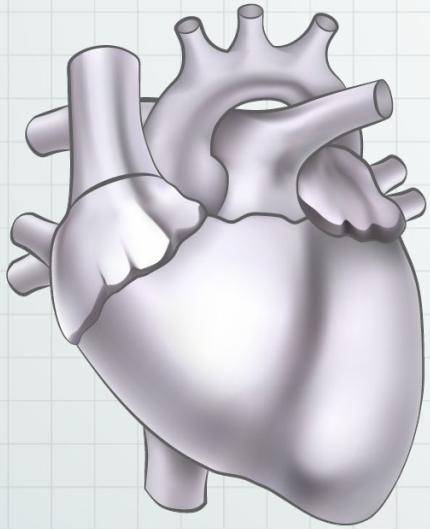


PREDICTING ATRIAL FIBRILLATION

Adam Cline, Amshula Gajula, Rachel Watermeier

TABLE OF CONTENTS

1 BACKGROUND

- Why are heart attacks a danger to public health?
- What is atrial fibrillation? Why is it our focus?
- What is our goal?

DANGERS OF MYOCARDIAL INFARCTION

200k-300k

DEATHS
before arriving to the hospital

Every Minute

A PATIENT DIES
of myocardial infarction

50%

experience severe or deadly **COMPLICATIONS**

ATRIAL FIBRILLATION

ARRHYTHMIA

Irregular heartbeat in heart atria

POOLING

Blood pools in atria due to improper pumping

CLOTTING

Still blood coagulates and forms clots

STROKE

Clots are pumped out to the brain and block blood flow

ATRIAL FIBRILLATION

- **Most common** type of cardiac arrhythmia
- Affects **over 2 million** US adults

GOAL

Determine which Covariates Measured at Hospital Admission can Predict Atrial Fibrillation

1. Clean Data and Select Covariates
2. Build Model
3. Evaluate Calibration and Discrimination of Model

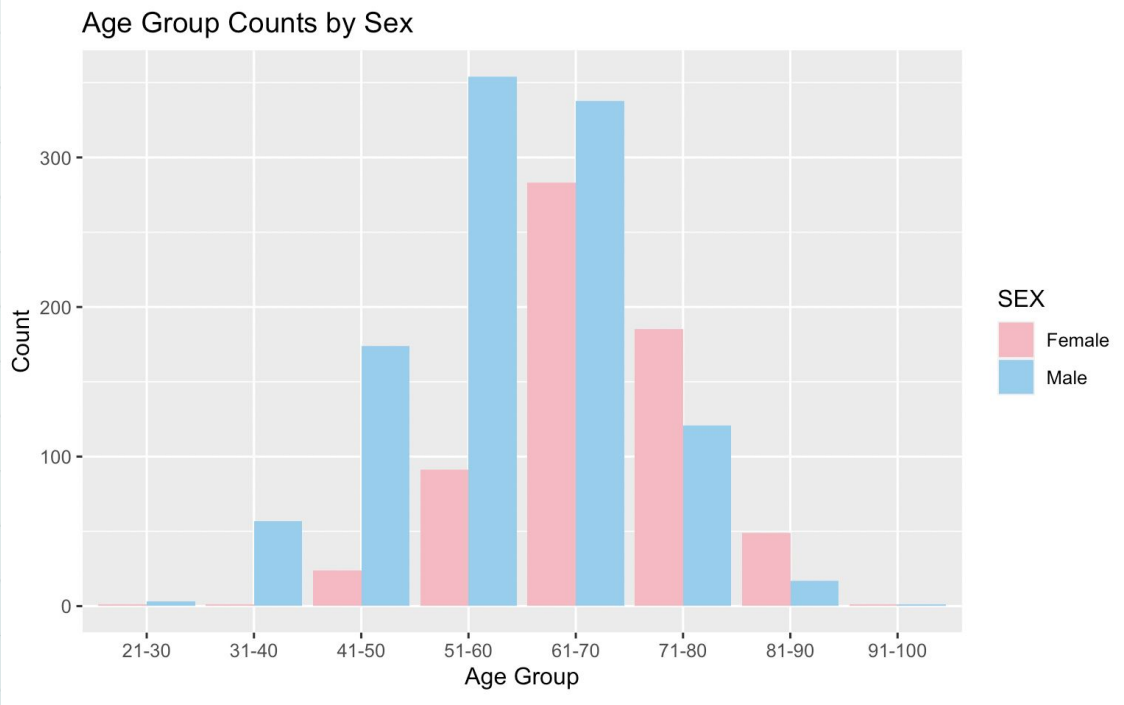
2 DESCRIPTIVE ANALYSIS

- What does the data consist of?
- What does the data look like?

