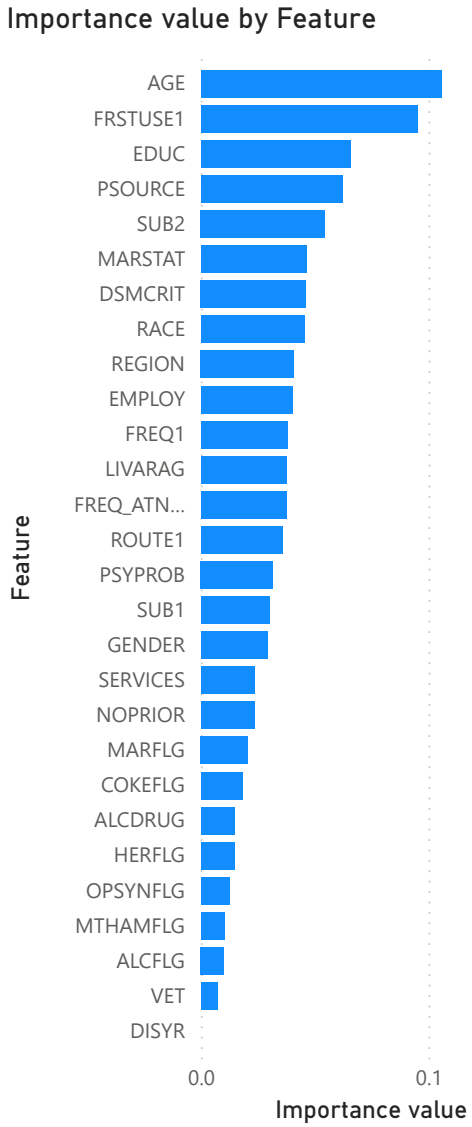
Random Forest Model Results



Changed focus from initial model development that used outpatient outcomes to looking at inpatient outcomes only

Removed data values of transferred to another treatment facility

Random Forest Model used to generate Feature Importance List

Random Forest Model Confusion Matrix

Column1	Predicted 0	Predicted 1	Treatment Outcome Totals
Actual 0	7925	3172	11097
Actual 1	3857	14878	18735
Total	**11782**	**18050**	**29832**

Random Forest Model Performance

Year	RF Training Score	RF Testing Score
2019	0.98	0.76

rf_model = RandomForestClassifier(n_estimators=6, random_state=78)

Model Produced Reasonable results with focus on inpatient outcomes

Limited optimization time spent on model

Further actions to look into Balanced Random Forest Classifier and adjust the class_weight parameter in the Random Forest Classifier

Neural Network Model Optimization vs Class Weight

Weight: 0:1, 1:0.3

Column1	Predicted 0	Predicted 1
Actual 0	9572	1525
Actual 1	7544	11191
Total	**17116**	**12716**

Weight: 0:1, 1:0.4

Column1	Predicted 0	Predicted 1
Actual 0	9160	1937
Actual 1	6130	12605
Total	**15290**	**14542**

Weight: 0:1, 1:0.5

Column1	Predicted 0	Predicted 1
Actual 0	8720	2377
Actual 1	5032	13703
Total	**13752**	**16080**

Weight: 0:1, 1:0.6

Column1	Predicted 0	Predicted 1
Actual 0	8115	2982
Actual 1	4024	14711
Total	**12139**	**17693**

Neural Network Model Performance vs weight

Weight	Training loss	Training accuracy	Testing loss	Testing accuracy	Testing Precision
0.60	0.47	0.77	0.48	0.77	0.83
0.50	0.51	0.75	0.51	0.75	0.86
0.40	0.54	0.73	0.54	0.73	0.87
0.30	0.58	0.71	0.58	0.71	0.87

```
wts = [.3, .4, .5, .6]
   for wt in wts:
      weights = {0:1, 1:wt}
      fit_model = nn.fit(X_train_scaled,y_train, class_weight=weights, epochs=ep, verbose=0)
```

Neural Network Model Performance (full 2019 dataset)
weight = 0.4

NN_cm	Predicted 0	Predicted 1	Treatment Outcomes Totals
Actual 0	36706	7682	44388
Actual 1	25035	49904	74939
Total	**61741**	**57586**	**119327**

Results and Observations

Outcome counts in cleaned dataset
Unsuccessful (0): 44388
Successful (1) : 74939

Precision is optimized over accuracy
Weight 0.4 selected for best compromise of minimizing false positives
while keeping the total predicted unsuccessful outcomes at ~ 50% of the total outcomes