

AUGUST 2022

# PATIENT SURVIVAL PREDICTION

WITH SUPERVISED MACHINE  
LEARNING

LINDSEY MORALES  
VISHAAL GUPTA  
JESSIE WAN  
ISAAC ROSENTHAL  
ATIKA HEMANI



# THE PROCESS

## DATA EXPLORATION & CLEANING

- Data sourced from MIT's GOSSIS (Global Open Source Severity of Illness Score) initiative via Kaggle.com.
- 85 columns, 91,700 rows
- Eliminate extraneous columns (i.e. Encounter ID, Patient ID, etc.)
- Drop null values.
- Cleaned data set includes 80 columns & 56,935 rows.

## EVALUATING MACHINE LEARNING MODELS

- Evaluate various classification models for supervised machine learning.
- Determine important features.

## LAUNCHING WEBPAGE VIA FLASK AND HEROKU

- HTML pages created to display the process.
- Webpage launched with prediction of patient survival.
- Site hosted by Heroku.

# THE PROCESS

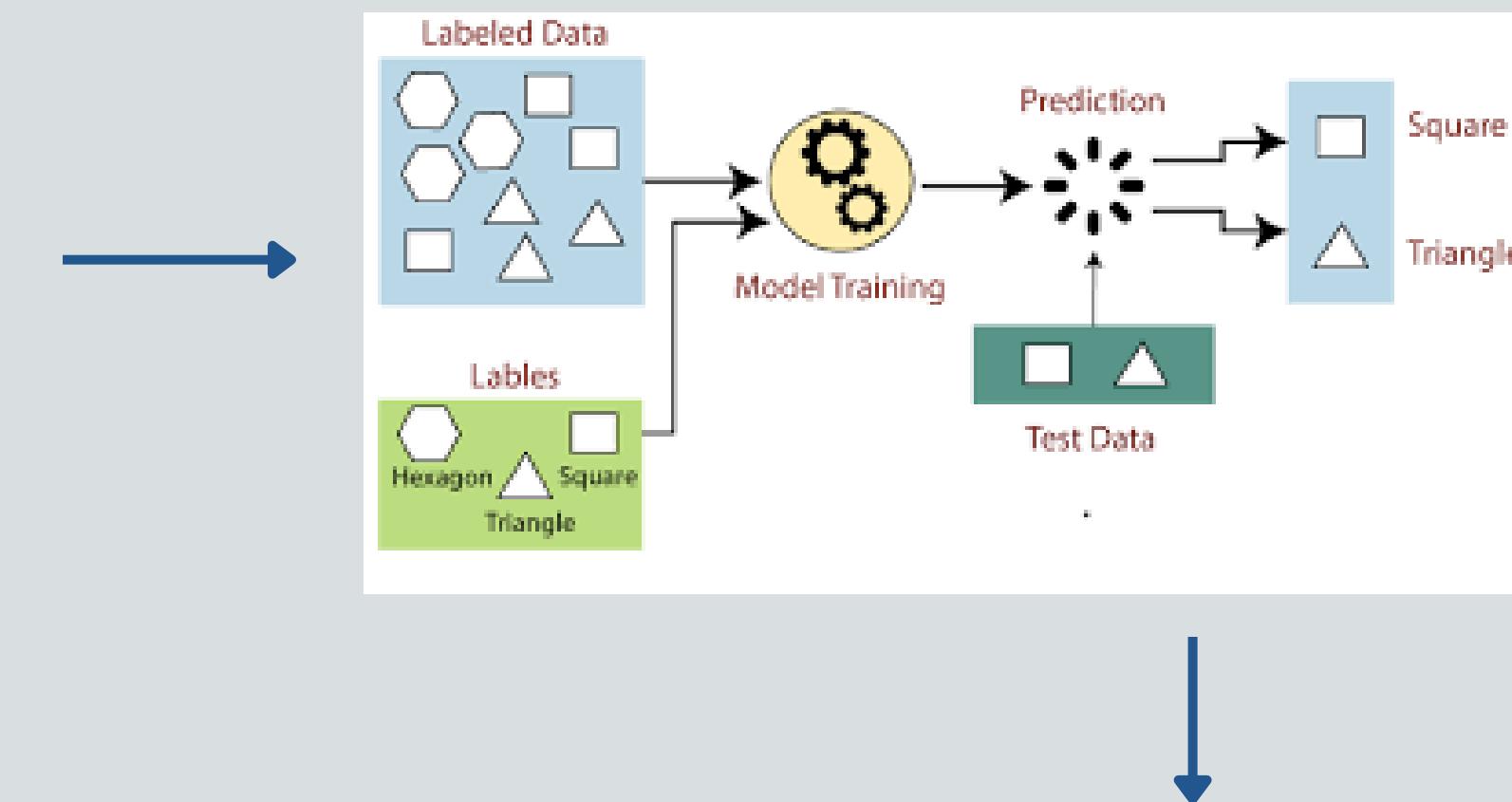
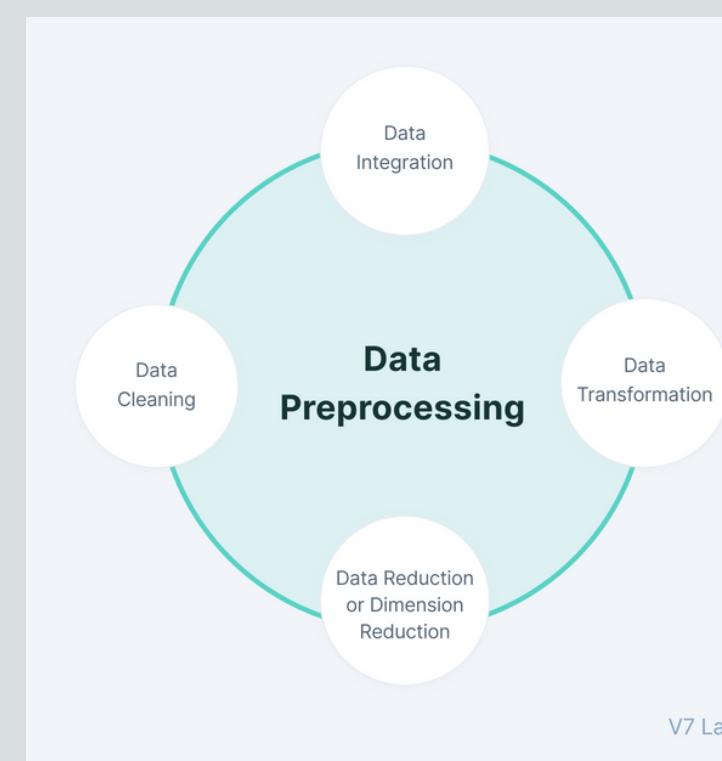
# kaggle →



