Healthcare - Persistency of a Drug

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Problem Statement

Measuring patient persistency with drug therapy provides valuable information for healthcare decision makers concerning the effectiveness of a drug in a routine practice setting, which epidemiologists call the population based setting, as opposed to the trial- or clinic-based setting.

One of the challenge for all Pharmaceutical companies is to understand the persistency of drug as per the physician prescription. To solve this problem ABC pharma company approached an analytics company to automate this process of identification.

Importance of the problem

Increasing adherence rates by only 10 percentage points would translate into a $41 billion pharmaceutical revenue opportunity in the US ($124 billion globally), accompanied by improved health outcomes and decreased healthcare spending. [1]

1 _ https://medipense.com/medication-adherence-compliance/

Glossary

Persistency Definitions [1]

The measurement of medication persistency attempts to capture the amount of time that an individual remains on chronic drug therapy. Under this framework, patients are classified as either persistent or non persistent with medication therapy for some duration of time. Individuals who are persistent with therapy are continuous with their medication-taking behavior during a certain period. Persistent individuals refill their medications frequently and regularly. In contrast, no persistent individuals either have sporadic refilling practices or have discontinued refilling their medications completely.

1 -https://www.ajmc.com/view/jul05-2085p449-457

Glossary

Medication adherence vs medication persistence [1]

Medication adherence (compliance): “the extent to which a patient acts in accordance with the prescribed interval and dose of a dosing regimen.”

Medication persistence: “the duration of time from initiation to discontinuation of therapy.”

1. https://www.pharmacytoday.org/article/S1042-0991(15)30340-6/fulltext#relatedArticles

Feature Description

Bucket (variable)

Variable Description

Unique Row Id (patient ID)

Unique ID of each patient

Target Variable (persistency Flag)

Flag indicating if a patient was persistent or not

Age

Age of the patient during their therapy

Race

Race of the patient from the patient table

Region

Region of the patient from the patient table

Feature Description

Demographics

Ethnicity:

Ethnicity of the patient from the patient table

Gender :

Gender of the patient from the patient table

IDN Indicator:

Flag indicating patients mapped to IDN

Feature Description

Provider Attributes

NTM - Physician Specialty

Specialty of the HCP that prescribed the NTM Rx

NTM - T-Score

T Score of the patient at the time of the NTM Rx (within 2 years prior from rxdate)

Change in T Score

Change in Tscore before starting with any therapy and after receiving therapy (Worsened, Remained Same, Improved, Unknown)

NTM - Risk Segment

Risk Segment of the patient at the time of the NTM Rx (within 2 years days prior from rxdate)

Change in Risk Segment

Change in Risk Segment before starting with any therapy and after receiving therapy (Worsened, Remained Same, Improved, Unknown)

NTM - Multiple Risk Factors

Flag indicating if patient falls under multiple risk category (having more than 1 risk) at the time of the NTM Rx (within 365 days prior from rxdate)

Feature Description

Provider Attributes

NTM - Dexa Scan Frequency

Number of DEXA scans taken prior to the first NTM Rx date (within 365 days prior from rxdate)

NTM - Dexa Scan Recency

Flag indicating the presence of Dexa Scan before the NTM Rx (within 2 years prior from rxdate or between their first Rx and Switched Rx; whichever is smaller and applicable**)**

Dexa During Therapy

Flag indicating if the patient had a Dexa Scan during their first continuous therapy

NTM - Fragility Fracture Recency

Flag indicating if the patient had a recent fragility fracture (within 365 days prior from rxdate)

Fragility Fracture During Therapy

Flag indicating if the patient had fragility fracture during their first continuous therapy

Feature Description

Provider Attributes

NTM - Glucocorticoid Recency

Flag indicating usage of Glucocorticoids (>=7.5mg strength) in the one year look-back from the first NTM Rx

Glucocorticoid Usage During Therapy

Flag indicating if the patient had a Glucocorticoid usage during the first continuous therapy