STUDY BACKGROUND

- Acute MI Patients
- Krasnoyarsk Interdistrict Clinical Hospital №20, Russia
- 1992 – 1995
  - Contains 1700 patients and 111 covariates
  - Covariates contain:
    - Demographic
    - Medical History
    - Clinical Features of MI

COHORT SEX AND AGE



Female	Male
635	1065

IMPORTANT CONSIDERATIONS

Afib	Frequency	Percent	Cumulative Frequency	Cumulative Percent
0	1530	90.00	1530	90.00
1	170	10.00	1700	100.00

MISSING	PRESENT
7.58%	92.42%

3 INFERENTIAL ANALYSIS

- How was missing data dealt with? Why?
- What model was used? Why?

MISSINGNESS AND CLEANING

DATA CLEANING

High Percentage of **Missingness**:

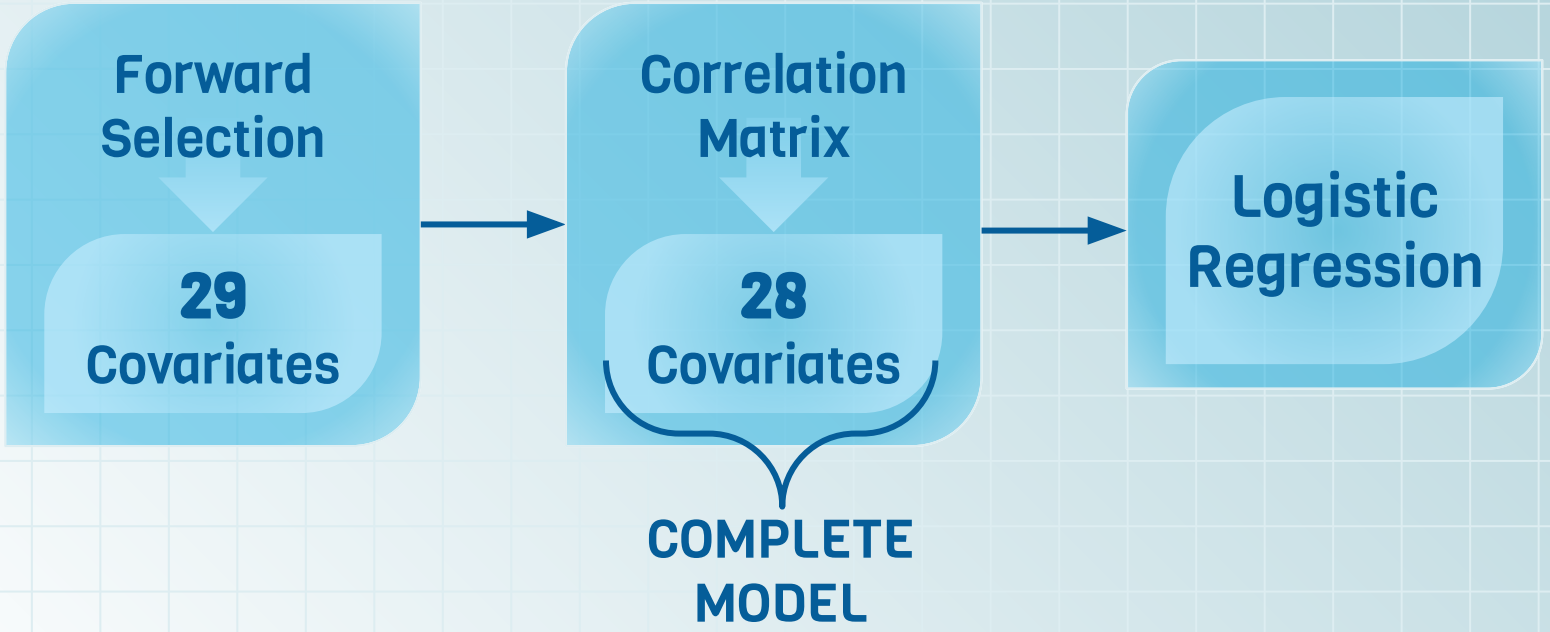
Variable <chr>	Missing_Count <dbl>	Missing_Percentage <dbl>
Serum CPK Content	1696	99.76470588
Serum AsAT Content	285	16.76470588
Serum AlAT content	284	16.70588235

