2019 Humana/Mays Healthcare Analytics Case Competition

Team- Avengers

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Introduction

Long Term Opioid Therapy (LTOT) Issue

Long Term Opioid Therapy (LTOT) is defined as continuous use of an opioid medication with 162 days over 6 months. During 1970s, opioids are only prescribed by physicians when patients were 'on the cusp of death', while throughout 2000s, LTOT for non-cancer pain conditions (NCPC) increased considerably. There are many debates on the use of LTOT, including advocates for patients receiving palliative care, and families who have lost members to overdoses.

According to Grisell and Jennifer (2018), patients treated with LTOT for NCPC and followed in a tertiary care pain center are at low risk for opioid misuse. However, Martin (2011) claims that 50% of people who used opioids for at least three months were still on the painkillers five years later. In addition, Nugent (2017) finds that 223 of 600 patients receiving LTOT who were also identified as using alcohol, cannabis, illicit substances, or non-prescribed controlled substances, had their LTOT discontinued for aberrancy.

LTOT-Business issue

Although the LTOT problem is still on debate, leading health companies like Humana is supposed to think proactively to avoid the disadvantage of LTOT.

Forecasting whether a customer would have LTOT in the future is significant for business. Given the previous behavior, Humana could be able to predict whether this customer would have LTOT in the future, then give medical advices and treatments in advance to avoid abuse and misuse. Customers will also be alerted when they are noticed that they will probably have LTOT in the future, so they are willing to restrain their dependence to opioid medicine. In addition, providing this information also displays Humana's social responsibility and improves its goodwill.

Analysis on Model

Dependent variable

In order to identify the elements that prompt customers to become LTOT, we choose 'whether the customer had LTOT' as y (dependent variable). We found MME in RX Claim- Paid is important because the MME is an indicator of whether the customer has opioid drug. Then, we use Days and Pay_Day_Supply_CNT to calculate time of intaking opioid drug and classify whether a customer is qualified for LTOT.

We also use 'for loop' to find customers who have LTOT more than once. The result shows that the number of customers who have LTOT for two or three times is less than 70, which is considered as small quantity compared to the total 14,000 customers. Therefore, we categorize all customers who had LTOT as true no matter how many times they had.

Independent variable

The original Comp data base gives us much information including different type of call, new diagnosis, Fully Paid Claim. We select MME, Surgery, RX-Claim – New Drug, New diagnosis-Top 5 and event_attri8 in RX Claim-Paid as independent variables.

MME

MME/Day is calculated as Strength per Unit *(Number of Units/Days Supply) *MME (U.S. Department of Health and Human Services) conversion factor, so we sum up all the MME a customer intook before the qualifying event as a dependent variable.

Surgery

Sum of times a customer had surgeries.

New Drug

Whether a customer had new drug or not.

New diagnosis- Top 5

After we look at the correlation between different type of diagnosis and LTOT, we chose one of five-CPD, as a dependent variable.

event_attri8- Type of Opioid

After we look at the correlation between different type of opioid medicine and LTOT, we chose 7 of 15- hydrocodone, oxycodone, tramadol, codeine, morphine, hydromorphone and methadone, as dependent variables.

Num

Sum of days having Opioid drug before qualifying event.

The chosen model:

earth(LTOT~.+MME*hydrocodone+usage*num+hydrocodone*num,degree=5,thresh=0.0001)

RMSE: 0.1963621

Implication and Recommendation

Based on our analysis and researches, a few of recommendations put forwards:

Pain management

2011 Institute of Medicine (IOM) report describes the moving away from opioid-focused treatments by 'improving provider education on pain management practices and team-based care.' Since opioid therapy is mainly for palliative care in NCPC, pain management is important. In reality, doctors often use pain scale to assess person's pain but that is not accurate or continuous. To solve this problem, Humana is supposed to set up a new pain management structure especially for opioid therapy.

Prescription monitoring

Since Humana collected historical events of a customer, it is able to trace and monitor customers' behavior. A sophisticated prescription monitoring system can be set up to give an immediate warning as soon as a customer is approaching to have LTOT. For example, since MME is highly correlated with LTOT, a warning line of total MME intake per capita can be set. When this monitoring system identifies the total amount MME a customer had has approaching the warning line, a warning will be sent to the doctor, customer and pharmacy. Furthermore, when this model becomes more accurate, we can give parameter to each independent variable and then calculate the final score as warning line.

Training and regulation

Correspondingly, training and regulation should also be provided to doctor, customer and pharmacist. For example, according to our model, several opioid medicines are highly related to LTOT like hydrocodone, oxycodone and tramadol, so doctor should be trained to restrain the times of prescription of these drugs. Besides, when a customer is going to pick up these drugs in pharmacy, pharmacist should also be alert and tell customers the risk.

Conclusion

In conclusion, our team has explained a general picture of LTOT and related business issues. We cleaned and filtered the raw data given, selected variables and tuned models. At last, we chose model:

Earth(LTOT~.+MME*hydrocodone+usage*num+hydrocodone*num,degree=5,thresh=0.0001)

which has lowest RMSE= 0.19636. At last, in order to avoid abuse and misuse opioid drug, based on research, we provide some recommendations including pain management, prescription monitoring and training and regulation.

We appreciate Texas A&M and Humana giving us precious opportunity to explore in this industry.

Reference

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