

Case Study:

— — Healthcare Systems HRRP Improvements

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— — Healthcare System

Integrated healthcare provider: 14 hospitals in Pacific NW.

18% of total 2012 revenue from Medicare reimbursements for AMI, HF, PN

HRRP: Readmission Reduction Program

~ 20% (30-day) readmission rate in US

estimated cost (US) ~ 17.4B / year

(2012) Penalties: \$750,000

CFO estimate for 2014 : \$8000 loss per readmitted patient

Seattle hospital: CareTracker reduced readmission by 40%

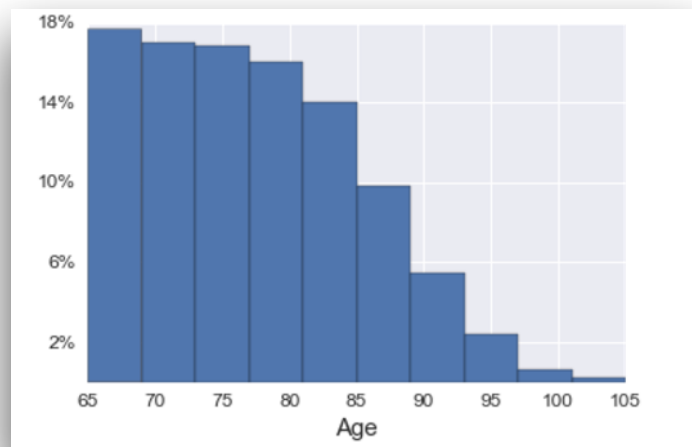
CareTracker : \$1200/patient

**Problem: Use of CareTracker?
What else?**

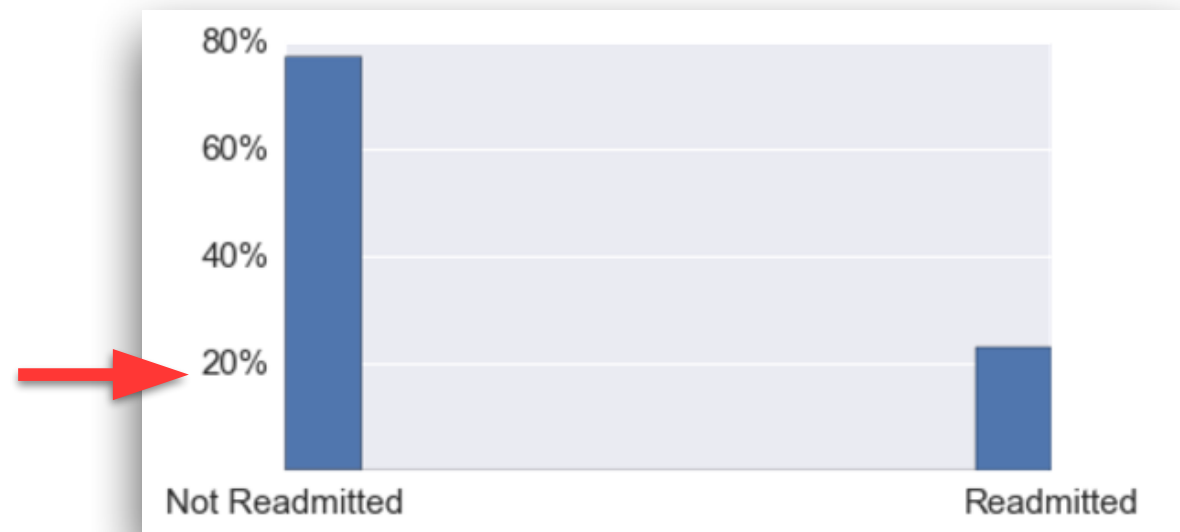
Data Driven Analysis

Data provided (on all hospitals) for AMI

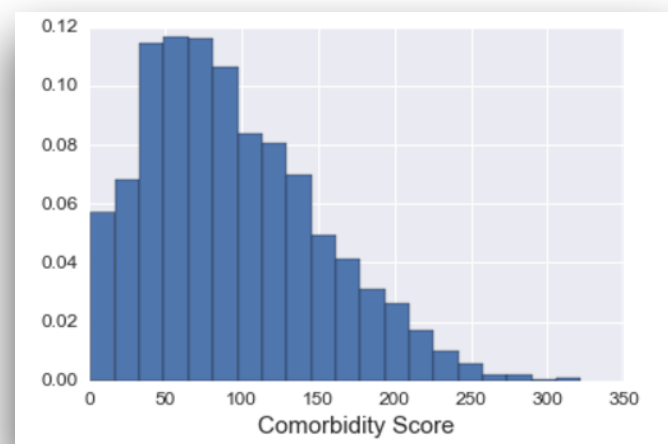
Age



The data provided by — Healthcare Systems includes 4382 records
readmission rate ~ 2.28% higher than national average