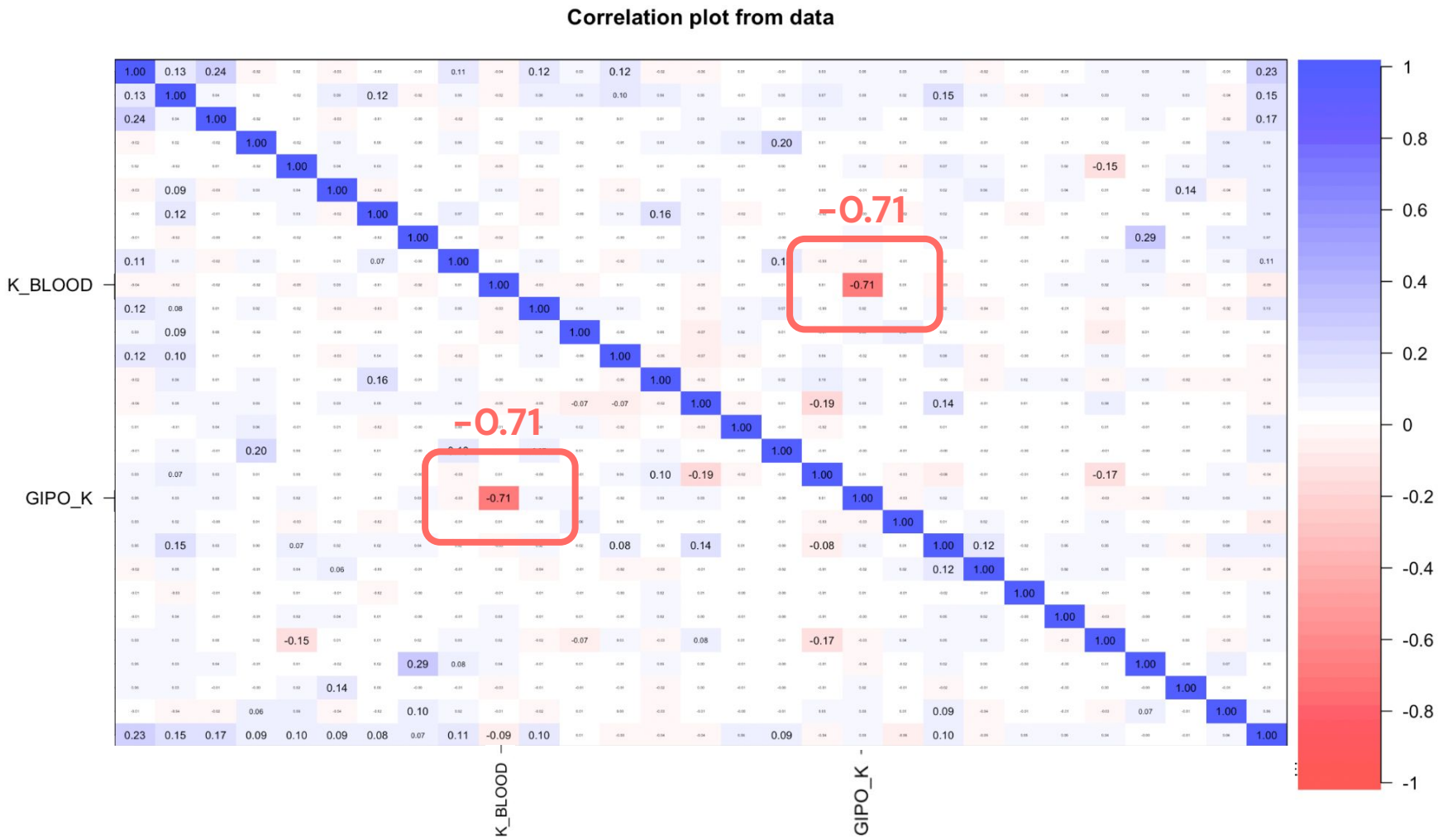
High **Multicollinearity**:

ECG: Sinus	419.322614
ECG: Atrial Fib	106.926709
ECG: Atrial	44.298676
ECG: Tachycardia	327.869301
ECG: Bradycardia	55.129998