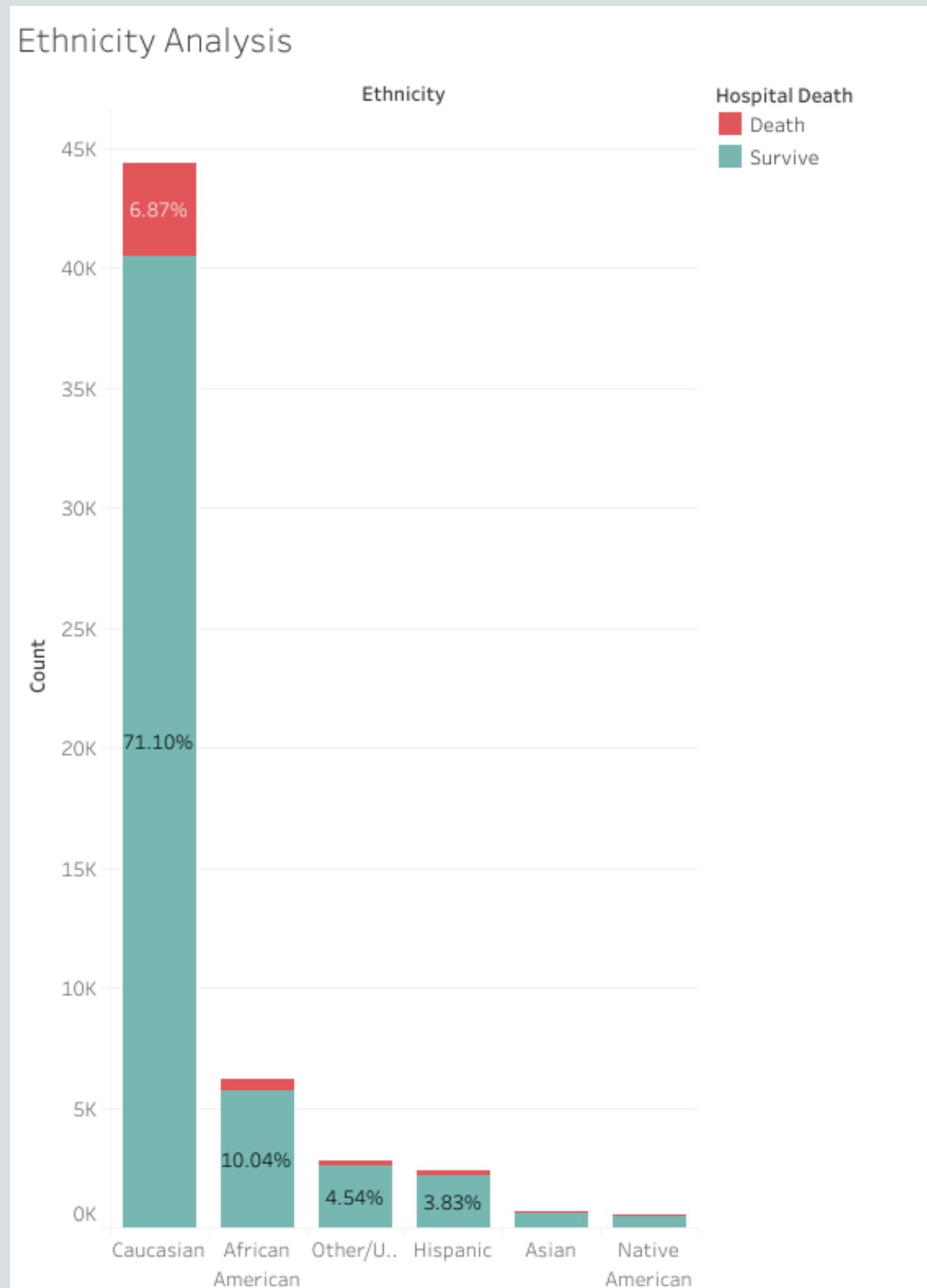
kaggle



Flask

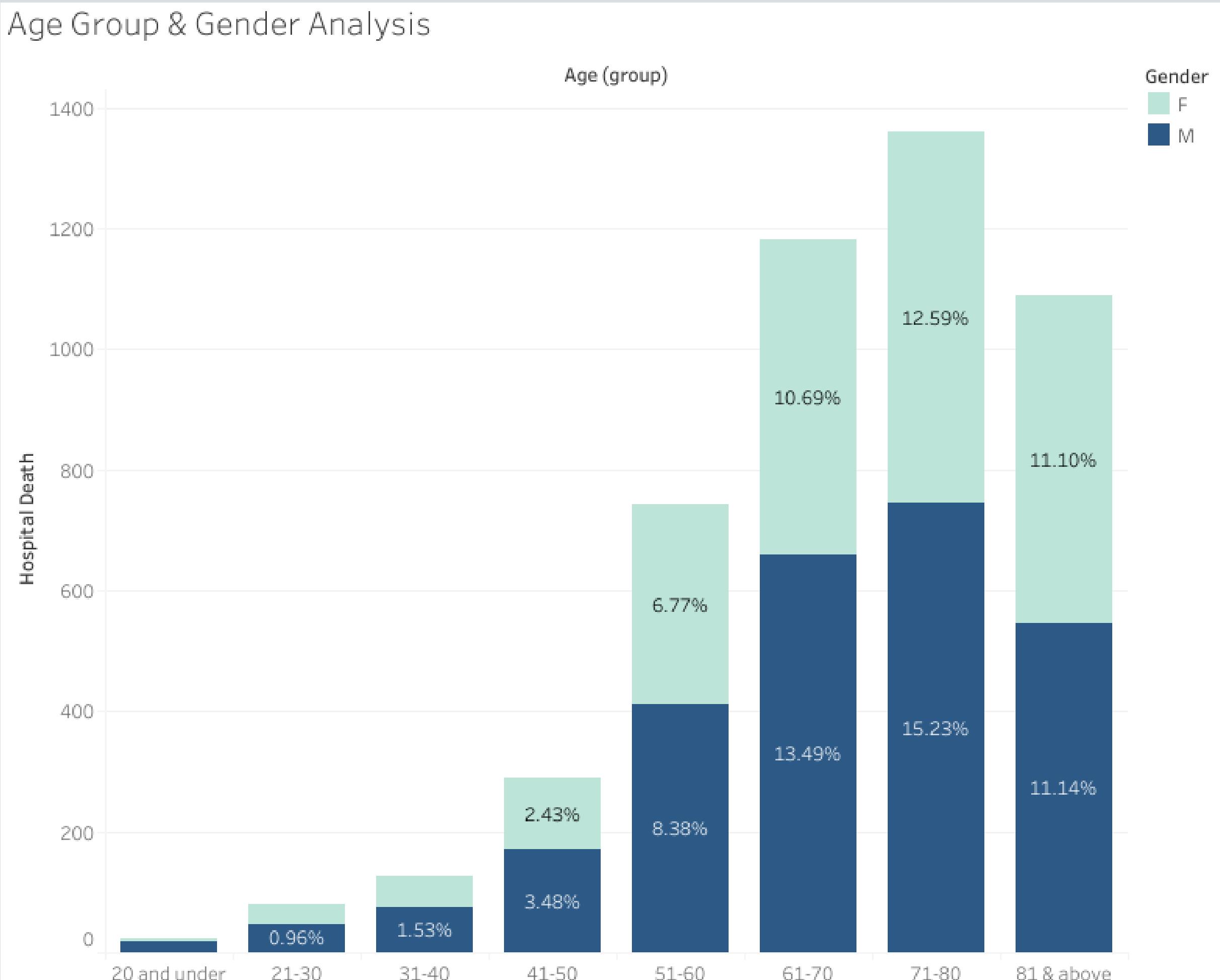


# DATA SUMMARY



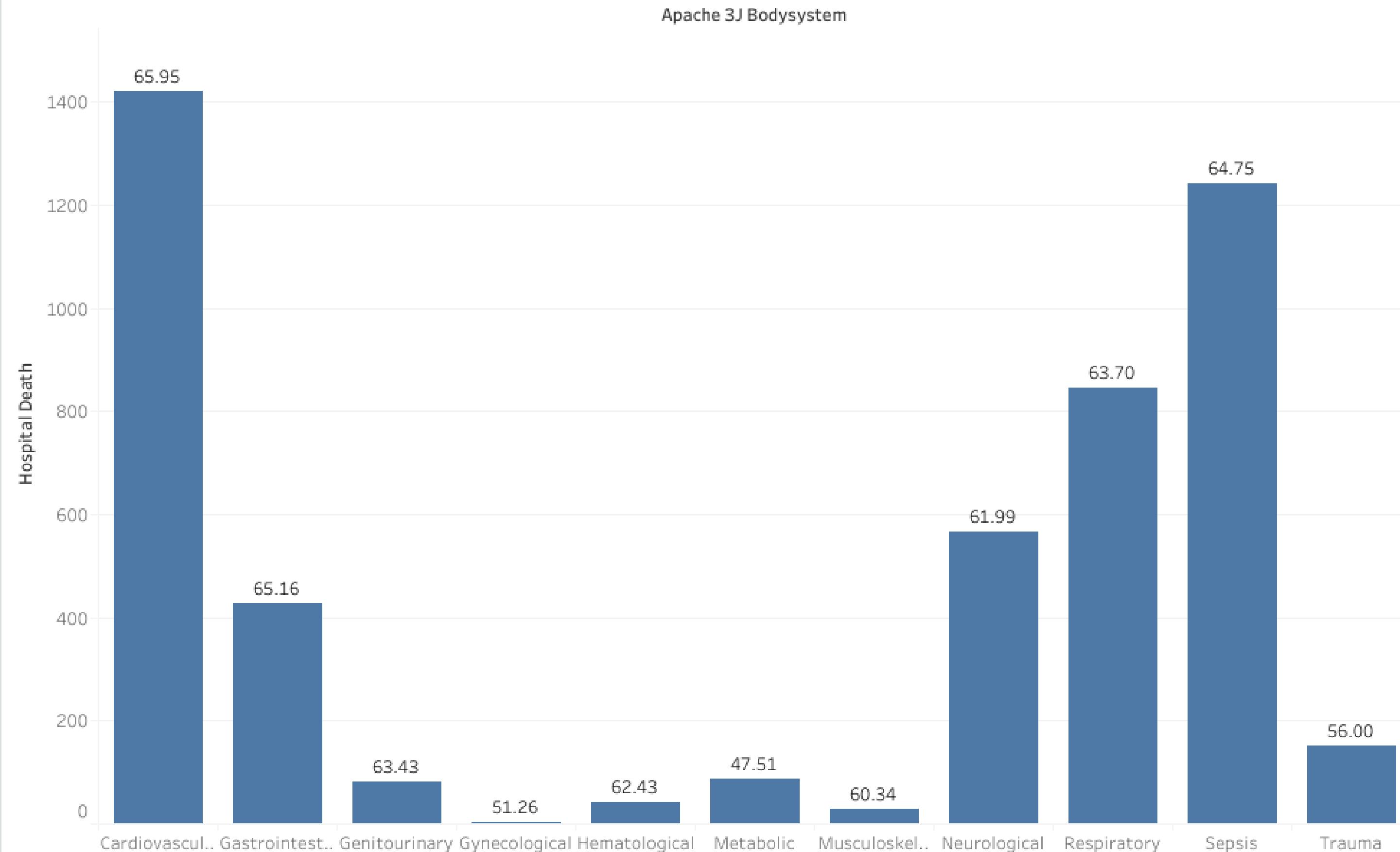
