

Development and validation of a claims-based algorithm for hidradenitis suppurativa severity

Maria C Schneeweiss^{1,2} P Anand,¹ A Mostaghimi,^{2,3} J Landon,^{1,2} D Shay,¹ O Davies,³ A Kumar,³ A Shang,⁵ T Tran,⁴ K Lin,^{1,2,6,7} R Wyss^{1,2}

1) Division of Pharmacoepidemiology and Pharmacoeconomics, Department of Medicine, Brigham and Women's Hospital, Boston, MA, USA

2) Harvard Medical School, Boston, MA, USA

3) Department of Dermatology, Brigham and Women's Hospital, Boston, MA, USA

4) UCB, Brussels, Belgium

5) UCB, Basel, Switzerland

6) Clinical Phenotyping and Outcome Validation Program, Mass General Brigham Center for Integrated Healthcare Data Research, Boston, MA, USA

7) Division of General Internal Medicine, Department of Medicine, Massachusetts General Hospital, Harvard Medical School, Boston, MA, USA



Presentation Number: 63547

OBJECTIVE:

- Develop and validate a claims-based algorithm for identifying patients with mild, moderate, or severe hidradenitis suppurativa (HS)

Figure 1: Mass General Brigham (MGB) electronic health records (EHR) were linked to Medicaid claims data in the US



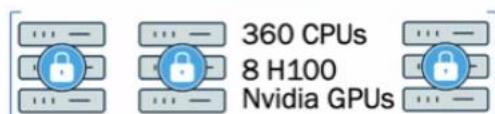
MGB EHR data:

- Free text notes
- Nursing notes
- Imaging
- Pathology
- Biobank
- Labs, etc.



Claim data:

- Medicare
- Medicaid
- Commercial



Background:

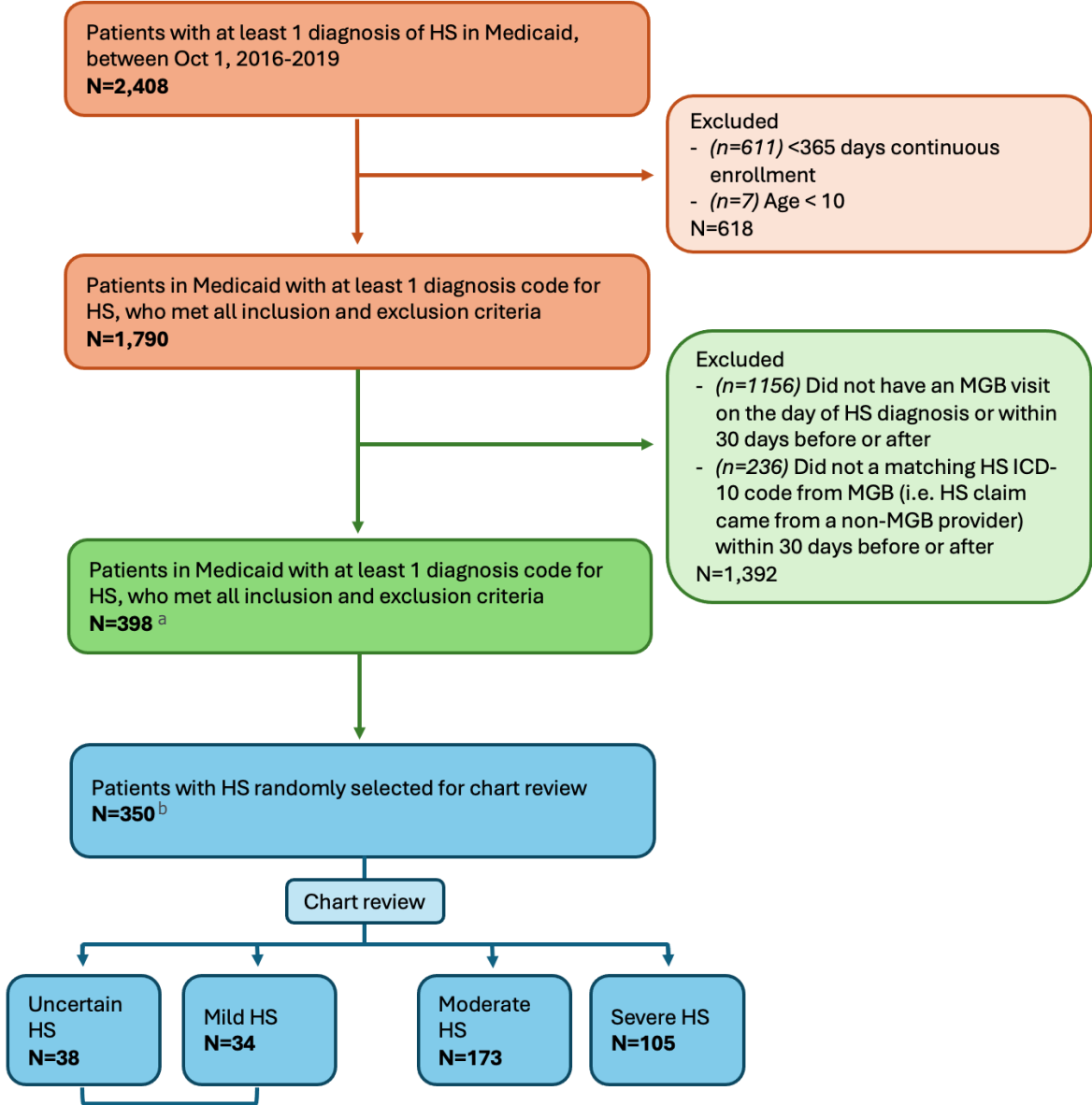
- Information on **HS severity** is **not available** in administrative **claims databases**.

