01

Drug Persistence and medical adherence

An EDA presentation by Feature Transformers

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Problem statement
Business understanding
Definition of terms
Adherence and Persistence analysis
Patients' analysis
Patients' Risk Analysis
Drug Comorbidity and Concomity
Conclusion and model recommendations

Presentation Highlights

Problem Statement

According to the World Health Organisation, only 50-70% of patients adhere properly to prescribed drugs during therapy. This is especially true among those with long-term medication. This
worrying statistic is caused by various factors, for example patients' condition or disease, their socio-economic status, confusion by the schedule, forgetting, or discontinuing because they feel better, just to name a few. Medical non-adherence can lead to devastating consequences on one's health,
especially for those with chronic illnesses. The purpose of this project is to study trends among patients in a sample and build a model that'll classify a new patient as Persistent or Non-Persistent. This project will give medical practitioners(especially pharmaceuticals) insight into which patients might require more rigorous follow-ups to ensure they will adhere to their prescriptions.

Business Understanding

According to a study carried out by LexisNexis in 2020, Medical Non-adherence is one of the biggest issues faced by the pharmacy industry. Pharmacists stated that they would want to put more effort into educating patients on the importance of medical adherence, send remainders to them, improve drug packaging and much more to deal with the issue.
Technology and Machine Learning being incorporated into the industry would help pharmacists identify patients who are likely to be non-adherent and non-persistent

Definition of terms

Medical adherence

According to the FDA, it can be termed as : "The extent to which patients take medication as prescribed by their doctors. This involves factors such as getting prescriptions filled, remembering to take medication on time, and understanding the directions."

Drug Persistence

The extent to which a patient acts in compliance to the prescribed interval, and dose of a dosing regimen.

So what's the difference between these two terms? Adherence refers to the proportion of pills taken within a specific time interval and persistence refers to the continuing use (in time) of the prescribed therapy.

Concomitant Drugs

Two or more drugs given at the same or almost the same time

Comorbidity

The presence of two or more diseases or medical conditions

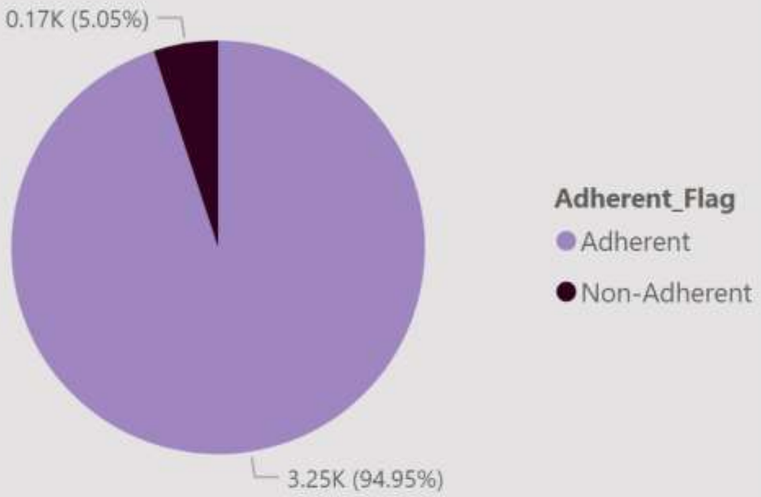
IDN(Integrated Delivery Network)

Network of healthcare providers and facilities within a specific geographical location that offer a full range of healthcare services

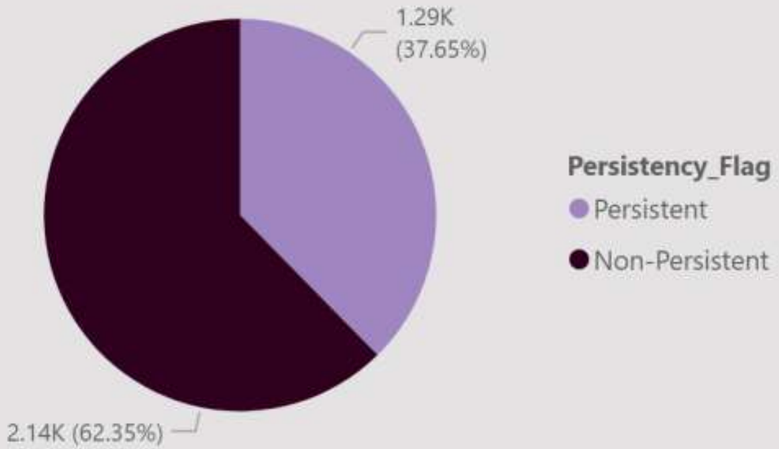
T-score

Measure of standard deviation that shows how much your bone density differs from the bone mass of an average healthy adult