Atrial Hypertension	3.358016
Systolic BP	4.590202
Diastolic BP	4.936101

COVARIATE SELECTION




Correlation plot from data
K_BLOOD
GIPO_K
-0.71
-0.71
K_BLOOD
GIPO_K
1
0.8
0.6
0.4
0.2
0
-0.2
-0.4
-0.6
-0.8
-1

Complete Model Covariates

Medical Records

Increased Risk

- Age (0.0433)
- Paroxysms of A-fib in medical record (1.982)
- Supraventricular tachycardia (1.795)
- Recent Coronary Heart Disease before hospital (0.714)
- Ventricular fibrillation in anamnesis (35.93)
- Arrhythmia in anamnesis (0.9586)
- Bronchial asthma in the anamnesis (1.18)
- Chronic heart failure (0.44)

Decreased Risk

- Quantity of MI in anamnesis (-0.7506)
- Persistent form of A-fib in anamnesis (-2.387)

Complete Model Covariates

Clinical Measurements at Hospital Admission

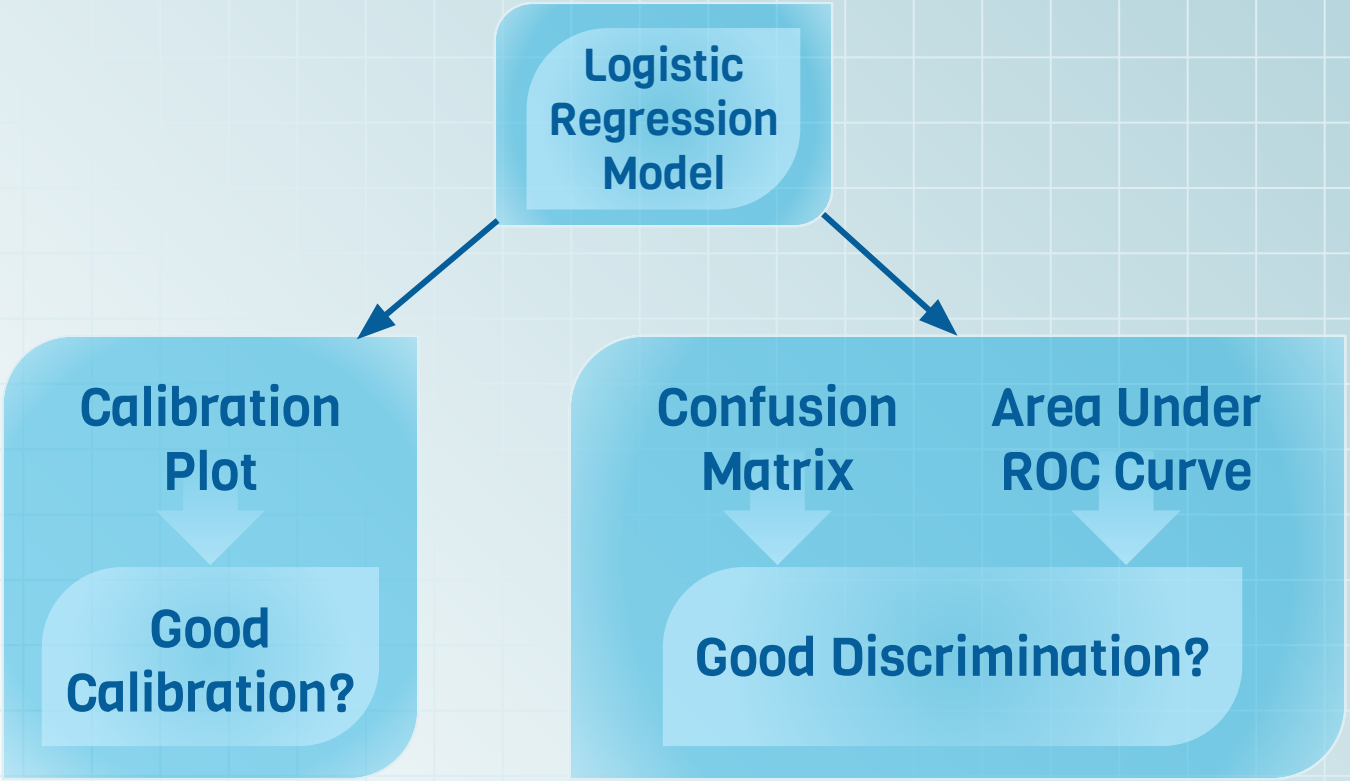
Increased Risk

- Paroxysms of A-fib on ECG at hospital (1.893)
- Opioid drug use in ICU in first hours of hospital (0.887)
- Supraventricular tachycardia on ECG (1.851)
- Paroxysms of A-fib on ECG at hospital admission (1.893)
- Use of lidocaine by Emergency Cardiology Team (0.753)
- Atrial contractions on ECG at Hospital (1.401)

