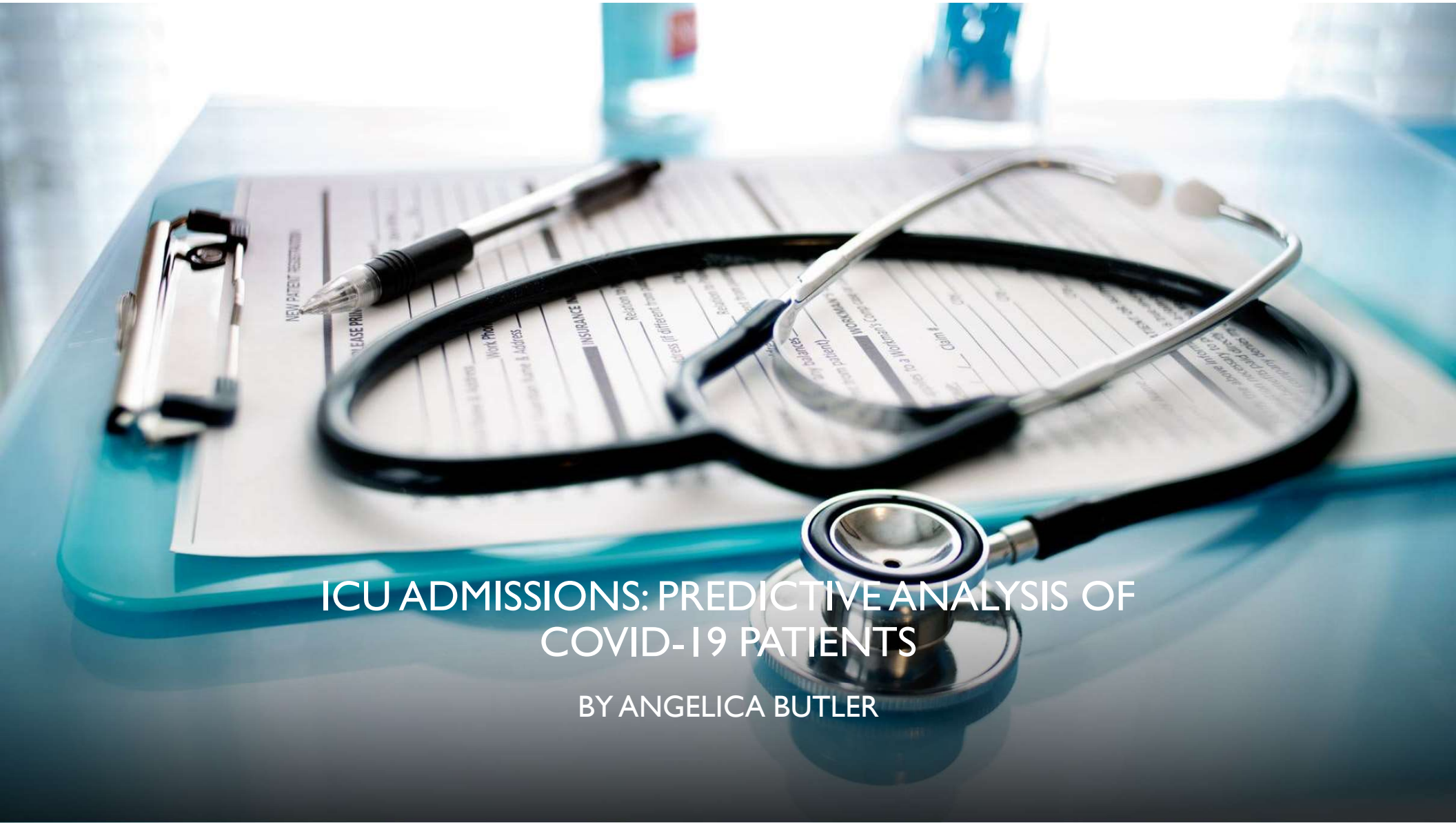


ICU ADMISSIONS: PREDICTIVE ANALYSIS OF COVID-19 PATIENTS

BY ANGELICA BUTLER

AGENDA

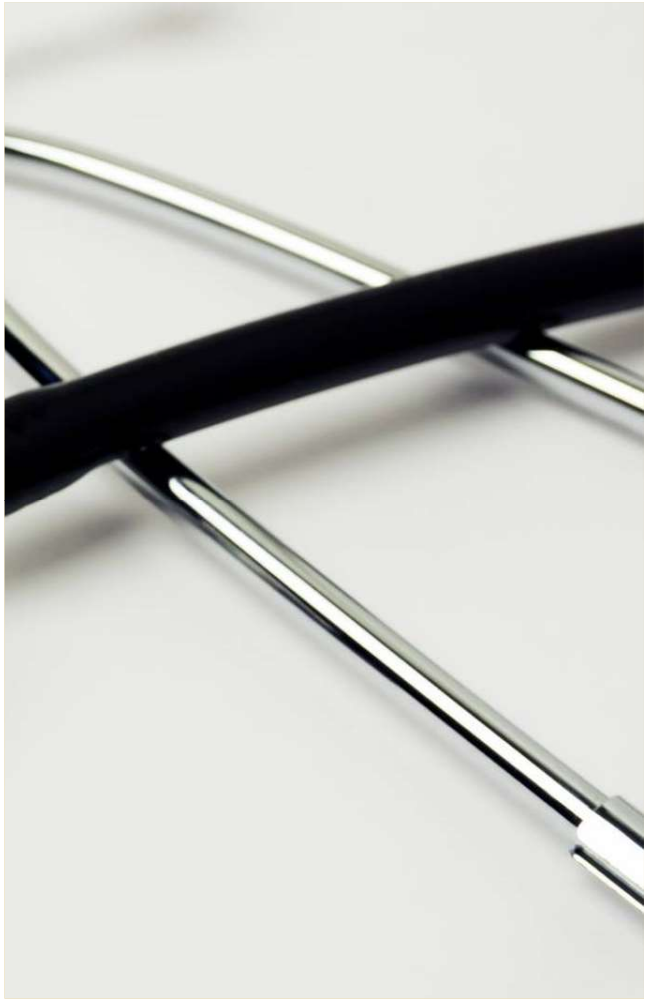
Pandemic Overview

ICU Challenges

Sirio Labenes Study

Predictive Analysis

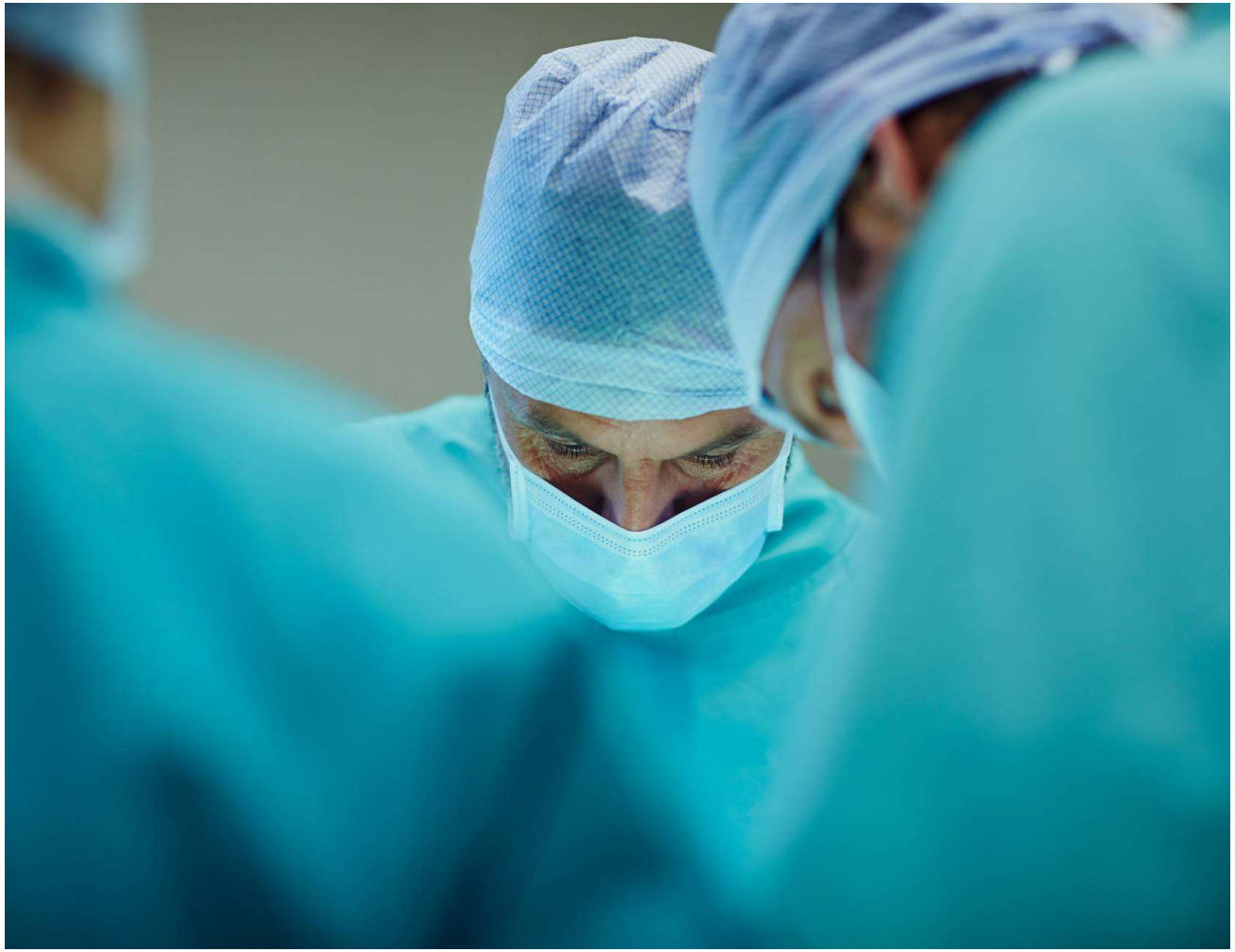
Conclusion



IMPACT OF THE COVID-19 PANDEMIC

The COVID-19 pandemic has had a profound impact on healthcare systems worldwide. Healthcare workers face unprecedented pressure and challenges as they navigate the chaos of the crisis. Key factors contributing to the strain include:

- ICU Bed Availability
- Access to Personal Protective Equipment (PPE)
- Staffing and Personnel Shortages
- Overall Healthcare Resource Constraints



INTENSIVE CARE UNIT (ICU) ADMISSION CHALLENGES'

Covid-19 is considered the greatest challenge in the history of critical care.

Identifying the requirement of intensive care among COVID-19 patients, can varies and take time when relaying on manual analysis.

Lost of resources can be wasted on patients that are ultimately not identified as critical care due to the time it task to distinguish from those who do.

Delays in identifying patients who need critical care can increase mortality rates.

