematosus, Sjogren's syndrome,

systemic sclerosis), other spondyloarthritis including psoriatic arthritis, ankylosing spondylitis and systemic vasculitis any time prior to the cohort entry date (**eFigure**).

Outcomes

The outcomes of interest include (1) ankylosing spondylitis (2 outpatient diagnoses with ≥ 2 months apart and ≤ 2 years between diagnosis or 1 rheumatologist diagnosis, or 1 inpatient diagnosis),[3] (2) psoriatic arthritis (2 rheumatologist diagnoses of psoriatic arthritis or 1 dermatologist diagnosis of psoriasis plus 1 rheumatologist diagnosis of psoriatic arthritis or 1 inpatient diagnosis of psoriatic arthritis),[4,5] (3) 'other spondyloarthritis' (2 outpatient diagnoses with ≥ 2 months apart and ≤ 2 years between diagnosis or 1 rheumatologist diagnosis, or 1 inpatient diagnosis),[6] and (4) rheumatoid arthritis (2 outpatient diagnoses with ≥ 2 months apart and ≤ 2 years between diagnosis or 1 inpatient diagnosis).[6] The study outcome, 'other spondyloarthritides,' included the following conditions: spinal enthesopathy (excluding ankylosing spondylitis which is captured separately), reactive arthropathy, sacroiliitis, and other unspecified inflammatory spondylopathies (**eTable 1** for specific ICD codes). The event date is the date on which all criteria are fulfilled. The primary analysis used a variable-length follow-up design. Follow-up began one day after the cohort entry date and lasted until one of the following events occurred: occurrence of outcome, death, disenrollment, end of enrollment, and end of data stream, whichever came first (**eFigure**).[7,9]

Baseline patient characteristics

All patient characteristics were assessed during the 180 days before cohort entry, including the day of cohort entry. The following patient characteristics were considered: age at cohort entry, sex,

region, health care utilization patterns (i.e., number of outpatient visits and number of unique prescription medications), use of systemic biologic or systemic non-biologic immuno-modulatory agents, comorbidities (i.e., psoriasis or inflammatory bowel disease) and combined comorbidity score.[8] The combined comorbidity score is a validated comorbidity score optimized for adjusting a range of comorbidities including diabetes, hypertension, chronic pulmonary disease, renal disease and more (**eTable 2** for details).[8] In the setting of the reported increased co-prevalence of psoriasis and inflammatory bowel disease, the baseline prevalence of these comorbidities was assessed in HS patients compared to non-HS patients and potential confounding by these comorbidities was adjusted using 1:1 propensity-score matching.