# DATA SUMMARY

## Age Group & Gender Analysis



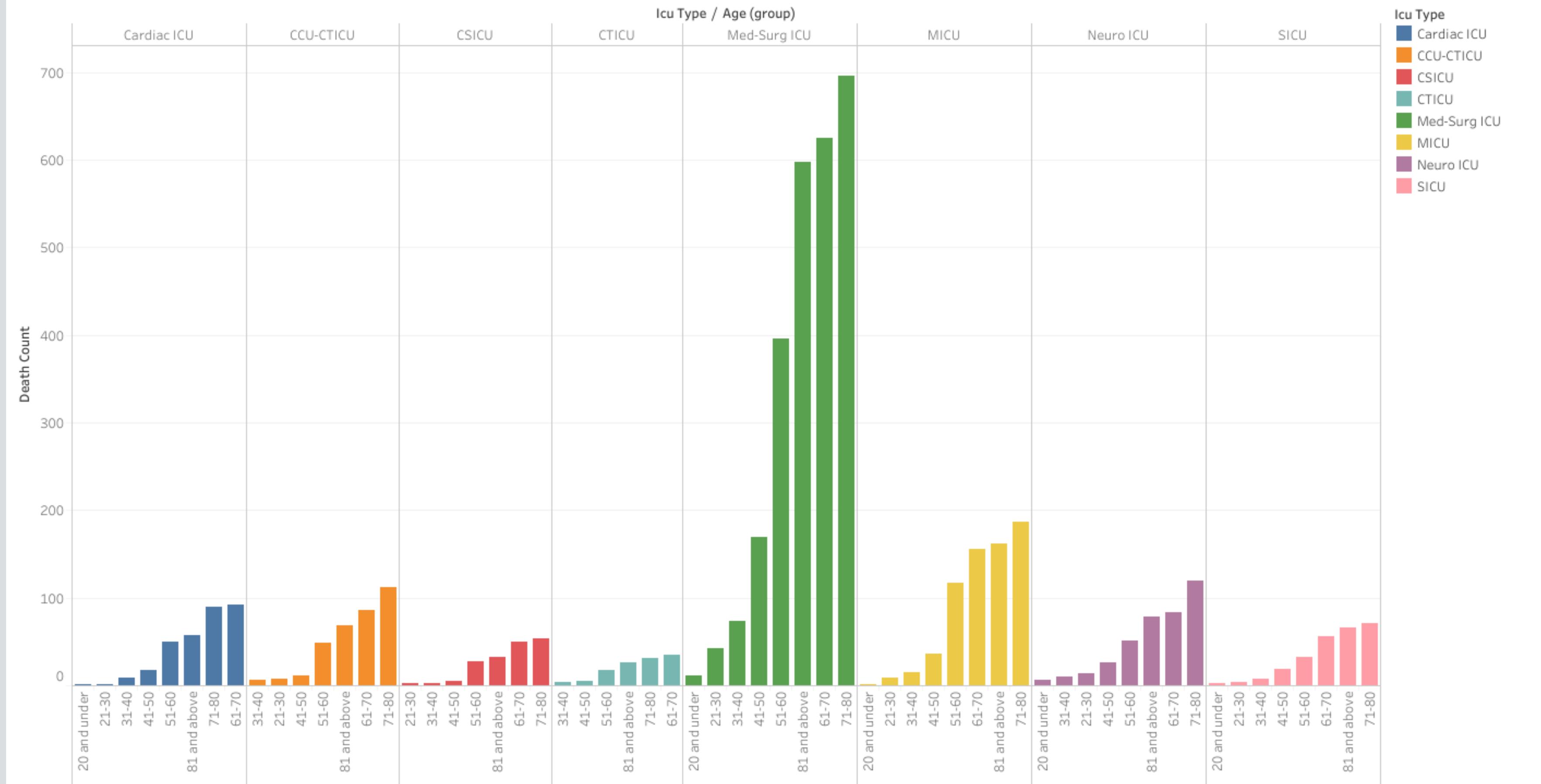
# DATA SUMMARY

## Hospital Deaths by Body System & Average Age



# DATA SUMMARY

## Icu\_type vs. Death





# MODELS EVALUATED:

- LINEAR REGRESSION
- LOGISTIC REGRESSION
- KNN
- RANDOM FOREST CLASSIFIER
- ADABOOST CLASSIFIER
- EXTRA TREES CLASSIFIER

# RANDOM FOREST VS. EXTRA TREES

**TEST ACCURACY: 98.8%**

	precision	recall	f1-score	support
0	1.00	0.98	0.99	12986
1	0.98	1.00	0.99	13036
accuracy			0.99	26022
macro avg	0.99	0.99	0.99	26022
weighted avg	0.99	0.99	0.99	26022