NTM - Injectable Experience

Flag indicating any injectable drug usage in the recent 12 months before the NTM OP Rx

NTM - Risk Factors

Risk Factors that the patient is falling into. For chronic Risk Factors complete lookback to be applied and for non-chronic Risk Factors, one year lookback from the date of first OP Rx

Feature Description

Disease/Treatment Factor:

NTM - Comorbidity

Comorbidities are divided into two main categories - Acute and chronic, based on the ICD codes. For chronic disease we are taking complete look back from the first Rx date of NTM therapy and for acute diseases, time period before the NTM OP Rx with one year lookback has been applied

NTM - Concomitancy

Concomitant drugs recorded prior to starting with a therapy(within 365 days prior from first rxdate)

Adherence

Adherence for the therapies

Features

Ptid, Persistency Flag, Gender, Race, Ethnicity, Region, Age Bucket, Ntm Speciality, Ntm Specialist Flag, Ntm Speciality Bucket, Gluco Record Prior Ntm, Gluco Record During Rx, Dexa Freq During Rx, Dexa During Rx, Frag Frac Prior Ntm, Frag Frac During Rx, Risk Segment Prior Ntm, Tscore Bucket Prior Ntm, Risk Segment During Rx, Tscore Bucket During Rx, Change T Score, Change Risk Segment, Adherent Flag, Idn Indicator, Injectable Experience During Rx.

Features

Comorb Encounter For Screening For Malignant Neoplasms, Comorb Encounter For Immunization, Comorb Encntr For General Exam W O Complaint, Susp Or Reprtd Dx, Comorb Vitamin D Deficiency, Comorb Other Joint Disorder Not Elsewhere Classified, Comorb Encntr For Oth Sp Exam W O Complaint Suspected Or Reprtd Dx, Comorb Long Term Current Drug Therapy, Comorb Dorsalgia, Comorb Personal History Of Other Diseases And Conditions.

Features

Comorb Personal history of malignant neoplasm, Comorb Gastro esophageal reflux disease, Concom Cholesterol And Triglyceride Regulating Preparations, Concom Narcotics, Concom Systemic Corticosteroids Plain, Concom Anti Depressants And Mood Stabilisers, Concom Fluoroquinolones, Concom Cephalosporins, Concom Macrolides And Similar Types, Concom Broad Spectrum Penicillins, Concom Anaesthetics General, Concom Viral Vaccines.

Features

Risk Type 1 Insulin Dependent Diabetes, Risk Osteogenesis Imperfecta, Risk Rheumatoid Arthritis, Risk Untreated Chronic Hyperthyroidism, Risk Untreated Chronic Hypogonadism, Risk Untreated Early Menopause, Risk Patient Parent Fractured Their Hip, Risk Smoking Tobacco, Risk Chronic Malnutrition Or Malabsorption, Risk Chronic Liver Disease, Risk Family History Of Osteoporosis, Risk Low Calcium Intake, Risk Vitamin D Insufficiency, Risk Poor Health Frailty, Risk Excessive Thinness, Risk Hysterectomy Oophorectomy, Risk Estrogen Deficiency, Risk Immobilization, Risk Recurring Falls, Count Of Risks.

Data intake

Total number of observations	3424
Total number of features	69
Base format of the file	csv
Size of the data	892 KB

Proposed Approach

- Modifying and Cleaning data
- Adding new variables using existing data to have some better insights to data
- Proposing machine learning models and testing hypothesizes
- Evaluating hypothesizes in order to predict persistency of drugs
- Report the accuracy of model

Hypothesis

In this research we want to develop a model predicting persistency of drug using machine learning algorithms based on the effects of:

- Gender
- Age
- Risk_Low_Calcium_Intake
- Risk_Vitamin_D_Insufficiency
- .
- .
- .
- Risk_Immobilization
- Risk_Recurring_Falls
- Count_Of_Risks

Data and code link

Data and code are uploaded at:

https://github.com/Alireza-Ehiaei/Data_Sciences/upload/main/Create%20Drug_Persistency1

Thank You