eReferences

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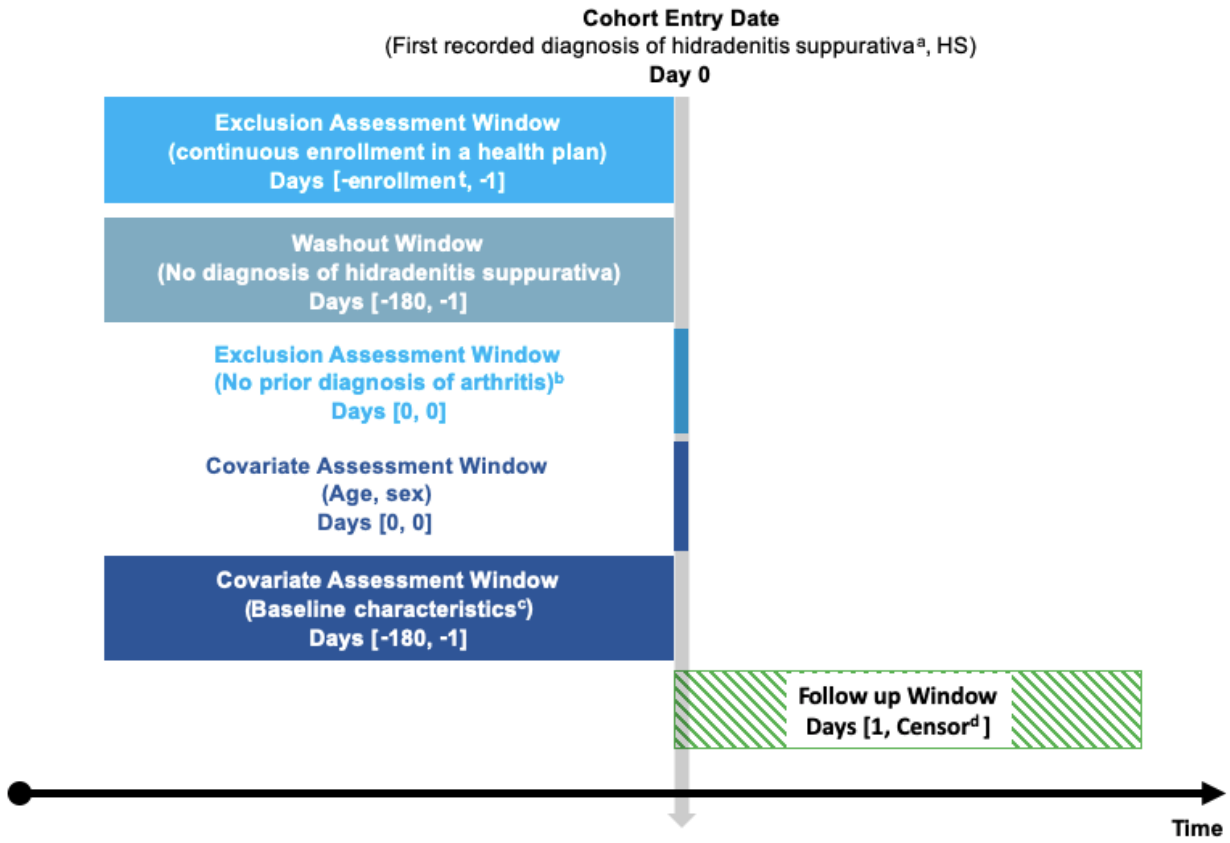
eFigure. Overview of Longitudinal Study Design[9]



Abbreviations: HS, Hidradenitis suppurativa.

a One recorded diagnosis of HS by a dermatologist or three recorded diagnoses of HS by any physician

b Exclusions included: Any prior diagnosis of ankylosing spondylitis, psoriatic arthritis, other spondyloarthritis (i.e., spinal enthesopathy, sacroiliitis, reactive arthritis, unspecified inflammatory spondyloarthritis), rheumatoid arthritis, connective tissue disease (i.e., systemic lupus erythematosus, Sjogren's syndrome, systemic sclerosis, localized sclerosis), or systemic vasculitis any time prior to the cohort entry date

c Baseline characteristics included: region, health care utilization patterns (i.e., number of outpatient visits and number of unique prescription medications), use of systemic biologic or systemic non-biologic immuno-modulatory agents, comorbidities (i.e., psoriasis or inflammatory bowel disease) and combined comorbidity score

d Earliest of: outcome of interest (i.e., ankylosing spondylitis, psoriatic arthritis, 'other spondyloarthritis', or rheumatoid arthritis), death, disenrollment, end of data stream

eTable 1. *International Classification of Disease* (*ICD*) Codes Used for Creating This Study's Outcome Measures