Adherence



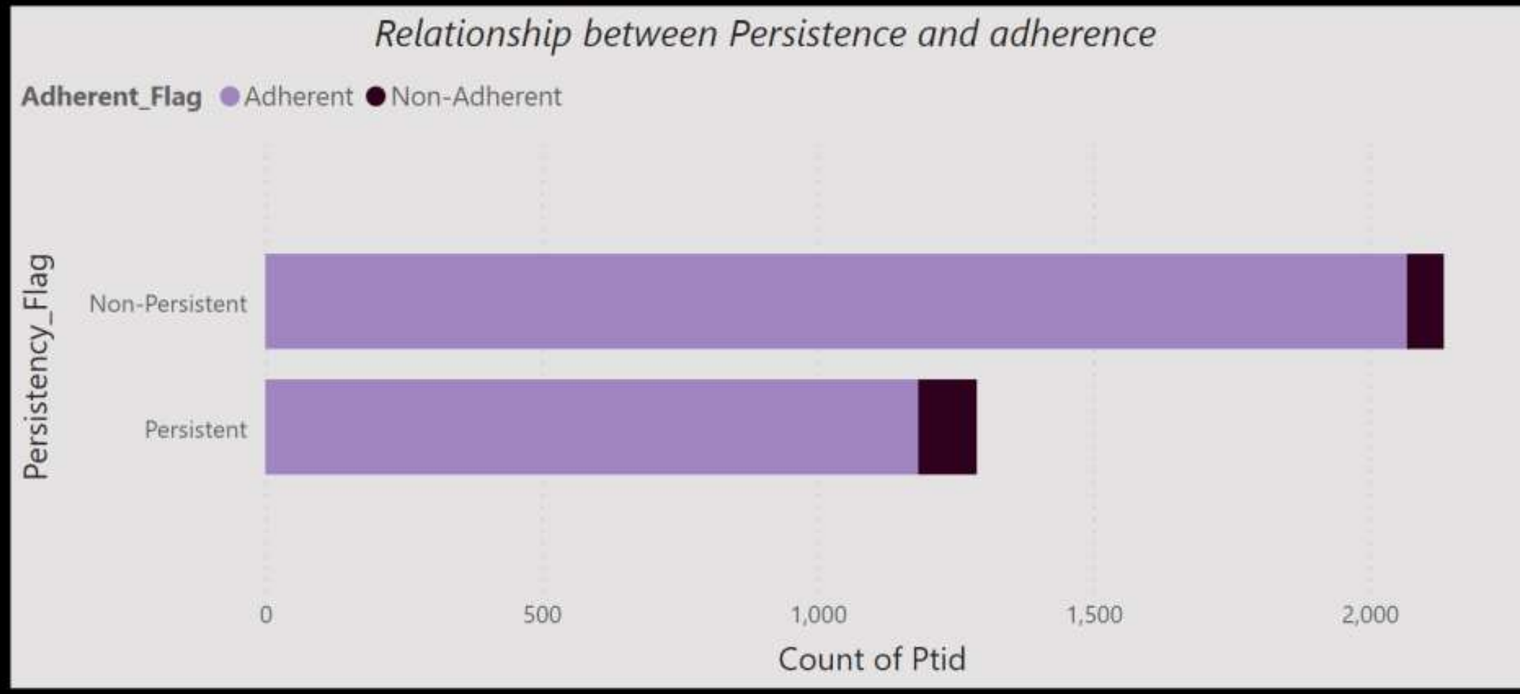
Persistence



Adherence and Persistence

An alarming 62% of patients in our sample have been flagged as Non-Persistent with their prescription while another 5% are non-adherent.

Is there any relationship between these two groups? Are patients who are non-adherent with their prescriptions also likely to stop taking their medication altogether?

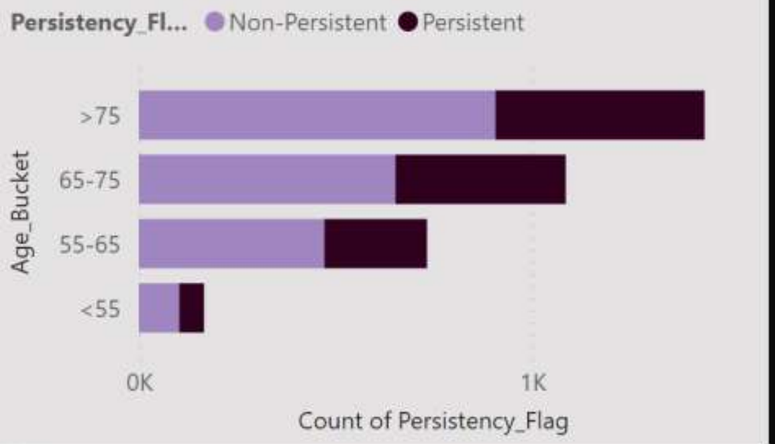


1183	106	2068	67
Persistent and Adherent	Persistent but Non-adherent	Non-persistent but Adherent	Non-persistent and non-adherent