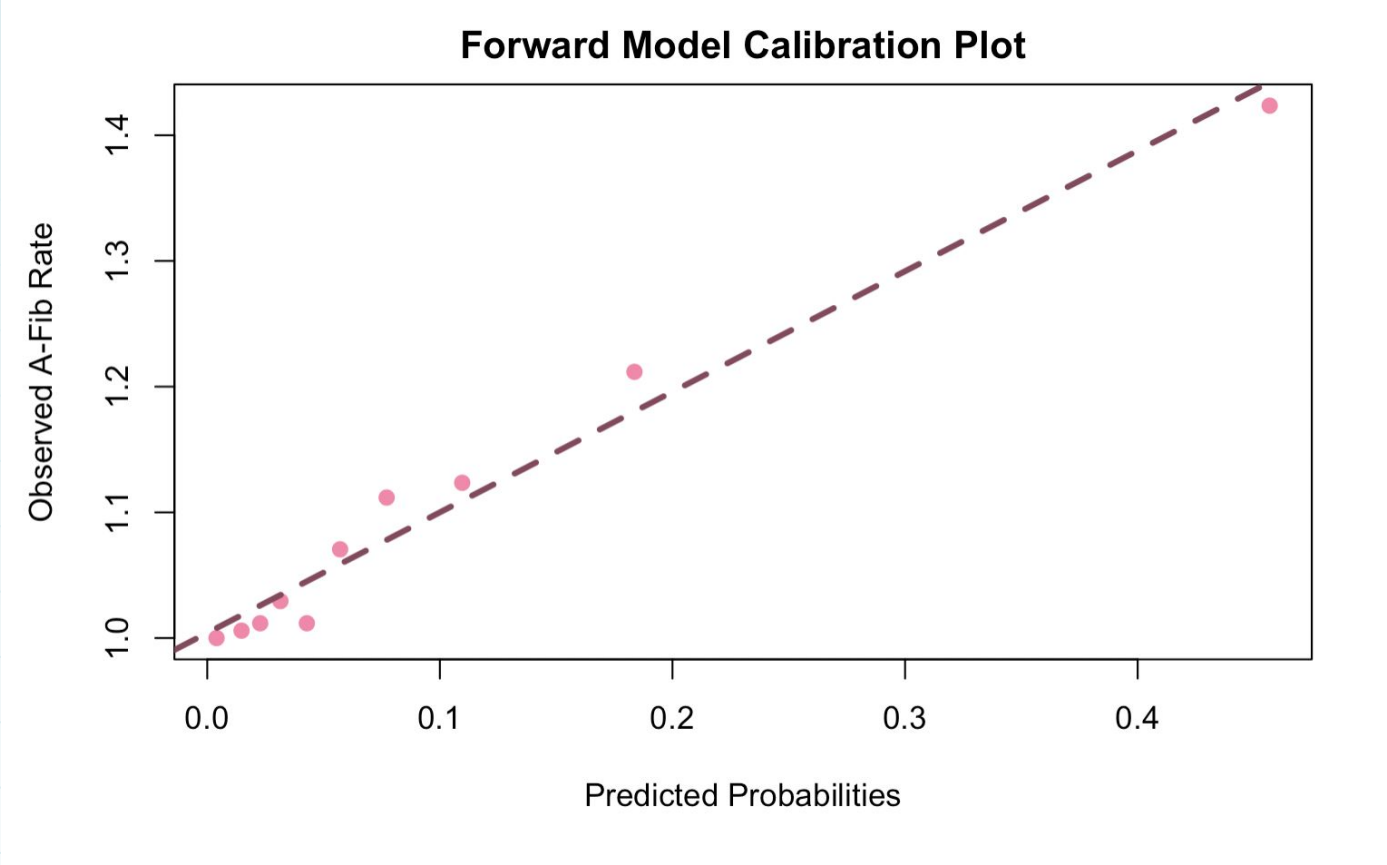
Decreased Risk

- Serum Potassium Content (-0.4402)
- Systolic Blood Pressure (-0.008)
- Cardiogenic shock at time of admission (-2.036)
- Use of NSAIDs in ICU hours after admission (-15.68)
- Relapse of pain on the 3rd day of hospital (-1.282)