12665	321
4	13032

AUGUST 2022

**TEST ACCURACY: 99.5%**

	precision	recall	f1-score	support
0	1.00	0.99	0.99	13083
1	0.99	1.00	1.00	12939
accuracy			1.00	26022
macro avg	1.00	1.00	1.00	26022
weighted avg	1.00	1.00	1.00	26022

12960	123
0	12939

# RANDOM FOREST VS. EXTRA TREES

TEST ACCURACY: 98.8%

DEATH PREDICTED ACCURATELY: 12,665

DEATH PREDICTED, PATIENT SURVIVED: 321

SURVIVAL PREDICTED ACCURATELY: 13,032

SURVIVAL PREDICTED, PATIENT DIED: 4

TEST ACCURACY: 99.5%

DEATH PREDICTED ACCURATELY: 12,960

DEATH PREDICTED, PATIENT SURVIVED: 123

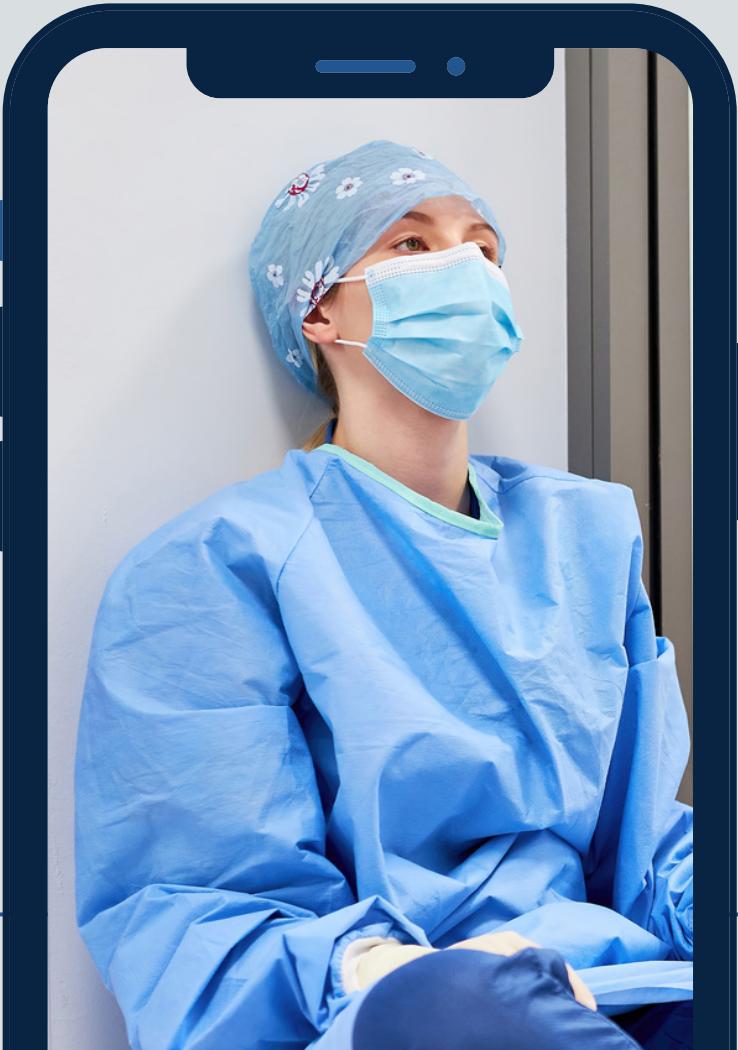
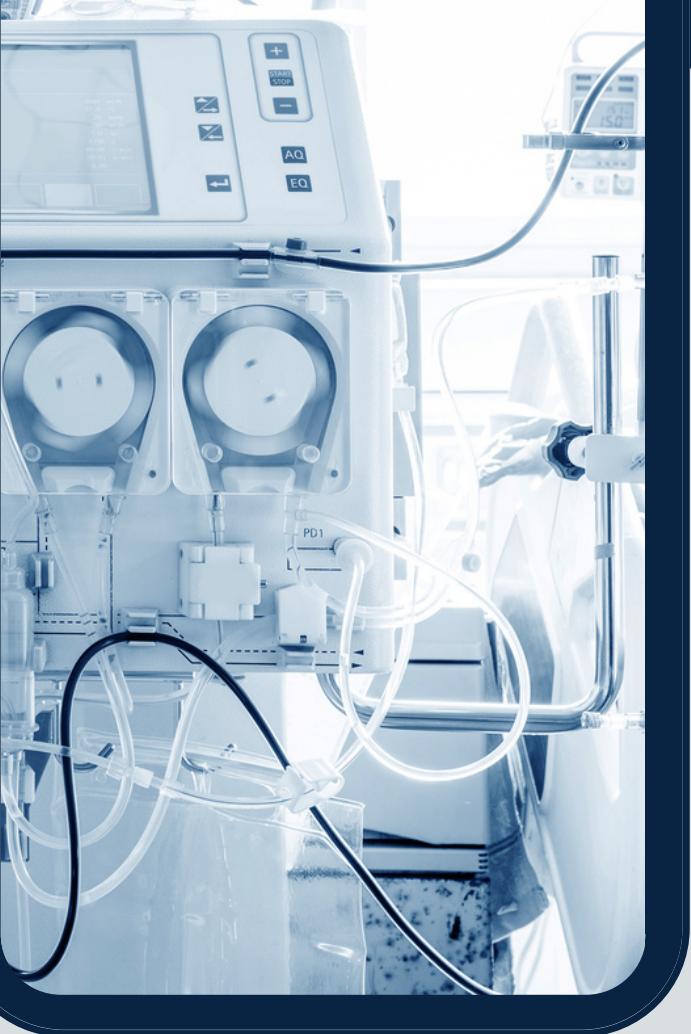
SURVIVAL PREDICTED ACCURATELY: 12,939