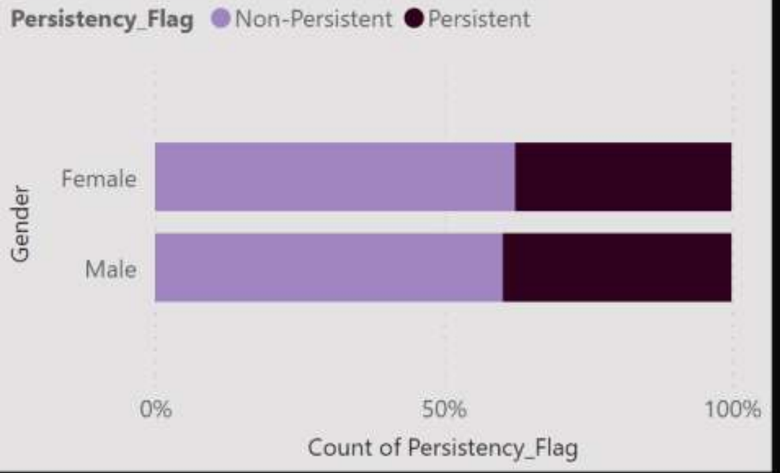
3424

Patients in this study

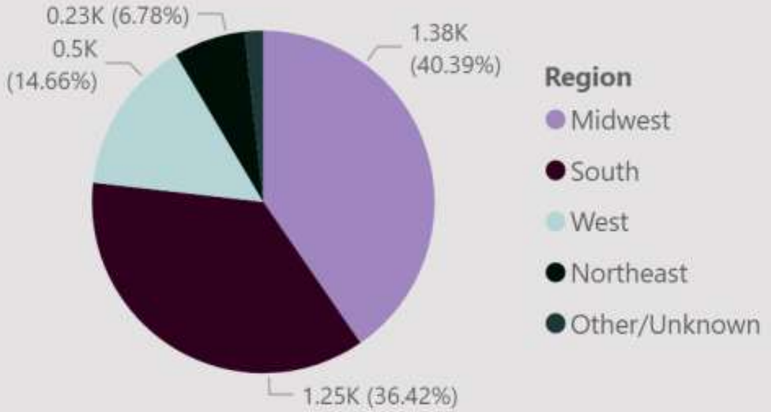
Age groups and their Persistence



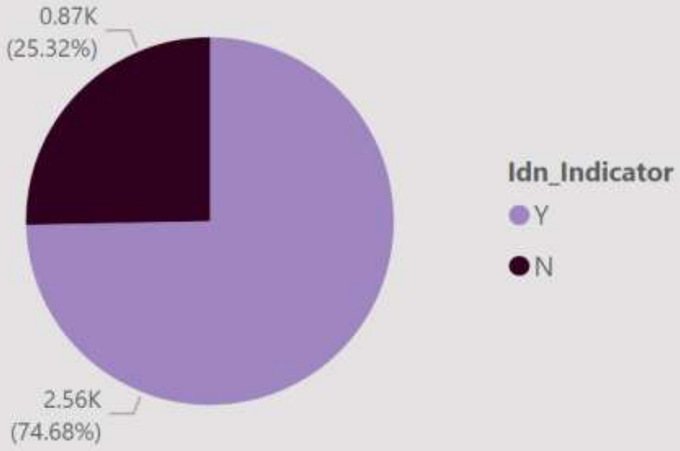
Gender and Persistence