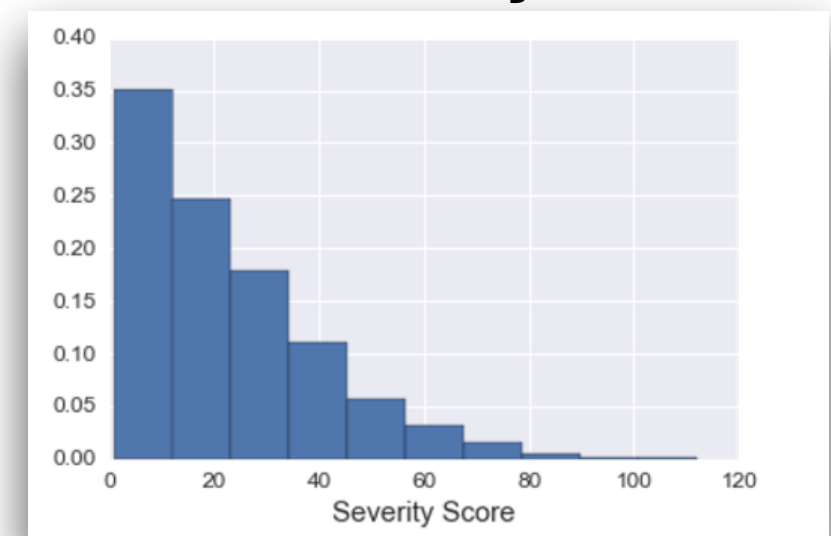
Comorbidity



Gender



Severity



Data Driven Analysis

No Action

If we do nothing: ~ \$8M Loss

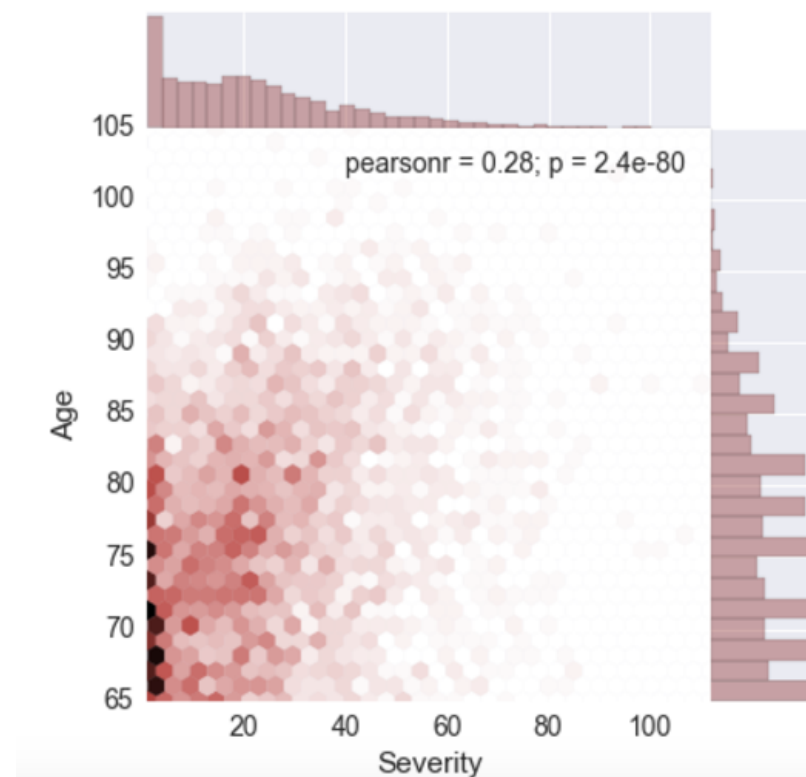
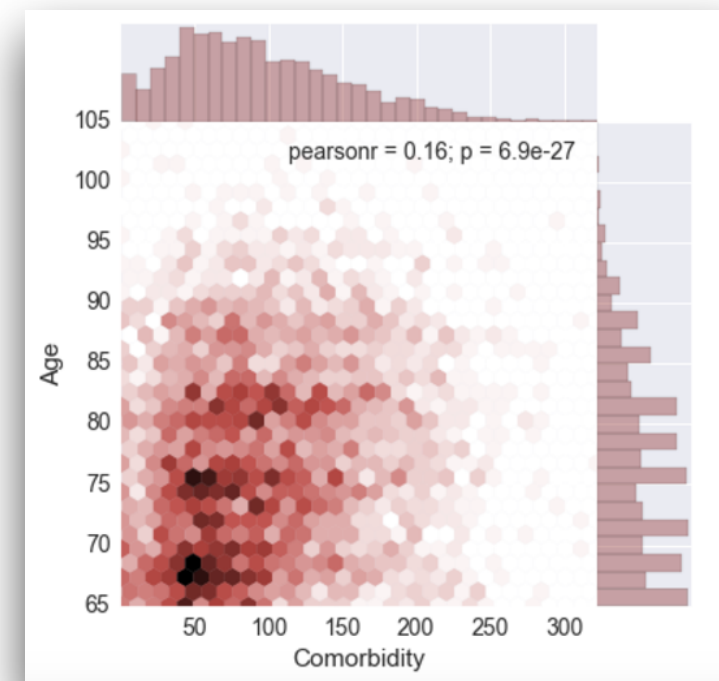
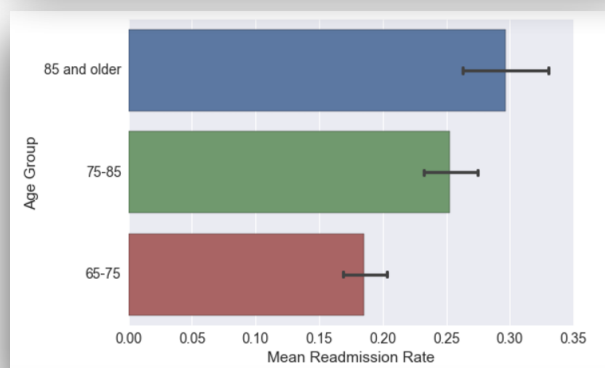
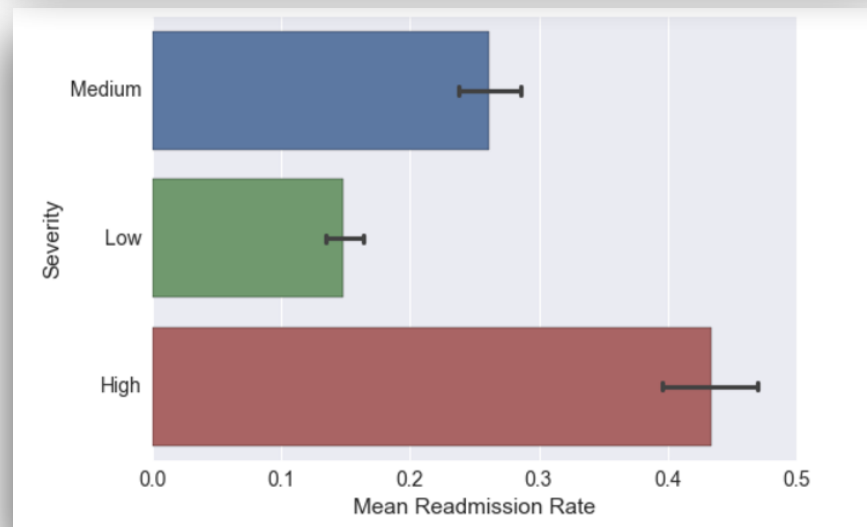
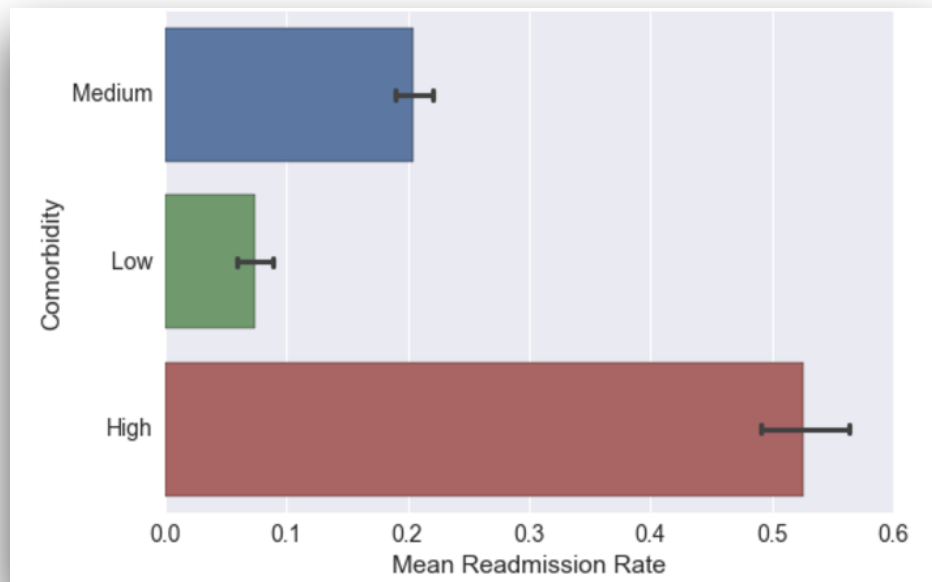
Wrong Action

**if we had used CareTracker for everyone:
~ \$10M Loss**

Right Action

**if we had used CareTracker for readmitted:
<~ \$6 M Loss**

Further insight into data:



Data Driven Decision

Given patient attributes and certain external conditions we can predict what is the chance of a patient to be readmitted.