SURVIVAL PREDICTED, PATIENT DIED: 0

# EXTRA TREES CLASSIFIER

Top 10 features:

1. ICU death probability score
2. Ventilation
3. Glasgow Coma Scale (GCS) verbal score
4. Glasgow Coma Scale eyes score
5. Hospital death probability score
6. Glasgow Coma Scale motor score
7. Day 1 minimum systolic blood pressure (BP), noninvasive
8. Day 1 minimum systolic blood pressure
9. Age
10. Minimum mean blood pressure



# GLASGOW COMA SCALE

EYE OPENING RESPONSE		VERBAL RESPONSE		MOTOR RESPONSE	
SCALE	SCORE	SCALE	SCORE	SCALE	SCORE
EYES OPEN SPONTANEOUSLY	4	ORIENTATED	5	OBEYS COMMANDS FOR MOVEMENT	6
EYES OPEN TO VERBAL COMMAND OR SPEECH	3	CONFUSED CONVERSATION BUT ABLE TO ANSWER QUESTIONS	4	PURPOSEFUL MOVEMENT TO PAINFUL STIMULUS	5
EYES OPEN TO PAIN	2	INAPPROPRIATE RESPONSES	3	WITHDRAWS FROM PAIN	4
NO EYE OPENING	1	INCOMPREHENSIBLE SOUND OR SPEECH	2	ABNORMAL FLEXION OR DECORTICATE POSTURE	3
		NO VERBAL RESPONSE	1	EXTENSOR RESPONSE OR DECEREBRATE POSTURE	2
				NO MOTOR RESPONSE	1
				NO MOTOR RESPONSE	

