Identifying Psoriasis and Psoriatic Arthritis Patients in Retrospective Databases When a Diagnosis Code Is Not Available: A Validation Study Comparing Medication/Prescriber Visit Based Algorithms to Diagnosis Codes

Wendy Dobson-Belaire, PhD[1]; Jason Goodfield, BMSc/HBA[1]; Richard Borrelli, MBA[1]; Fei Fei Liu, BSc(Pharm), MBA[2]; Zeba M. Khan, RPh, PhD[3]

[1]IMS Brogan, a unit of IMS Health, Mississauga, ON, Canada; [2]Celgene Inc., Mississauga, ON, Canada; [3]Celgene Corporation, Summit, NJ, USA

BACKGROUND

- Diagnosis code-based algorithms are the primary method of identifying patient cohorts in retrospective studies from administrative drug databases. However, many databases lack reliable diagnosis code information, such as the case with the largest and most nationally representative administrative database in Canada. This can impair the ability of researchers to gain valuable insight into real-world drug utilization and treatment patterns.
- Thus, a need exists to develop an algorithm to infer patients' diagnoses when leveraging drug claim databases that lack diagnosis codes.

OBJECTIVES

- To develop a precise diagnosis-independent algorithm based on a combination of medication claims and prescriber visits (MC/PV) to identify psoriasis patients and psoriatic patients with arthritic conditions, a proxy for psoriatic arthritis (PsA).
  - This algorithm will be available for the purpose of conducting subsequent drug utilization studies in Canadian databases without diagnosis codes.
- To validate the proposed algorithm by comparing the predicted results against actual patient diagnoses in a database where both MC/PV and diagnoses are present.

METHODS

Algorithm Development

- Diagnosis-inference algorithms using MC/PV were developed based on reviews of published treatment guidelines, physician consultation, and literature findings for psoriasis and PsA.
- The psoriasis algorithm includes:
  - Patients with ≥1 or ≥2 medication claims for psoriasis defining molecules (**Table 1**).
- The psoriasis with arthritic conditions algorithm includes:
  - Patients who satisfied the psoriasis algorithm, AND
  - With ≥1 or ≥2 medication claims for psoriasis with arthritic conditions defining molecules (**Table 1**), OR
  - With ≥1 or ≥2 medical claims from a rheumatologist visit in a clinical setting.
- All psoriasis and psoriasis with arthritic conditions algorithms tested are presented in **Table 2**.
- Psoriasis and PsA medications with broad indication profiles, such as topical corticosteroids and non-steroidal anti-inflammatory drugs (NSAIDs), were excluded to emphasize algorithm precision.

Table 1. Psoriasis and Psoriasis With Arthritic Conditions Algorithm Selection Molecules

Psoriasis Defining Molecules	Psoriasis With Arthritic Conditions Defining Molecules
Acitretin	Abatacept
Anthralin	Anakinra
Calcipotriene	Azathioprine
Calcipotriene + betamethasone	Certolizumab pegol
Calcitriol	Golimumab
Methoxsalen	Hydroxychloroquine
Trioxsalen	Leflunomide
	Rituximab
	Sulfasalazine
	Tocilizumab

Table 2. PPV, NPV, Sensitivity, and Specificity Results of Multiple Pharmacy Data and Prescriber Specialty Algorithms

Case	Algorithm	PharMetrics Reference	PPV % (95% CI)	NPV % (95% CI)	Specificity % (95% CI)	Sensitivity % (95% CI)
Psoriasis	≥1 psoriasis MC	≥1 psoriasis Dx	78 (78-79)	99 (99-99)	100 (100-100)	22 (22-22)
	≥1 psoriasis MC	≥2 psoriasis Dx	65 (65-66)	99 (99-99)	100 (100-100)	30 (30-30)
	≥2 psoriasis MC	≥1 psoriasis Dx	85 (84-85)	99 (99-99)	100 (100-100)	13 (13-14)
	≥2 psoriasis MC	≥2 psoriasis Dx	75 (75-76)	99 (99-99)	100 (100-100)	19 (19-19)
Psoriasis with arthritic conditions	≥1 psoriasis MC AND ≥1 PsA MC OR ≥1 RHEUM	≥1 PsA Dx OR ≥1 psoriasis AND RA Dx	56 (54-57)	100 (100-100)	100 (100-100)	11 (11-12)
	≥1 psoriasis MC AND ≥1 PsA MC OR ≥1 RHEUM	≥2 PsA Dx OR ≥2 psoriasis AND RA Dx	50 (48-51)	100 (100-100)	100 (100-100)	13 (13-14)
	≥2 psoriasis MC AND ≥2 PsA MC OR ≥2 RHEUM	≥1 PsA Dx OR ≥1 psoriasis AND RA Dx	65 (63-66)	100 (100-100)	100 (100-100)	6 (6-7)
	≥2 psoriasis MC AND ≥2 PsA MC OR ≥2 RHEUM	≥2 PsA Dx OR ≥2 psoriasis AND RA Dx	60 (58-62)	100 (100-100)	100 (100-100)	8 (8-9)

All values shown in the format of number (percentage) unless otherwise indicated.
CI=confidence interval; Dx=diagnosis code; RA=rheumatoid arthritis; RHEUM=claim by a rheumatologist.

Data

- Algorithm validation was conducted using the PharMetrics Plus™ (PharMetrics) database, which is a US-based administrative claim database that includes medication claims, prescriber visits, and diagnoses in the form of ICD-9-CM codes.

Study Period

- This retrospective study was conducted from July 1, 2009, to June 30, 2013.

