Measuring Low-Value Primary Care with OMOP Common Data Model in the Adult Primary Care Registry

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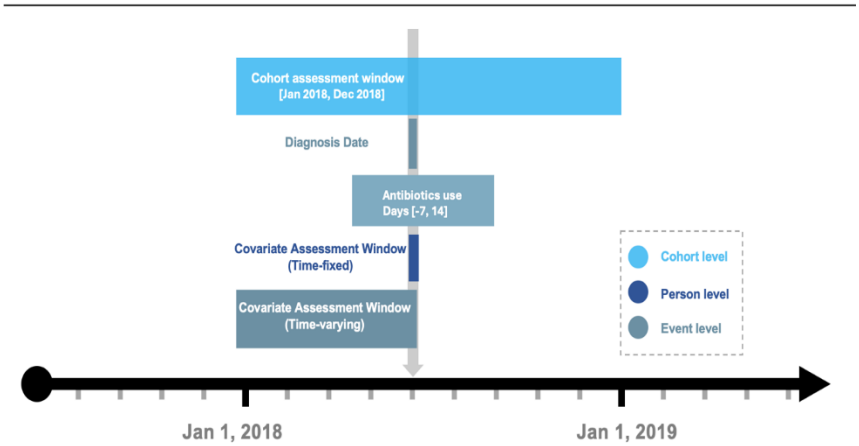
Background

While primary care is considered a high-value activity[1], primary care clinicians also deliver low-value care, motivated by diverse forces including intolerance of ambiguity and patient preference. Healthcare overuse is low value care and includes inappropriate testing, medications where risk of harms outweigh benefits, and interventions that add burden without benefit.[2-4] We are unaware of tools that use electronic health record (EHR) data to that quantify when patients are exposed to low value care, and none that are implemented for near real time use. Existing tools rely on claims data and are proprietary. (MILLIMAN) Therefore, we aimed to develop computable phenotypes using our health system's EHR data. This is proof-of-concept exercise to illustrate that overuse measures can be operationalized using the Atlas tools. We began by operationalizing five phenotypes that are commonly used measures of overuse of healthcare services, using data mapped to the OMOP Common Data Model (CDM). We sought to demonstrate the potential of the OMOP CDM to streamline the development and implementation of these metrics within the health system, ensuring their reproducibility across our 42 clinics, and facilitating network analyses across the OHDSI community.

Methods

The Adult Primary Care Center of Excellence (APC-COE) OMOP projection includes all EHR data from patients who visited a primary care clinician at least twice in any of the 42 clinics within our health system since 2016. We had previously identified overuse measures including those recommended by the American Geriatrics Society (AGS), National Committee for Quality Assurance (NCQA), Healthcare Effectiveness Data and Information Set (HEDIS), and American Academy of Family Physicians (AAFP).[5] To start, we operationalized five metrics to reflect the annual number of overuse "events" among individuals who were eligible to experience an overuse event that year. The phenotyping process is illustrated in the **Figure**. Elements of the study design were decomposed into three levels: cohort, person, and event levels. Diagnoses,

Figure. *Demonstration of Cohort Development by Measuring Antibiotics Use among Patients Diagnosed with Upper Respiratory Infection in 2018*



medication prescriptions, and procedures were ascertained within the pre-specified time window. Time-fixed variables were obtained on the same date as the index date, and the look-back period was used to identify time-varying variables as needed for some of the metrics. We used Atlas to characterize the patients in the projection. The primary outcome is the annual prevalence of each overused service from 2018 to 2023. The analysis was conducted using Atlas and R (CohortMethod and FeatureExtraction packages). Details of the cohort development are shown in Supplementary Table 1.

Results

As of June 2024, the cohort includes 389,867 patients engaged in primary care. (Table 1) Nearly 60% are female; 58% are White and 26.4% are Black or African American, with other racial groups less represented in this health system with sites across Maryland. The operationalized metrics were antibiotic use among patients diagnosed with URI, antibiotic use among patients with acute bronchitis, non-selective peripheral alpha-1 blocker use for treatment of hypertension without another indication, dual-energy x-ray absorptiometry (DEXA) use in women under age 65 years, and sinus imaging in patients with acute sinusitis. (Table 2) There was no restriction by the ordering clinician. The inappropriate use of medication was more prevalent than the imaging procedures. The proportion of antibiotic use among patients with URI decreased from 59.5% to 47.8%, then rebounded to 52.5% in 2023. A similar pattern was observed for antibiotic use among patients with acute bronchitis. The percentage of prescriptions for non-selective peripheral alpha-1 blockers for hypertension only remained around 2.1% to 2.2%. We observed a V-shape pattern for the use of DEXA and sinus imaging over time, which may reflect the impact of the pandemic.

Conclusion

We intend to develop scalable, reproducible tools to be used across the OHDSI data network to identify and track low-value healthcare use within health systems. Through the surveillance of use of these services that impose more risk than benefit to patients, we will inform development and implementation of interventions to reduce overuse, lower costs to patients, and improve health outcomes. The use of OMOP data modernizes the process from data processing to cohort development and characterization, ensuring the reproducibility of research and the rapid scalability of validated tools for monitoring overuse. Our future work includes preparing these metrics specific to each of our clinics and communicating these results to clinic leadership. The availability of these JSON should allow collaborations across institutions among investigators committed to reducing low value care.