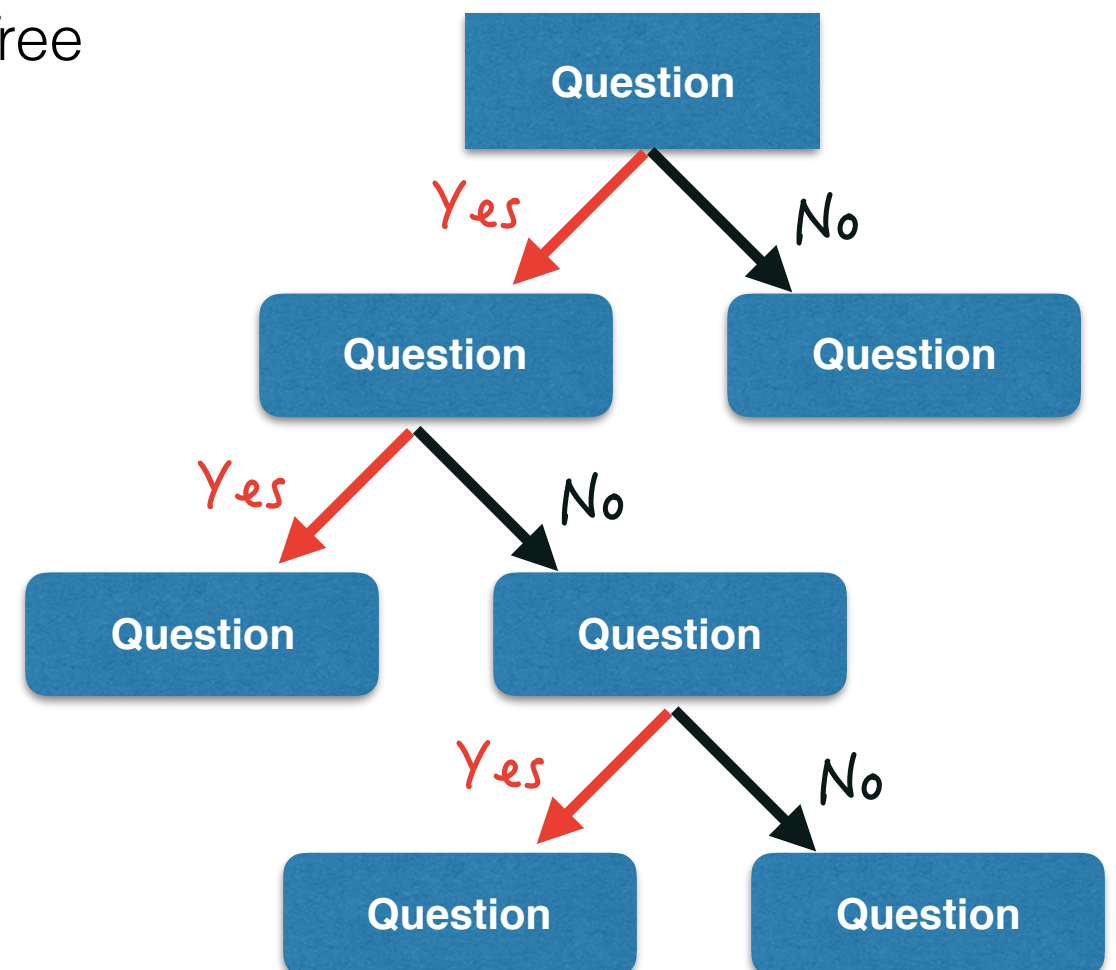
The targeted patients may be offered CareTracker service or any other provisions.