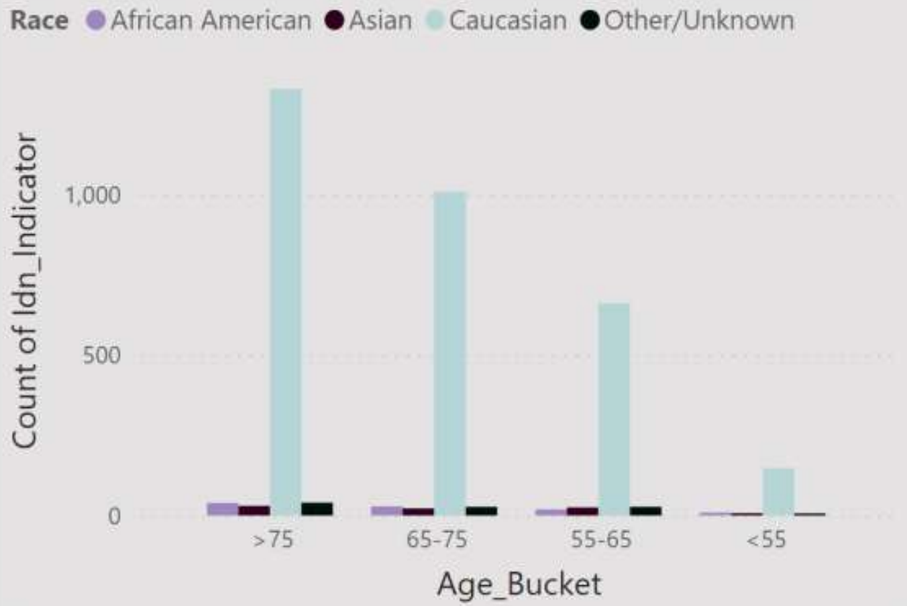
Patients and their Regions



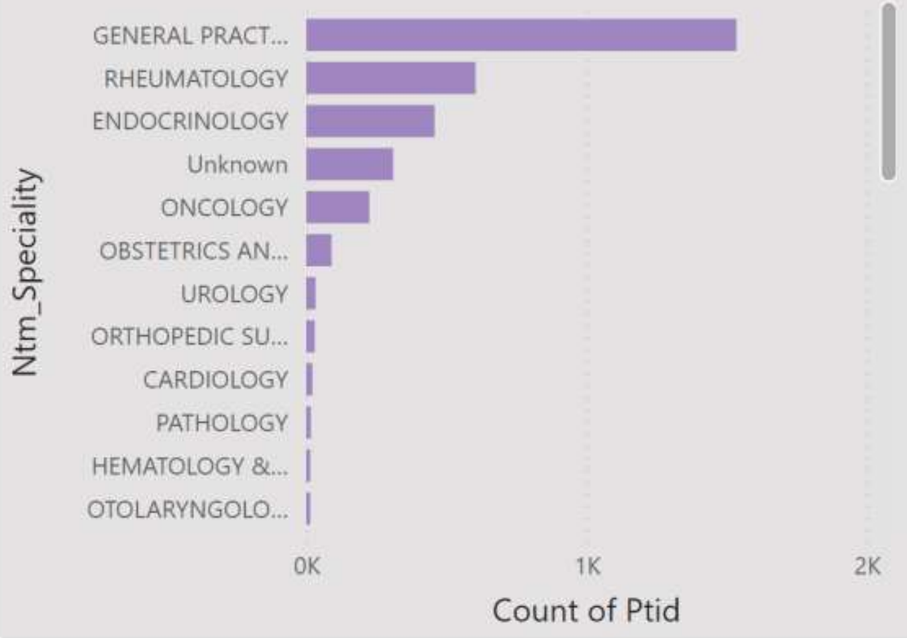
Patients assigned to IDNs

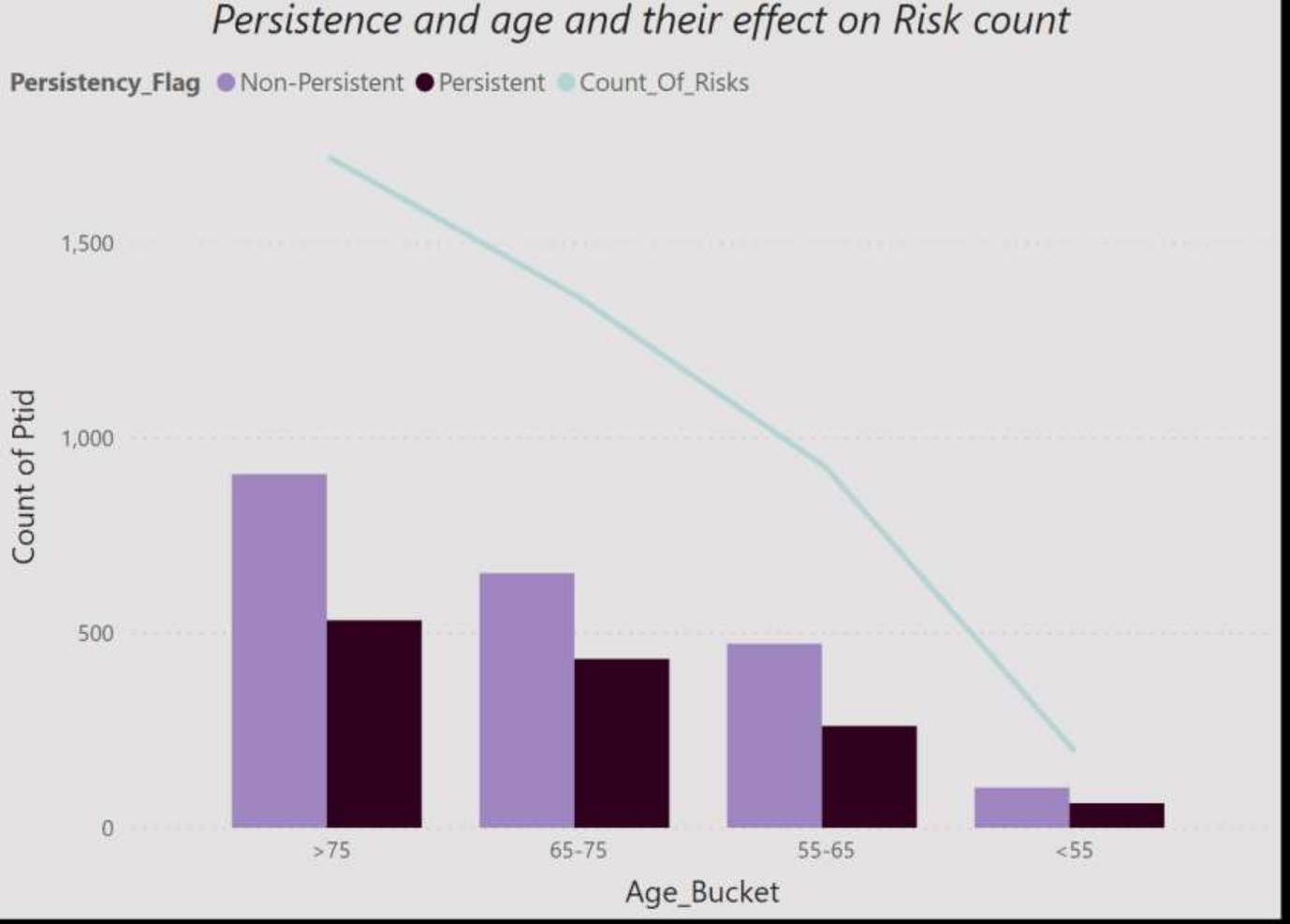


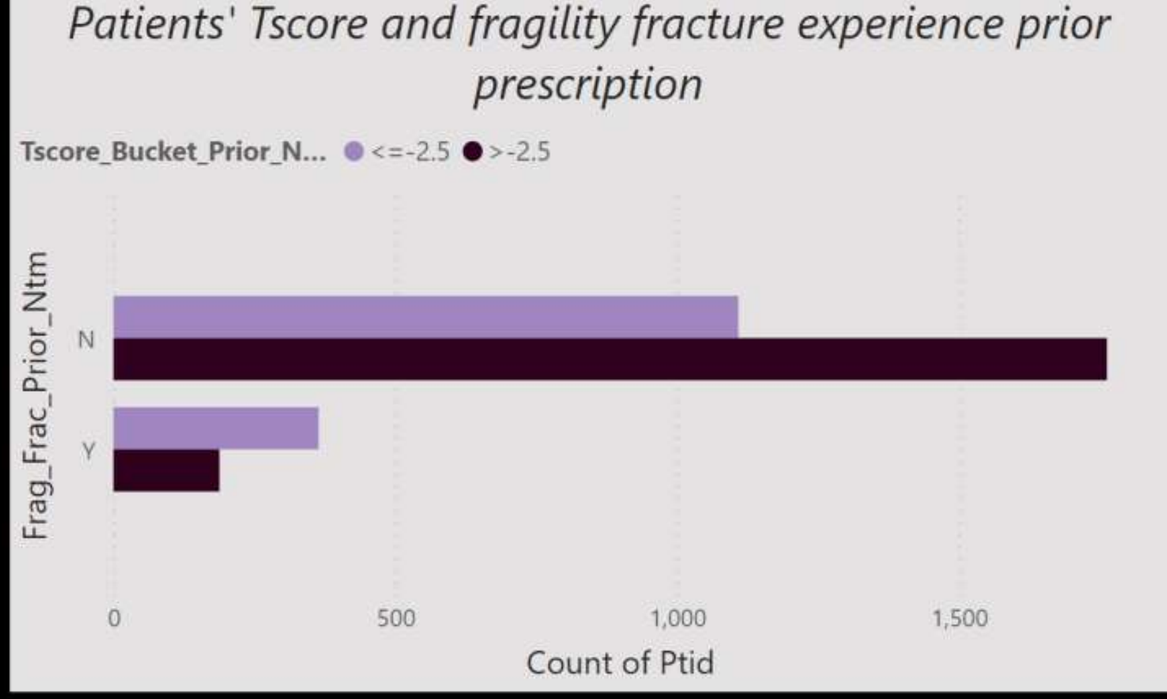
Patients' Age, Race and IDN Indicator