Methods:

- Identified patients who received an ICD-10 diagnosis code for HS (L73.1) in Medicaid (Oct 2016-Dec 2019) and MGB (**Fig. 1**).
- Chart review determined HS severity as mild, moderate or severe.
- A multinomial LASSO regression within a **70% training sample** determined the most influential claims-based variables out of 30 candidates associated with mild, moderate, or severe HS.
- This model was used to calculate the positive predictive values (PPVs) for each level of HS severity within the **30% hold-out testing sample**.

HS: hidradenitis suppurativa; MGB: Mass General Brigham; EHR: Electronic health records; LASSO: Least absolute shrinkage and selection operator; ICD-10: International classification of diseases, tenth edition; PPV: positive predictive value.

Included Patients



Selected Baseline Characteristics^c

	Mild / uncertain HS	Moderate HS	Severe HS
Number of patients, n	72	173	105
Age (years), mean ± SD	32.8 ± 12.3	32.3 ± 11.9	33.7 ± 12.1
Female, n (%)	59 (81.9)	143 (82.7)	80 (76.2)
Black, n (%)	10 (13.9)	32 (18.5)	31 (29.5)
Obesity, n (%)	17 (23.6)	54 (31.2)	40(38.1)
HS-related treatments, n (%)			
Topical HS treatment	24 (33.3)	58 (33.5)	46 (43.8)
Systemic antibiotics	18 (25.0)	66 (38.2)	55 (52.4)
Hormone treatments	15 (20.8)	57 (32.9)	41 (39.0)
Any Biologic use	1 (1.4)	4 (2.3)	15 (14.3)
Adalimumab use	0 (0)	2 (1.2)	8 (7.6)
HS-related procedures, n (%)			
Incision and drainage	7 (9.7)	32 (18.5)	16 (15.2)
HS-specific surgery	0 (0)	0 (0)	11 (10.5)
No. prior derm visits, n (%)			
1	16 (22.2)	24 (13.9)	27 (25.9)
2	10 (13.9)	20 (11.6)	12 (11.4)
Prior inpatient HS, n (%)	6 (8.3)	5 (2.9)	14 (13.3)

[a] These exclusions are related to linkage to MGB. **[b]** After all inclusion and exclusion criteria were met, a random sample of 350 patients was chosen for chart review and model development. **[c]** This is a selection of baseline characteristics, recorded in the 365 days prior, for patients with at least one ICD-10 diagnosis code for HS grouped by HS severity. MGB: Mass General Brigham; SD: standard deviation.