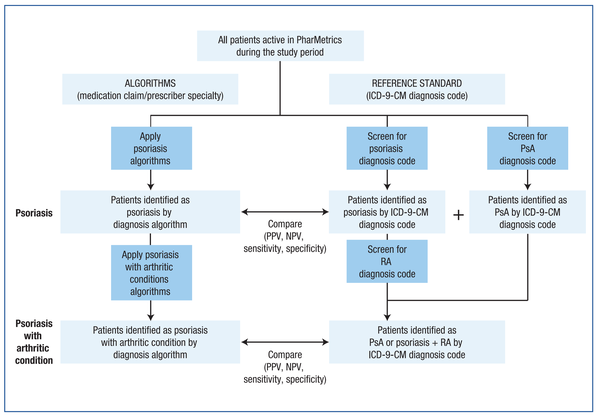
Patient Selection

- Patients actively enrolled in PharMetrics during the full study period.

Validation Analysis

- The psoriasis and psoriasis with arthritic conditions diagnosis-inference algorithms were evaluated by comparing the algorithm-predicted result against the ICD-9-CM diagnosis codes as the reference standard for each patient (**Figure 1**).
- A diagnosis of either ICD-9-CM 696.1 (other psoriasis) or 696.0 (psoriatic arthropathy) was used as the reference standard for psoriasis, while either 696.0 or 696.1 with 714.0 (rheumatoid arthritis) were used as the reference standard for psoriasis with arthritic conditions.
- Positive predictive value (PPV), negative predictive value (NPV), sensitivity, and specificity were evaluated for multiple permutations of MC/PV and reference diagnosis code claims.

Figure 1. Overview of Patient Selection and Algorithm Validation Process



RESULTS

- 11,320,833 patients within the PharMetrics database were actively enrolled in their health plan over the entire study period.
- Similar to previous findings,[1] psoriasis prevalence was estimated at 1.5%, with psoriasis with arthritic conditions representing 15.7% of the psoriasis population.
- The highest PPVs achieved for the psoriasis and psoriasis with arthritic conditions group were 85% and 65%, respectively, using algorithms involving ≥2 MC/PV and reference standards of ≥1 diagnosis codes (**Table 2**).
- Sensitivity was low (≤30%), primarily due to the exclusion of topical corticosteroids and NSAIDs, which were present in ≥70% of false-negative cases. As a result, identified patients may represent a more moderate to severe psoriasis cohort.

LIMITATIONS

- The proposed algorithms were evaluated in a US database, where the psoriasis and PsA treatment strategies are very similar to those in Canada. However, in countries with different treatment strategies, the PPV, NPV, sensitivity, and specificity may be less applicable.
- The exclusion of topical corticosteroids and NSAIDs due to the broad treatment profile of these medications resulted in low sensitivity and, therefore, may be more selective for moderate to severe patients. Future study in this area could consider including high-dose corticosteroids and NSAIDs to improve sensitivity.
- Because of the difficulty in identifying PsA patients using MC/PV, a psoriasis with arthritic conditions proxy was developed, which represents a subset of an overall psoriatic population.

CONCLUSION

- We have developed an MC/PV-based algorithm to infer psoriasis patients with a high degree of precision, while the precision of the algorithm to infer psoriasis with arthritic conditions in patients requires further investigation. Such methods allow researchers to conduct retrospective studies in databases where diagnosis codes are absent.

REFERENCE

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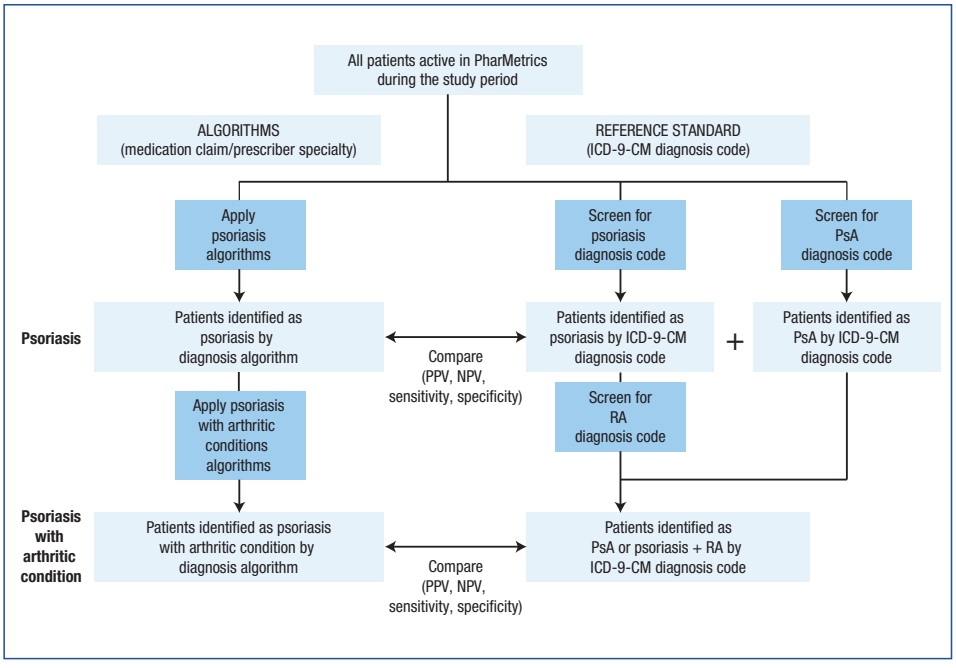

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