Lace Index and Lace Index Plus

Background:

Hospital readmission is an episode when a patient admitted again after the discharge from the a same or other hospital with in the specific time interval. Rate of this indicator is called the readmission rate (RR) and has been increasingly been used as an outcome measure of the health services and the quality benchmark of the health system. Generally 30 days readmission rate will be considered for this measure, but it is not worth to see the 60, and 90 days readmission rate as well.

Reducing the preventable readmission is the national priority for the payers, providers, and policy makers who are seeking to improve the health care and lower the cost of the total health care. It is also associated with unfavorable patient outcome and high financial cost for the patient and the in tsurance company. It was estimated that the average cost of in one admissson is about $20k and 20% of readmissions are avoidable.

This is being said, the Electronic health record system has created the golden opportunity to proactively identify by the patient of high risk of readmission based on their demographic and clicnical histoy and apply the effective interventions to metigae the risk that helps the significance cost that could be avoidable and improve some confidence level of the patient heatlht status. There are large number of Machine learning models and high level sctific models are placed to predict the risk of readmission of the patient after discharge from the hospital stay, but still we need accurate, real time and intuitional based some simple predictive model in the local setting.

The Lace Index and Lace index plus one of those models that could be help to identify the high risk of readmission of the patients calculated based on the demographic and clinical history of the patient.

Lace Index and Lace Index Plus:

Lace Index- It is the predictive tool that identify patients that are at risk of readmission or death with in the 30 days of hospital discharge. It basically use the four parameters or variables.

L: It is the length of stay of that index admission.

A: It is the acuity of admission.

C: It is the comorbidity of the patient. It generated based on charlson comordity score.

E: Total number of emergency deparmemt vist last 6 month before the admission.

After sum up these four parameters, the score ranges from 0 to 19 for each patients and higher the number gives the higher the risk of readmission.

The following table gives the scoring method for this Lace Model

Generally, the score 0-4 is consider as the ‘Low’, 5-9 as the moderate and 10-19 as the high risk of readmission.

Lace Index Plus:

It is the updated version of the Lace index model that also account the dempgraphic profile of the patient particularly the gendera and age; and type of discharge institution. It is showing up from the data and research, teaching and small genral hospital gives the quality of the service compared to the big hospital. It also account some additional clinical history of the patient particularly for elective admissions before the index. It also consider the score the level of care after the discharge. If the patient will go for the alternative care, the score will be reduce as the assumption that patient get the high level care from the heatlth institution.

As we know, the severity of the patient depends on the age, so the Charlosn comorbidity score has been calculated based on the age and the history of the emergency visit of the past .

Scope :

DnA is working with ----- to develop the Machine Learning algorithem identify the risk of the member who are admitted with in the last couple of days or have the plan to admit into the hospital with in the couple of days. For this , inpatients information since 2006 has been used to develop the AI algorithem and predecit the member risk for those authorizations. This model helps DnA to compare the outcome of that model in some extent, and also this model is the basic foundation of the Lace Index readmission model that we can use as the alternative to identify the risk of the readmission of the member. As this models have been already pro highly siginifact of those variables to predectit the readmisson

Variable and Data Source:

Lace Index :

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Data Source | Scoring Criteria | Note |
| Length of Index Stay | Available in EDW from |  | Straight forward to pull the data |
| Acuity of Admission | Available in EDW from |  |  |
| Comorbidities | Available in EDW from |  | Need some data manipulation to get the Charlson Commorbidity score |
| Emergency Department Vists | Available in EDW |  |  |

Lace Index Plus:

|  |  |  |  |
| --- | --- | --- | --- |
| Variable | Data Source | Scoring Criteria | Note |
| Length of Index Stay | Available in EDW from |  | Straight forward to pull the data |
| Acuity of Admission | Available in EDW from |  |  |
| Comorbidities | Available in EDW from |  | Need some data manipulation to get the Charlson Commorbidity score |
| Emergency Department Visits | Available in EDW |  |  |
| Age | Available in EDW |  |  |
| Gender | Available in EDW |  |  |
| Discharge Institution | Name available in EDW |  |  |
| Elective Admission | Available in EDW |  |  |
| Alternative level of Care | Available in EDW |  |  |

Data Management and other Data for Comparision:

Data Management:

Charleston Comorbidity Score:

Discharge Institution:

Comorbity score based on the age of the patient:

Propsective and Retrospevtive zrisk score of the patient:

Predectired Risk score based on the previous model.

Model and Scoring

Specification of Scoring Table.

Validation of Variable that Predicted the Risk of Readmission.

After computing the variables of the Lace Index and Lace Index model, the score has been assigned the actual index of the hospitals for 2018 and 2019 inpatient data. The logistic model has been developed and tested the significance of each variable of Lace and Lace index plus with the actual readmission that happens during that period.

The following result

Other 6 Machine learning models were developed based on those variables, the performance matrix of those 6 different models like as below.

Limitation

Conclusion

Appendix:

Query sql

External data source that is available in the local sand box to calculate the Lace Index .

Logistic model for validation

Machine Learning algorithms of 7 different models are used to see the outcome of Lace Index and Lace Index predictive value.