

# Identification of patients with drug resistant epilepsy in electronic medical record data using the Observational Medical Outcomes Partnership Common Data Model

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## Background

Over a third of appropriately treated patients with epilepsy fail 2 or more medication trials, meeting criteria for drug resistant epilepsy (DRE) <sup>1,2</sup>. Gold standard phenotyping of patients with DRE would improve the rigor and reproducibility of large-scale, real world comparative effectiveness research and improve access to specialized epilepsy care. We compared the performance of DRE phenotypes using the Observational Medical Outcomes Partnership (OMOP) Common Data Model (CDM).

## Methods

Using ATLAS, we made DRE phenotypes on the Columbia University Irving Medical Center (CUIMC) electronic health record (EHR). We sampled 600 patients at random using previously validated criteria for epilepsy (1/2015-08/2021) and cross-validated our phenotypes with those patients. Two reviewers manually classified patients as having DRE, drug responsive epilepsy, undefined drug responsiveness, or not epilepsy as of the last EHR encounter in the study period based on consensus definitions. We calculated the sensitivity, specificity, positive predictive value (PPV), negative predictive value (NPV) and F1-score for each phenotype.

## Results

Among 412 patients with source-record confirmed epilepsy, 62 (15.0%) had DRE, 163 (39.6%) drug responsive epilepsy, 124 (30.0%) undefined drug responsiveness, and 63 (15.3%) insufficient records. The best performing phenotype for DRE in terms of the F1-score was the presence of  $\geq 1$  intractable epilepsy code and  $\geq 2$  unique non-gabapentinoid antiseizure medication (ASM) exposures, each with  $\geq 90$ -day drug era (sensitivity 0.661, specificity 0.937, PPV 0.594, NPV 0.952, F1-score 0.626). Several phenotypes achieved higher sensitivity at the expense of specificity and vice versa. The phenotype performance metrics are shown in Table 1.

## Conclusion

CDM algorithms can identify DRE in EHR-derived data with varying tradeoffs between sensitivity and specificity. These DRE definitions can be applied across an international network of standardized databases for further validation, reproducible observational research, and improving access to appropriate care.

Phenotype criteria	Among cohort of patients meeting $\geq 1$ epilepsy phenotype criteria (2015-2021, n=507)				AUC	F1 Score
	Sensitivity	Specificity	PPV	NPV		
$\geq 2$ years of observation (after meeting $\geq 1$ of 3 epilepsy phenotype inclusion criteria)	0.581	0.569	0.158	0.907	0.575	0.248
$\geq 1$ epilepsy diagnosis code	0.984	0.231	0.151	0.990	0.608	0.262
$\geq 1$ intractable epilepsy code	0.806	0.804	0.365	0.968	0.805	0.503
$\geq 2$ intractable epilepsy codes $\geq 30$ d apart	0.629	0.897	0.459	0.945	0.763	0.531
$\geq 2$ unique ASM exposures	0.935	0.252	0.148	0.966	0.594	0.256
$\geq 3$ unique ASM exposures	0.887	0.425	0.177	0.964	0.656	0.295
$\geq 2$ unique non-gabapentinoid ASM exposures	0.935	0.308	0.158	0.972	0.622	0.271
$\geq 3$ unique non-gabapentinoid ASM exposures	0.887	0.483	0.193	0.968	0.685	0.317
$\geq 2$ unique ASM exposures ( $\geq 90$ d drug era)	0.694	0.849	0.391	0.952	0.772	0.500
$\geq 3$ unique ASM ingredient ( $\geq 90$ d drug era)	0.435	0.946	0.529	0.923	0.691	0.478
$\geq 2$ unique non-gabapentinoid ASM exposures ( $\geq 90$ d drug era)	0.677	0.881	0.442	0.951	0.779	0.535
$\geq 3$ unique non-gabapentinoid ASM exposures ( $\geq 90$ d drug era)	0.387	0.966	0.615	0.919	0.677	0.475
<b><math>\geq 1</math> intractable epilepsy code AND...</b>						
$\geq 2$ unique ASM exposures	0.758	0.829	0.382	0.961	0.794	0.508
$\geq 3$ unique ASM exposures	0.726	0.856	0.413	0.957	0.791	0.526
$\geq 2$ unique non-gabapentinoid ASM exposures	0.758	0.834	0.388	0.961	0.796	0.514
$\geq 3$ unique non-gabapentinoid ASM exposures	0.726	0.863	0.425	0.958	0.795	0.536
$\geq 2$ unique ASM exposures ( $\geq 90$ d drug era)	0.677	0.930	0.575	0.954	0.804	0.622
$\geq 3$ unique ASM ingredient ( $\geq 90$ d drug era)	0.435	0.971	0.675	0.925	0.703	0.529
$\geq 2$ unique non-gabapentinoid ASM exposures ( $\geq 90$ d drug era)	0.661	0.937	0.594	0.952	0.799	0.626
$\geq 3$ unique non-gabapentinoid ASM exposures ( $\geq 90$ d drug era)	0.387	0.978	0.706	0.920	0.683	0.500

**Table 1.** Performance of Drug Resistant Epilepsy Phenotypes. ASM, Antiseizure Medication; d, Day.

### References

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