	ICD-9		*ICD-10*	
Diagnosis	Code	Description	Code	Description
Ankylosing spondylitis	720.0	Ankylosing spondylitis	M45.x	Ankylosing spondylitis
Psoriatic arthritis	696.0	Psoriatic arthropathy	L40.5x	Arthropathic psoriasis
Other Spondyloarthritis				
…Spinal enthesopathy	720.1	Spinal enthesopathy	M46.0x	Spinal enthesopathy
…Sacroiliitis	720.2	Sacroiliitis, not elsewhere classified	M46.1	Sacroiliitis, not elsewhere classified
…Reactive Arthritis	099.3	Reiter's Arthritis	M02.3x	Reiter's disease
	711.1x	Arthropathy associated with Reiter's disease & nonspecific urethritis	M02.8	Other reactive arthropathies
			M02.9	Reactive arthropathy, unspecified
…Other inflammatory spondylopathies	720.8x	Other inflammatory spondylopathies	M46.8x	Other specified inflammatory spondylopathies
			M46.9x	Unspecified inflammatory spondylopathy
Rheumatoid arthritis	714.x	Rheumatoid arthritis and other inflammatory polyarthopathies[a]	M05.x	Rheumatoid arthritis with rheumatoid factor
			M06.x	Other rheumatoid arthritis
			M08.x	Juvenile arthritis
			M12.0x	Chronic postrheumatic arthropathy

Abbreviations: ICD-9, International Classification of Diseases, Ninth Revision; ICD-10, International Classification of Diseases, Tenth Revision.
[a] ICD-9 code 714.x - *Rheumatoid arthritis and other inflammatory polyarthopathies* (includes 714.3x - *Juvenile chronic polyarthritis* and 714.8x – *Other inflammatory polyarthritis*)

eTable 2. Components Included in the Combined Comorbidity Score [8]

Condition	Weight
Metastatic Cancer	5
Congestive Heart Failure	2
Dementia	2
Renal failure	2
Weight loss	2
Hemiplegia	1
Alcohol abuse	1
Any tumor	1
Cardiac arrhythmias	1
Chronic pulmonary disease	1
Coagulopathy	1
Deficiency anemia	1
Fluid and electrolyte disorders	1
Liver disease	1
Peripheral vascular disorder	1
Psychosis	1
Pulmonary circulation disorder	1
HIV/AIDS	-1
Hypertension	-1

eTable 3. Follow-up Time and Reasons for Censoring After Propensity Score Matching

Outcome of interest	HS n = 70,697					Non-HS n = 141,412				
	Median follow-up time in days [IQR]	Outcome reached # (%)	Death [a] # (%)	End of patient data # (%)	End of enrollment # (%)	Median follow-up time in days [IQR]	Outcome reached # (%)	Death [a] # (%)	End of patient data # (%)	End of enrollment # (%)
Ankylosing spondylitis	528 [209, 1,109]	97 (0.1%)	0 (0.0%)	22,042 (31.2%)	48,558 (68.7%)	540 [213, 1,138]	79 (0.1%)	0 (0.0%)	45,605 (32.3%)	95,728 (67.7%)
Psoriatic arthritis	527 [208, 1,108]	190 (0.3%)	0 (0.0%)	21,997 (31.1%)	48,510 (68.6%)	540 [213, 1,138]	112 (0.1%)	0 (0.0%)	45,589 (32.2%)	95,711 (67.7%)
Other Spondylo-arthritis [b]	525 [208, 1,101]	570 (0.8%)	0 (0.0%)	21,819 (30.9%)	48,308 (68.3%)	538 [212, 1,135]	577 (0.4%)	0 (0.0%)	45,331 (32.1%)	95,504 (67.5%)
Rheumatoid arthritis	519 [202, 1,090]	1,023 (1.4%)	0 (0.0%)	21,688 (30.7%)	47,986 (67.9%)	535 [210, 1,130]	914 (0.6%)	0 (0.0%)	45,272 (32.0%)	95,226 (67.3%)

Abbreviations: HS, Hidradenitis suppurativa; IQR, inter-quartile range.

[a] In the Marketscan claims database, out of hospital mortality is under recorded and subsumed in the disenrollment;

[b] Other Spondyloarthritis (excluding ankylosing spondylitis): spinal enthesopathy, sacroiliitis, reactive arthritis, unspecified inflammatory spondyloarthritis.