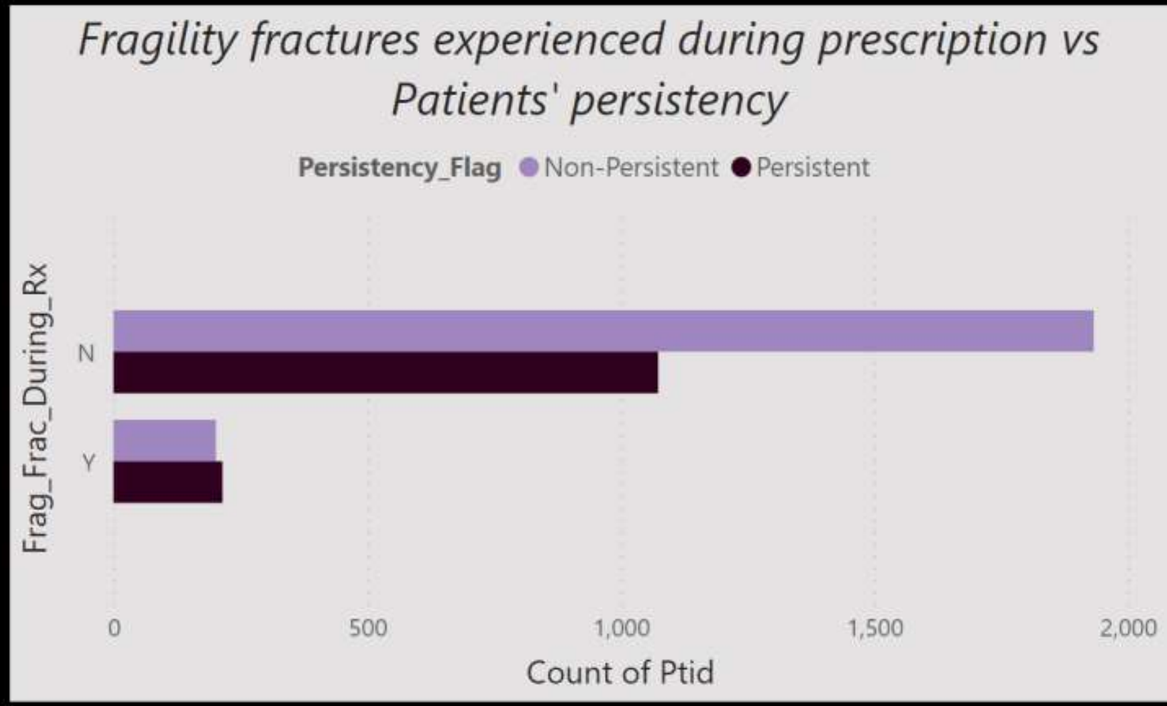


Patients and their Ntm Specialities





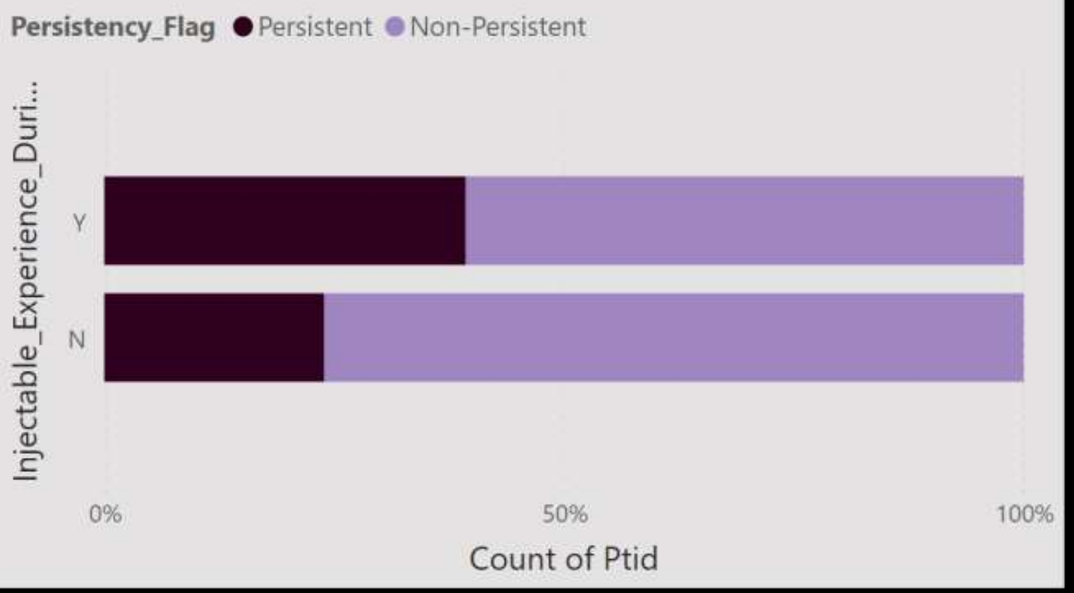




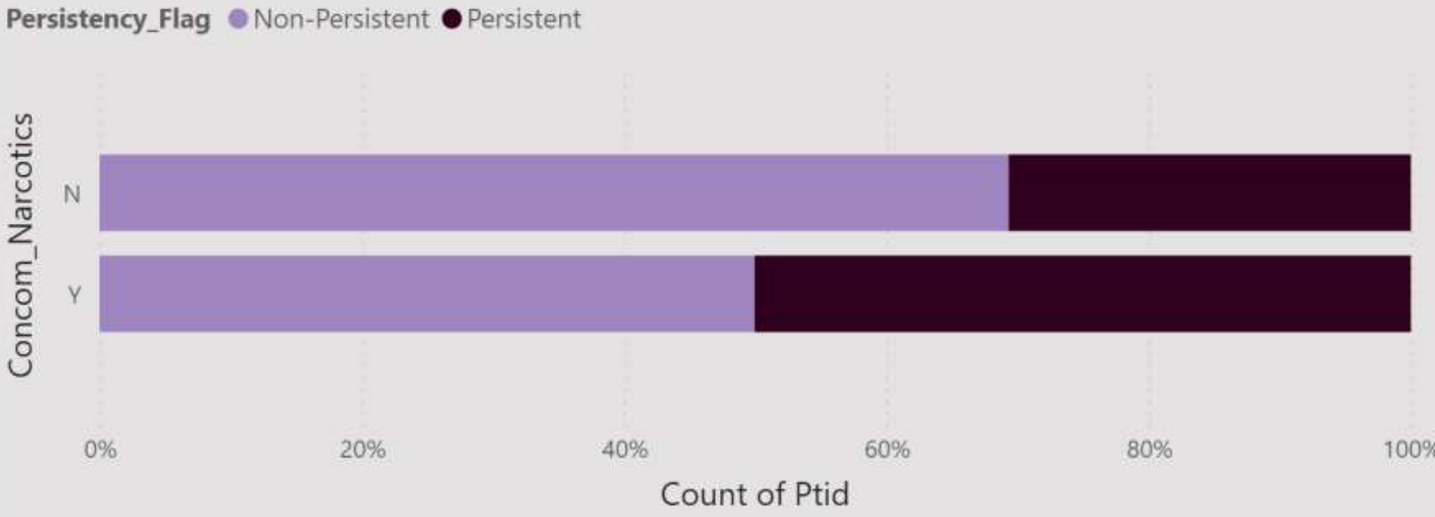
From the above visualization, it is clear that a patient's risk count increases with age, with those being non-persistent with their medication being at an even higher risk.

Patients with lower T-scores are more prone to fragility fractures due to their low bone density.