Model:

Random Forest:

Decision tree + Random Tree
Selection + Averaging

- Low chance of overfitting
- Fast

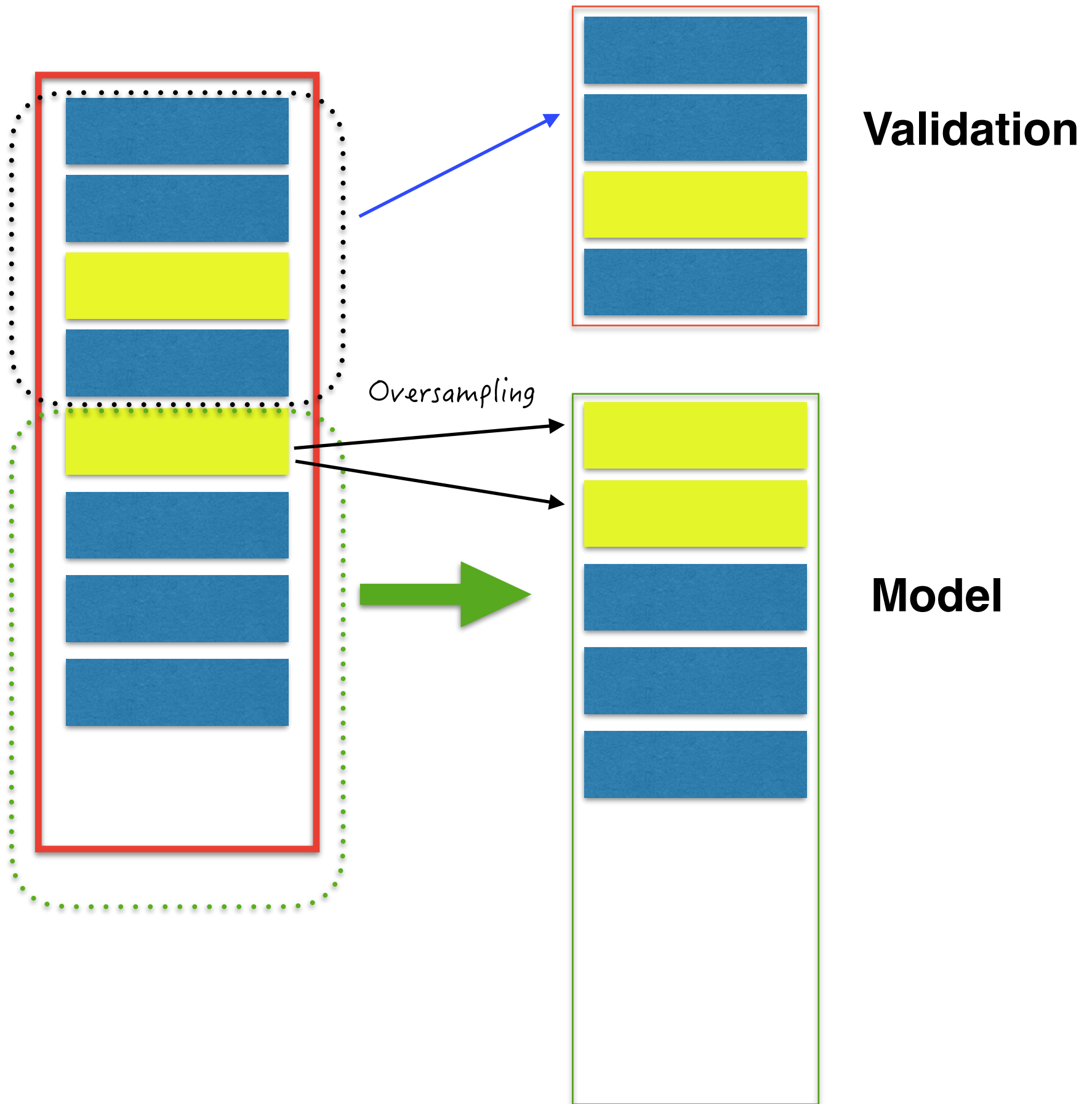


Data Modeling



Accuracy:
Rate of Correct Prediction :
Readmitted and Not Readmitted

Random Forest:
76% Accuracy



Feature Importance

Comorbidity

Severity

Age

Flu Season

Gender

Emergency

$\text{penalty_readmit} - 0.76 \cdot 0.4 \cdot (\text{penalty_readmit} - \text{CareTracker_cost}) \sim \$ 5900$

25.8% reduction in cost (compared to \$8000)

Conclusion and Recommendations

Data Driven Model helps identifying chance of readmission.

Hospitals will save as a result.

Condition based decision.

Improvements

Data:

- **Clustering : More data driven categorization of patients.**
- **CareTracker or other provisions are recommended based on the data driven model.**
- **The provision must be accompanied by insights from data:
Attention to the patient attributes.**
- **More data for more accuracy and more insight!**

Managerial and Medical:

- **Better provisions: higher success rate.**

Thank you!