CALIBRATION AND DISCRIMINATION



CALIBRATION PLOT



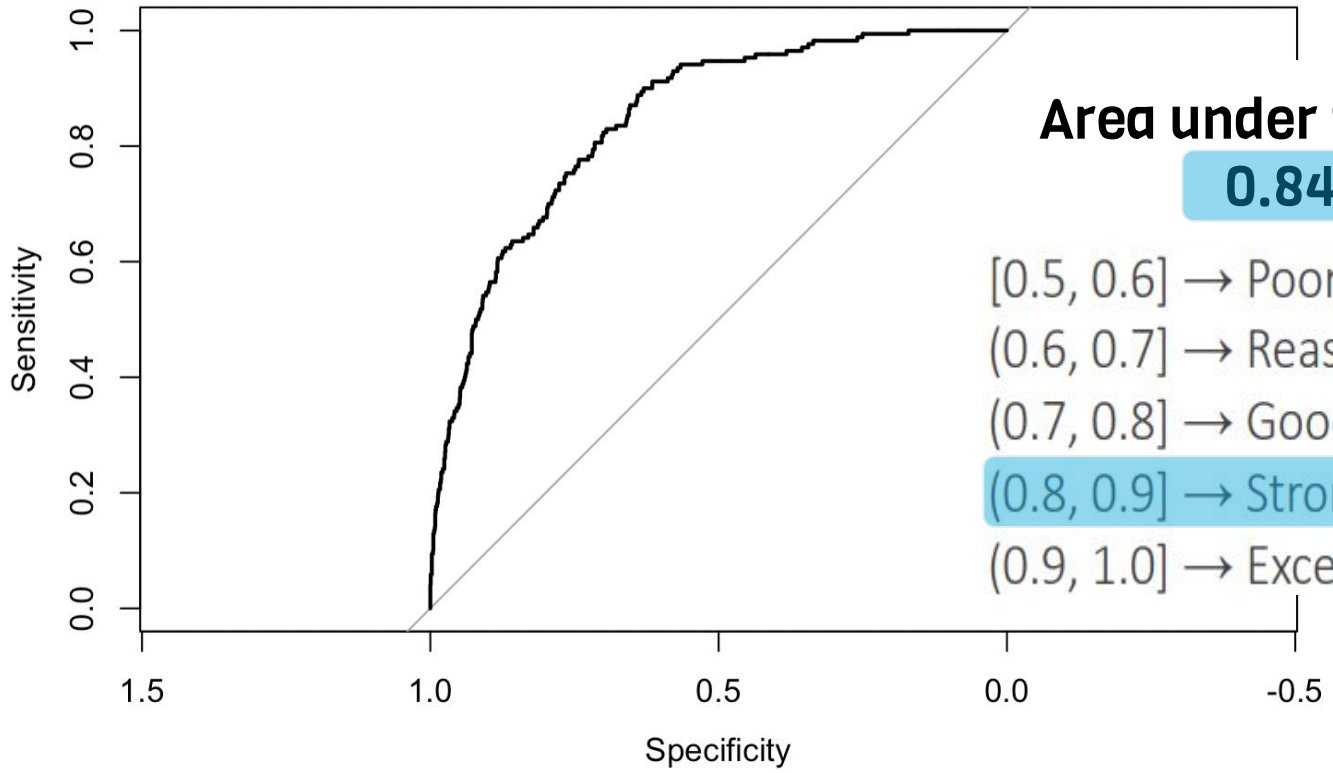
CONFUSION MATRIX

Predicted / Observed	1	0
1	123	47
0	339	1191
	462	1238

Sensitivity = 123 / 462
= 0.266

1 - Specificity = 47 / 1238
= 0.038

ROC CURVE



Area under the curve:

0.8455

[0.5, 0.6] → Poor model

(0.6, 0.7] → Reasonable model

(0.7, 0.8] → Good model

(0.8, 0.9] → Strong model

(0.9, 1.0] → Excellent model

CONCLUSION

STRENGTHS	WEAKNESSES
Predicting non-event patients	Predicting event patients
Low false negative rate	Moderate false positive rate