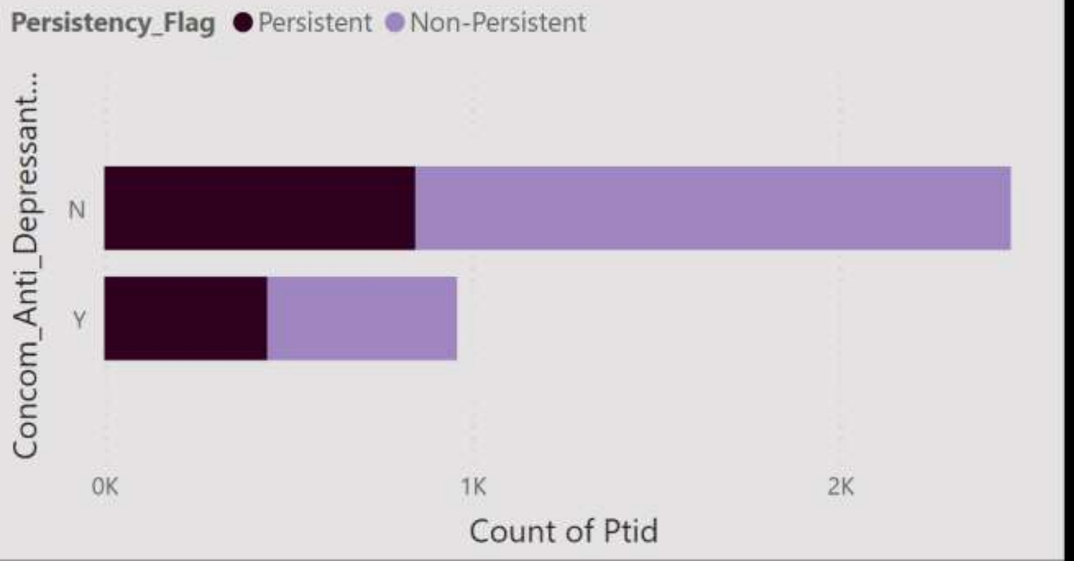
Persistence with Injectable medication



Persistence with Concomitant Narcotics



Persistence with Concomitant Anti-depressants and mood stabilisers



60.7%

Of patients with Injectable medication are non-persistent

53.8%

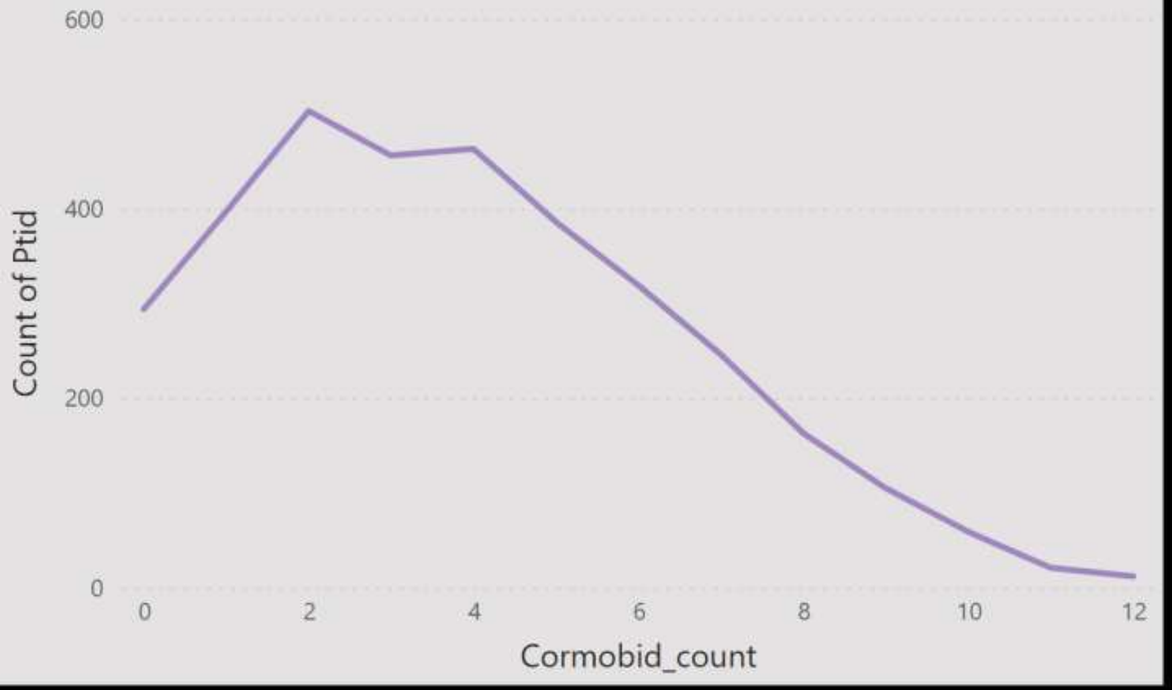
Of patients on Anti-depressants are non-persistent