Table 1. Characteristics of All Patients in the Adult Primary Care Registry

Characteristics	All Patients, N (%)
All adult patients	389867 (100)
Age at first observation	
18-39	153260 (39.3)
40-64	165392 (42.4)
65-84	64790 (16.6)
≥ 85	6425 (1.7)
Female	229135 (58.8)
Race	
White	225559 (57.9)
Black or African American	102976 (26.4)
Asian	8638 (2.2)
Native Hawaiian or Pacific Island	649 (0.2)
Other	52045 (13.3)
Ethnicity	
Hispanic or Latino	11759 (3.0)
Not Hispanic or Latino	378108 (97.0)
BMI, kg/m^2, median (IQR)	27.4 (23.7, 32.5)
Index year of visit	
2016	176273 (45.2)
2017	80222 (20.6)
2018	33916 (8.7)
2019	26431 (6.8)
2020	21763 (5.6)
2021	22056 (5.7)
2022	13577 (3.5)
2023	9693 (2.5)
2024	5936 (1.5)
Length of observation	
≤ 1 year	63525 (16.3)
1-3 years	66905 (17.2)
≥ 3 years	259437 (66.5)

Table 2. Preliminary Results of Cohort Definitions for Selected Metrics over 6 Years

Metrics ¶	Recommendations	N, Proportions§ (%)					
		2018	2019	2020	2021	2022	2023
Medications							
Antibiotics	Assesses the percentage of episodes for adult patients with a diagnosis of upper respiratory infection	13087/22005 59.5%	12699/22036 57.6%	9034/16281 55.5%	7691/16078 47.8%	10329/19440 53.1%	10977/20917 52.5%
Antibiotics*	Assesses the percentage of episodes for adult patients with a diagnosis of acute bronchitis	7458/13332 55.9%	6924/12813 54.0%	3524/7634 46.2%	2236/5689 39.3%	3187/5185 61.5%	4196/8240 50.9%
Non-selective peripheral alpha-1 blockers†	Avoid use as an antihypertensive	2891/138083 2.1%	3001/142904 2.1%	2426/115523 2.1%	2955/134318 2.2%	2893/131500 2.2%	2763/131571 2.1%
Imaging							
DEXA	Don't use dual-energy x-ray absorptiometry in women younger than 65	1349/113285 1.2%	1414/112732 1.3%	1187/109538 1.1%	1719/114532 1.5%	1708/108880 1.6%	1854/102738 1.8%
Cardiopulmonary and Neurologic Testing							
Sinus imaging	Measuring performance of sinus imaging studies for patients with acute rhinosinusitis	264/9606 2.8%	221/10344 2.1%	110/7563 1.5%	131/6225 2.1%	204/8613 2.4%	79/6346 1.2%

Note:

§ The proportion is calculated by diving the number of new cases by the total events for patients who met the inclusion criteria during that year.

* Patients with history of smoking were excluded from the cohort.

† Measuring the annual percentage of prescriptions of doxazosin, prazosin, terazosin among patients over 65 years old with hypertension who were not diagnosed with benign prostatic hypertrophy within the previous 365 days.

Supplementary Table 1. Details of the Phenotyping Process

Metrics [¶]	Recommendations	Definition of Numerator	Definition of Denominator
Medications			
Antibiotics	Assesses the percentage of episodes for adult patients with a diagnosis of upper respiratory infection	Patients who met the following criteria: • They received antibiotics that were not for topical or ophthalmic use; AND • The antibiotics were prescribed within 3 days before or 3 days after the diagnosis	Patients were included in the cohort if: • They were ever diagnosed with a URI (Upper Respiratory Infection) • With age greater or equal to 18 years
Antibiotics[*]	Assesses the percentage of episodes for adult patients with a diagnosis of acute bronchitis	Patients who met the following criteria: • They received antibiotics that were not for topical or ophthalmic use; AND • The antibiotics were prescribed within 3 days before or 3 days after the diagnosis	Patients were included in the cohort if: • They were ever diagnosed with acute bronchitis • With age greater or equal to 18 years • Had no smoking history within the prior 356 days
Non-selective peripheral alpha-1 blockers[†]	Avoid use as an antihypertensive	Patients who met the following criteria: • They were prescribed any of the following medications within the year of measure: doxazosin, prazosin, and terazosin	Patients were included in the cohort if: • They were ever diagnosed with hypertension • With age greater or equal to 65 years • Had no history of benign prostatic hypertrophy within the prior 356 days
Imaging			
DEXA	Don't use dual-energy x-ray absorptiometry (DEXA) in women younger than 65	Patients who met the following criteria: • They had a DEXA scan ordered within the year of measure	Patients were included in the cohort if: • They are female and had ever visited a clinic • With age greater or equal to 65 years
Cardiopulmonary and Neurologic Testing			
Sinus imaging	Measuring performance of sinus imaging studies for patients with acute rhinosinusitis	Patients who met the following criteria: • They had a CT scan ordered within 28 days after the diagnosis	Patients were included in the cohort if: • They were ever diagnosed with a rhinosinusitis • With age greater or equal to 18 years

References

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