Positive predictive values for correctly identifying true HS in Medicaid claims-data

PPV 89%: Among 350 patients with at least one ICD-10 diagnosis code for HS recorded in Medicaid claims data, 312 had HS confirmed in the MGB chart review resulting in a **PPV of 89%**.

1 HS diagnosis	Total	False positive	True positive	PPV (95% CI)
By any provider	350	38	312	89 % (86%, 92%)
By dermatologist	139	9	130	94% (89%, 98%)
Plus any biologic ^a	20	0	20	100% (84%, 100%)

PPV 100%^a: 20 patients had a single code for HS followed by biologic treatment resulting in a **PPV of 100%**

[a] Any biologic includes treatment with the following medications: adalimumab, infliximab, anakinra, ustekinumab, secukinumab, and ixekizumab. HS: hidradenitis suppurativa; PPV: positive predicate value; CI: confidence interval; MGB: Mass General Brigham; ICD-10: International classification of diseases, tenth edition.

Measurement characteristics for the multinomial LASSO model identifying mild/uncertain, moderate, and severe HS in claims-data*

3 severity categories

Diagnostic	HS Severity		
	Mild/uncertain HS ^a	Moderate HS	Severe HS
	(n=72)	(n=173)	(n=105)
Positive Predictive Value	0.20	0.54	0.67
Negative Predictive Value	0.80	0.50	0.82
Sensitivity	0.05	0.82	0.45
Specificity	0.96	0.31	0.90
Overall multiclass c-statistic for model: 0.66			

2 severity categories

Diagnostic	HS Severity	
	Mild or Moderate HS vs. Severe HS	
Positive Predictive Value	0.71	PPV ^b : among as severe, 71% severe
Negative Predictive Value	0.80	
Sensitivity	0.48	
Specificity	0.92	
Overall multiclass c-statistic for model: 0.75		

PPV^b: among those classified as severe, **71% were truly severe**

*The reported performance metrics are derived in the 30% holdout testing sample that was not used for the development of the claims data algorithm
[a] Patients with mild HS and uncertain HS were combined into one group. **[b]** In a sensitivity analysis we combined severity into “mild/uncertain/moderate HS versus severe HS” and achieved a PPV of 71%, meaning that among those classified as severe, 71% were truly severe. HS: hidradenitis suppurativa; PPV: Positive predictive value; LASSO: Least absolute shrinkage and selection operator.

CONCLUSION:

- A single ICD-10 diagnosis code for HS can accurately capture the existence of HS in claims data.
 - For researchers who want to identify their HS population in claims, in the absence of EHR data to confirm HS status, the high PPV (89%) for identifying the sample of HS patients with one ICD-10 code helps to ensure a true HS population.
- Patients with severe HS can be reasonably well differentiated using our algorithm in claims data; however, it performed insufficiently to fully capture mild HS.
 - In part, this was due to the very small number of mild cases.
- This algorithm can accurately distinguish mild/moderate HS versus severe HS.

Disclosures: Drs. Wyss, Lin, Anand, Shay, Davies, and Kumar have no financial disclosures to report. Dr. M. Schneeweiss has received a research grant to the Brigham and Women's Hospital from UCB. Dr. Mostaghimi reports personal fees from Pfizer, Digital Diagnostics, 3Derm, AbbVie, Bioniz, Concert, Lilly, Hims, and participation in clinical trials with Incyte, Aclaris, Concert, and Lilly outside the submitted work. Dr. Tran is an employee of UCB receiving stock and/or stock options. Dr. Shang is an employee of UCB receiving stock and/or stock options.

Funding/Support: The study was funded by a research grant from UCB to the Brigham and Women's Hospital

IRB approval: The Brigham and Women's Hospital's institutional review board approved this study, and a signed data licensing agreement was in place.