Credit: Pepermprom/shutterstock.com

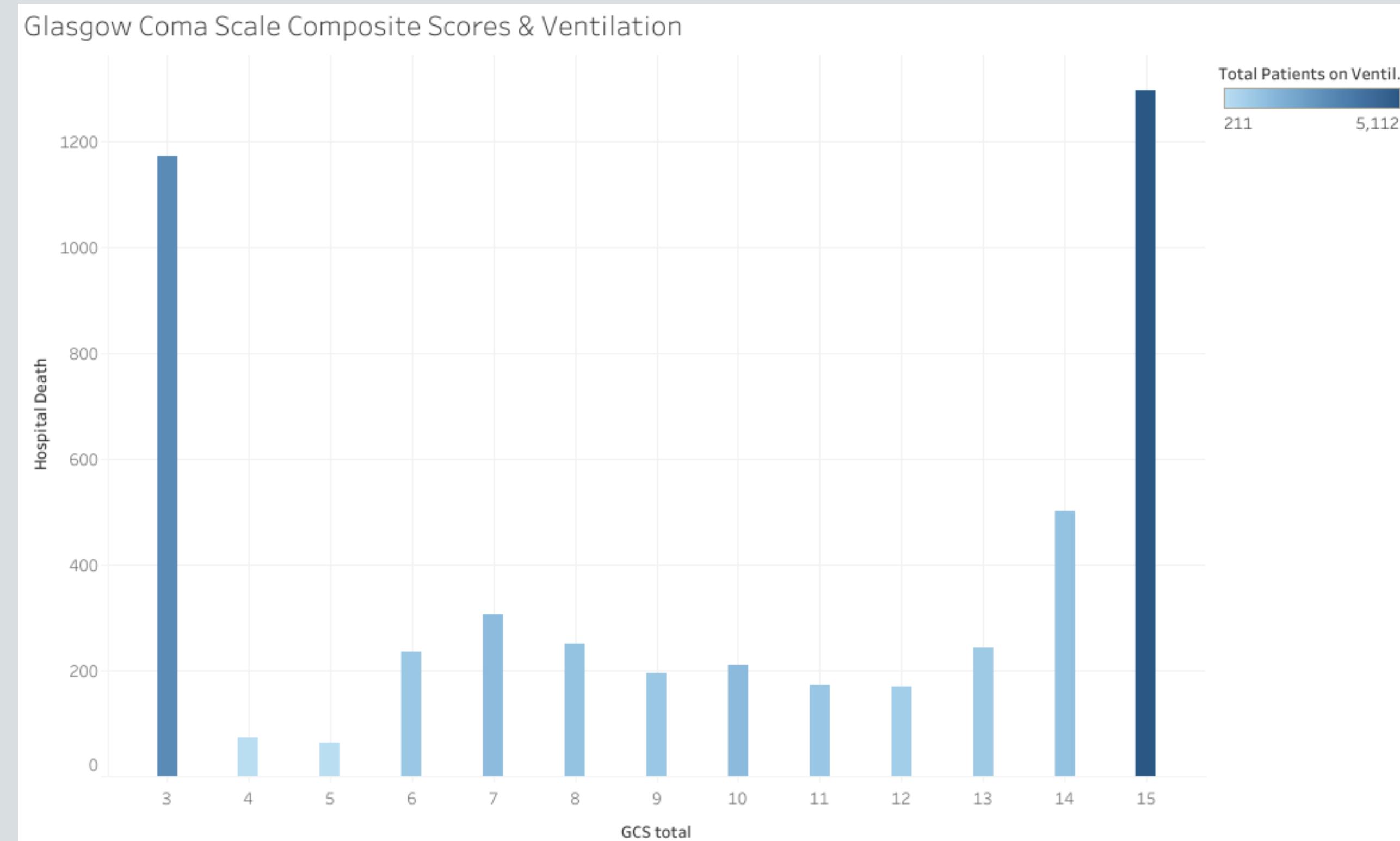
# GLASGOW COMA SCALE

Total score:

15 - fully alert and oriented

<8 - severe head injury or  
coma

3 - death likely imminent



# REAL WORLD APPLICATIONS:

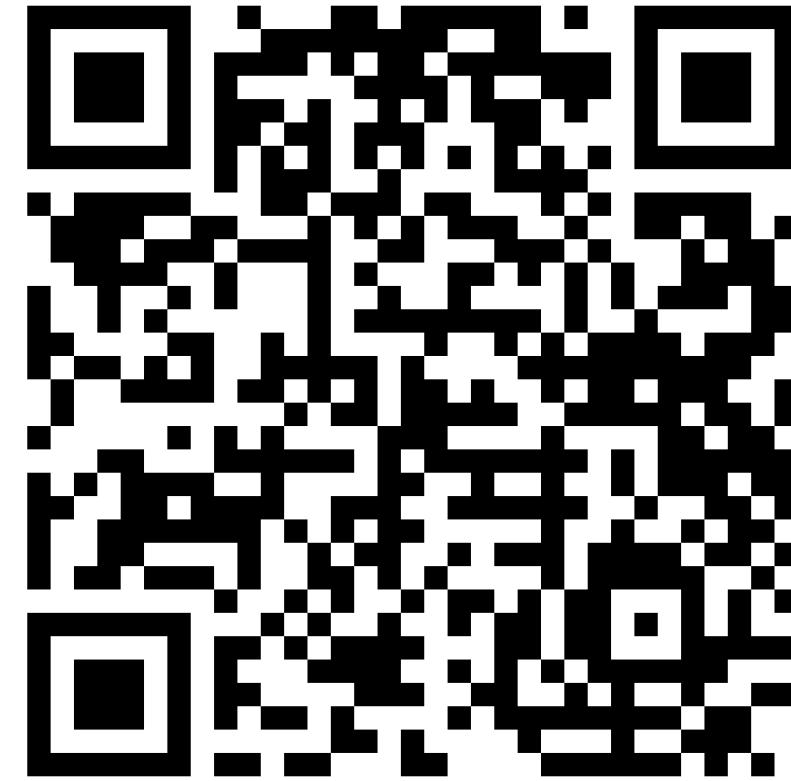


- Medical staff - use survival prediction to assist with clinical decision making.
- Medical staff - early detection of key factors that may impact a patient's chance of survival.
- Family of patient - use survival prediction to assist with end of life decision making.

G I T H U B



D A T A S E T



Thank you!