Title: #73 - Comparing Performance Characteristics of Phenotype Algorithms for Dermatological and Renal Diseases

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INTRODUCTION

Phenotype algorithms (PAs) are commonly used to determine subjects with specific health conditions in observational research. There has been few research studies performed to examine the performance characteristics of PAs for diseases within dermatology. **The objective of this research was to use PheValuator, a package within the OHDSI toolset, to determine the performance characteristics, e.g., sensitivity and positive predictive value (PPV), of PAs from dermatological diseases and to compare those results to results from renal diseases in administrative claims data.**

METHODS

Data for this study were collected between January 1, 2010 and December 31, 2018 from 4 administrative claims data sets: IBM MarketScan's Commercial Claims and Encounters, Medicare Supplemental Beneficiaries, and Multi-State Medicaid; OptumInsight's de-identified Clinformatics™ Datamart (Eden Prairie,MN); and Optum© de-identified Electronic Health Record Dataset (OptumInsight, Eden Prairie,MN). Each dataset was converted to the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM), version 5.01 and has been reviewed by the New England Institutional Review Board (IRB) and were determined to be exempt from broad IRB approval. For this research, we examined the performance characteristics of PAs for **8 health conditions: atopic dermatitis, plaque psoriasis, candidiasis, malignant skin cancer, chronic kidney disease, acute renal failure, kidney stones, and renal cell carcinoma.** We used two PAs in this study: 1) a PA where subjects were included if a diagnosis code appeared 1 or more times within the health record ("≥1 X Outcome") and 2) a PA where subjects were included in the cohort if a diagnosis code appeared 3 or more times in the patient record or if there was 1 or more diagnosis code from a hospital in-patient setting ("≥3 X Outcome/1 X IP").

RESULTS

PAs involving dermatological diseases consistently demonstrated low values for sensitivity and PPV in claims data. PAs involving renal diseases consistently demonstrated higher values for sensitivity and PPV compared to those from dermatological diseases.

CONCLUSIONS

We found consistently low values for performance characteristics from PAs for several dermatological diseases in claims data. Results from research involving these PAs may be prone to significant misclassification bias.

Cohort Definitions for **dermatological conditions** have **low sensitivities and low positive predictive values** in administrative claims data.

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Dermatological Conditions

Phenotype Algorithm	Sens	PPV	Spec	NPV
1 x Atopic Dermatitis	0.280	0.161	0.979	0.989
3 x Atopic Dermatitis/1 x IP	0.070	0.302	0.998	0.986
1 x Psoriasis	0.388	0.199	0.983	0.993
3 x Psoriasis/1 x IP	0.235	0.366	0.995	0.991
1 x Candidiasis	0.410	0.223	0.946	0.977
3 x Candidiasis/1 x IP	0.141	0.351	0.989	0.968
1 x Skin Malignancy	0.688	0.340	0.959	0.990
3 x Skin Malignancy/1 X IP	0.496	0.411	0.979	0.981

Renal Conditions

Phenotype Algorithm	Sens	PPV	Spec	NPV
1 x Acute Renal Failure	0.777	0.447	0.963	0.992
3 x Acute Renal Failure/1 x IP	0.727	0.484	0.969	0.990
1 x CKD	0.787	0.540	0.953	0.983
3 x CKD/1 X IP	0.642	0.658	0.977	0.971
1 x Kidney Stone	0.756	0.294	0.961	0.994
3 x Kidney Stone/1 x IP	0.573	0.463	0.986	0.991
1 x RenalCarc	0.694	0.378	0.997	0.999
3 x RenalCarc/1 x IP	0.635	0.516	0.998	0.999

Extended Conclusions

We found consistently low values for the performance characteristics from PAs for the non-cancer associated dermatological diseases tested in administrative claims data. **As sensitivity, in particular, is rarely determined in traditional validation studies, these results represent an important addition to the body of knowledge for these diseases.** There may be several reasons for these findings. **The low values for sensitivity and PPV may be due to alternate diagnoses for diseases with similar characteristics.** The lack of definitive diagnostic tests for these diseases is also an issue. **Definitive diagnostic tests are important for informing the model and allowing better discrimination between disease states.** However, improving the performance characteristics of PAs for these diseases is possible. **Anti-psoriasis and anti-fungal medications were important predictors in the models for psoriasis and candidiasis, respectively, and the inclusion of these elements into the PAs would likely improve the performance characteristics.** It appears that caution should be used when developing PAs to study common dermatological conditions in administrative claims data. **Results from research involving these PAs may be prone to significant misclassification bias.**

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