49.9%

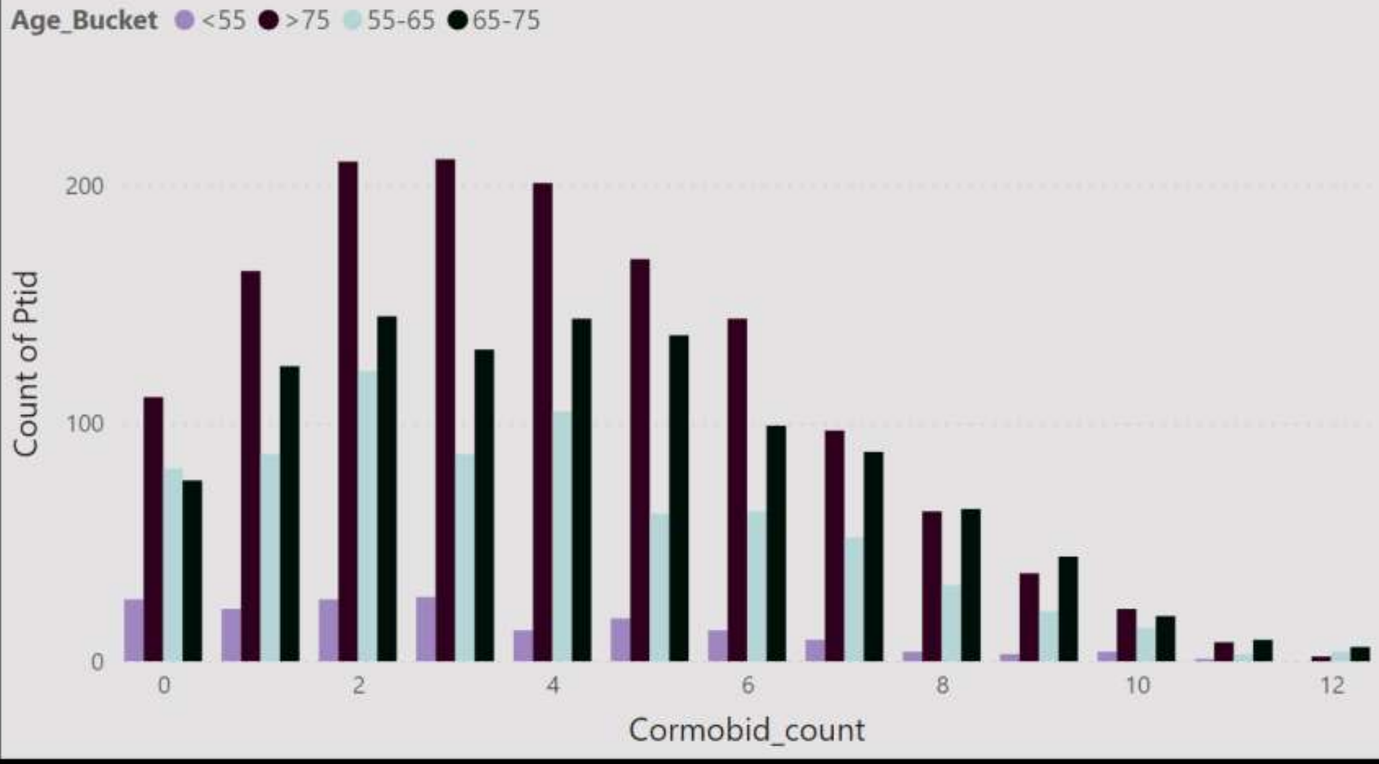
Of patients on Narcotics are non-persistent

Patients who were on Anti-depressants and Narcotics during their prescriptions and those with injectable medication prescriptions were found to have the highest rates of non-persistence. This may be caused by a number of factors that are yet to be studied. It is clear that rigorous follow-ups must be done on these patients.

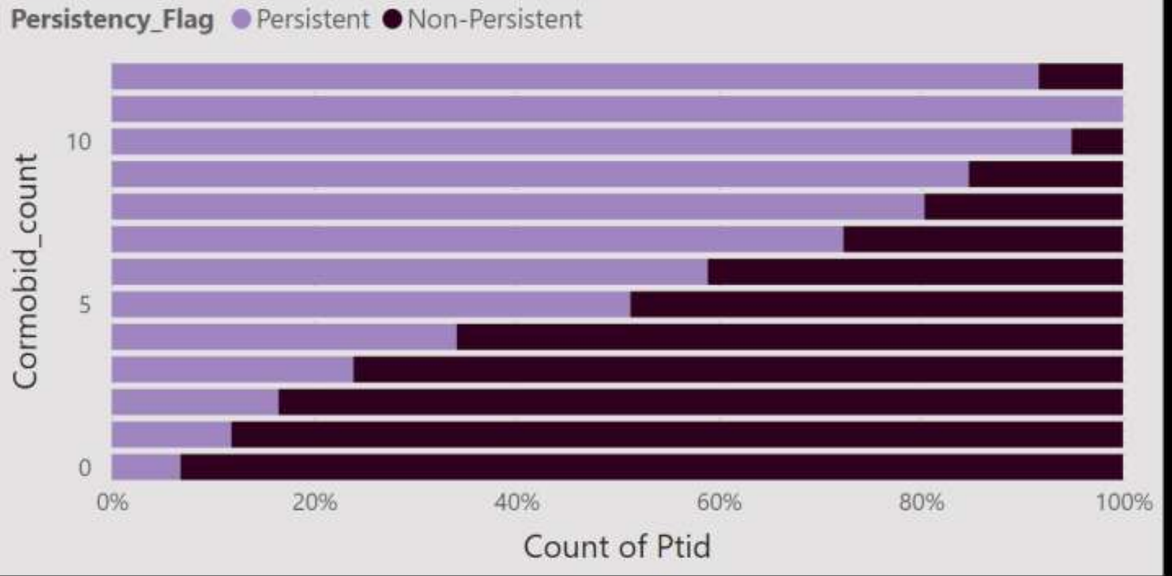
Number of comorbid issues patients have



Comorbidity and age



Persistence and patients comorbidity count



A majority of patients have comorbidity with between 2 and 4 medical conditions, a huge fraction of this being people above 75 years of age. According to our data, people with more comorbid issues tend to be persistent with their medication.

93.2%

Of patients with no comorbid illness are non-persistent with their medication

91.7%

Of patients with 11 comorbid illnesses are persistent with their medication

Model recommendation for technical user

Our aim is to create a classification model that will somewhat accurately predict whether a patient will be persistent or non-persistent with their treatment using the sample dataset.
We will start by splitting our model into train and test datasets since necessary cleaning and transformation have been done on our dataset.
We recommend using K-nearest neighbours and Support Vector Machines as our classifiers. Both classifiers will be trained on the training dataset after which we will proceed to make some predictions. We will perform a proper evaluation of both our models through different methods, some of them being: Logarithmic Loss and classification accuracy. The model that proves to be more efficient and accurate shall be implemented.