4 DISCUSSION

- Why are our findings useful to healthcare professionals?
- Limitations

APPLICATIONS

- Important predictors for healthcare professionals to consider:
  - Age
  - Previous heart disease/complications
  - ECGs
- Can predict risk of A-Fib at admission

LIMITATIONS

- Large amount of covariates
- Low rate of A-Fib in data -> low specificity
- Patients monitored for only 3 years after hospital admission
- Old data
- High rate of missingness
- Collected at 1 site

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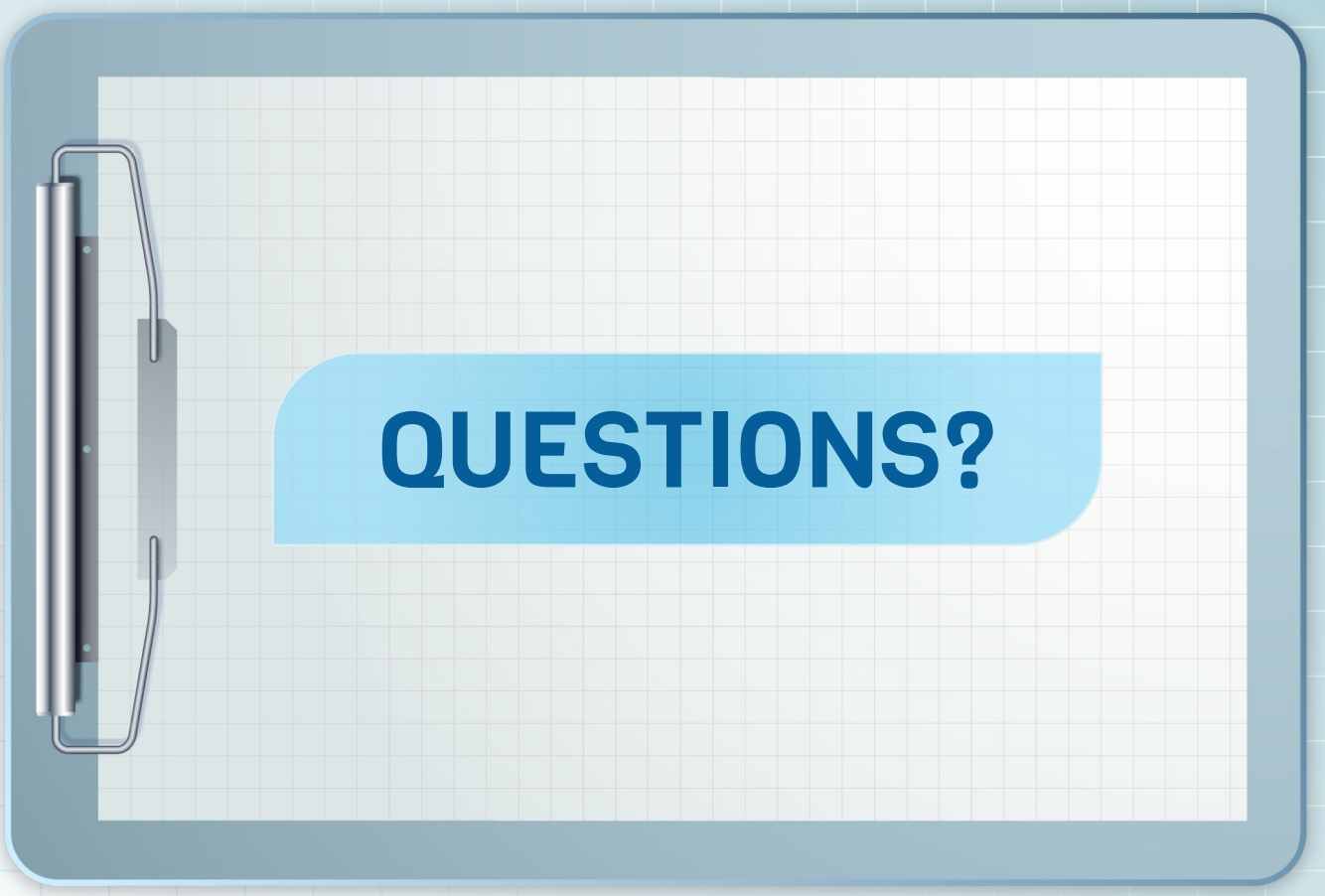
QUESTIONS?

THANKS!

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