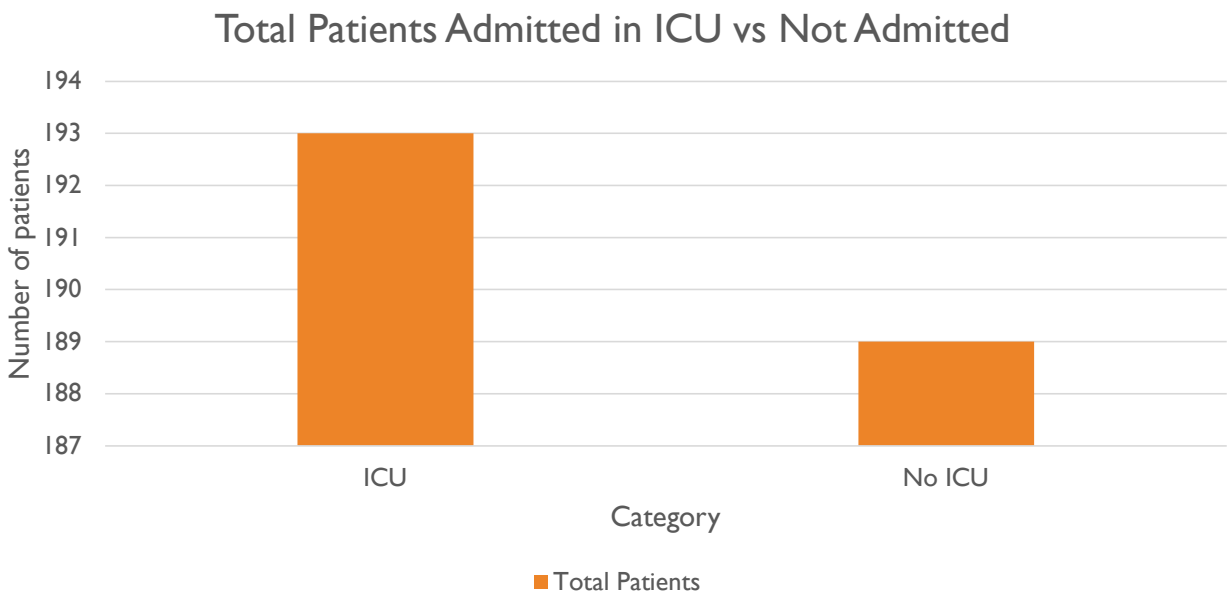
SIRIO LABANES STUDY

- Data from COVID-19 patients was gathered from Sirio Labenes and used in our analysis.
- There was a total of 383 patients and the data that was gathered included the following variables:
  - Demographic Information
  - Previous Diseases
  - Blood Results
  - Vital Signs
  - Blood Gases

OBJECTIVE OF THE STUDY

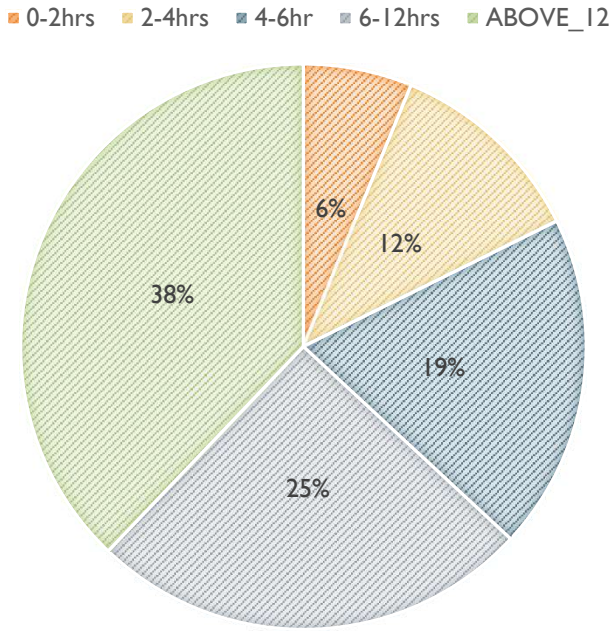
The study aims to develop a predictive model that identifies COVID-19 patients who are likely to require ICU admission sooner in their treatment.

PATIENTS CARE OUTCOME

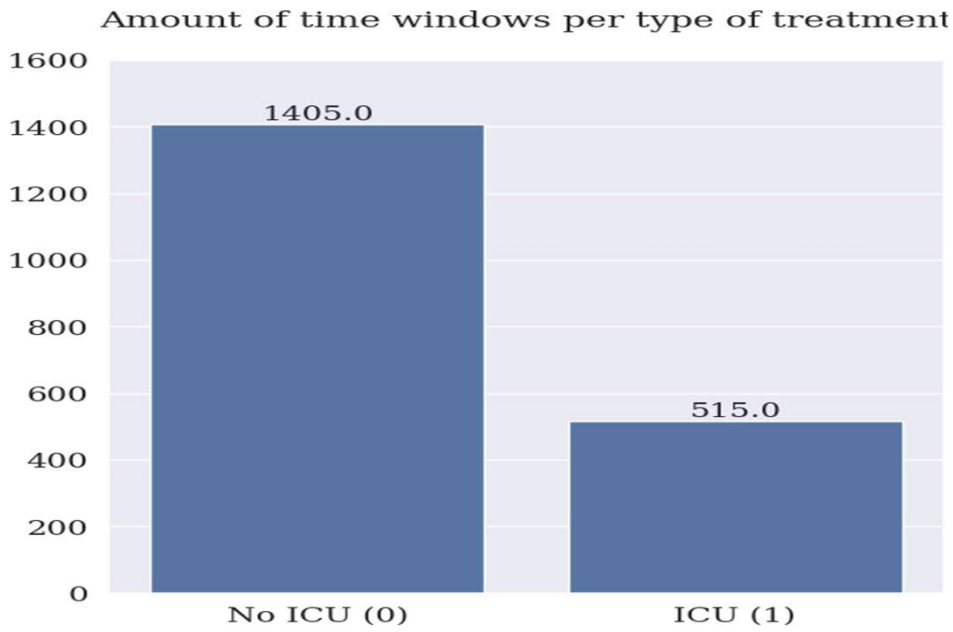


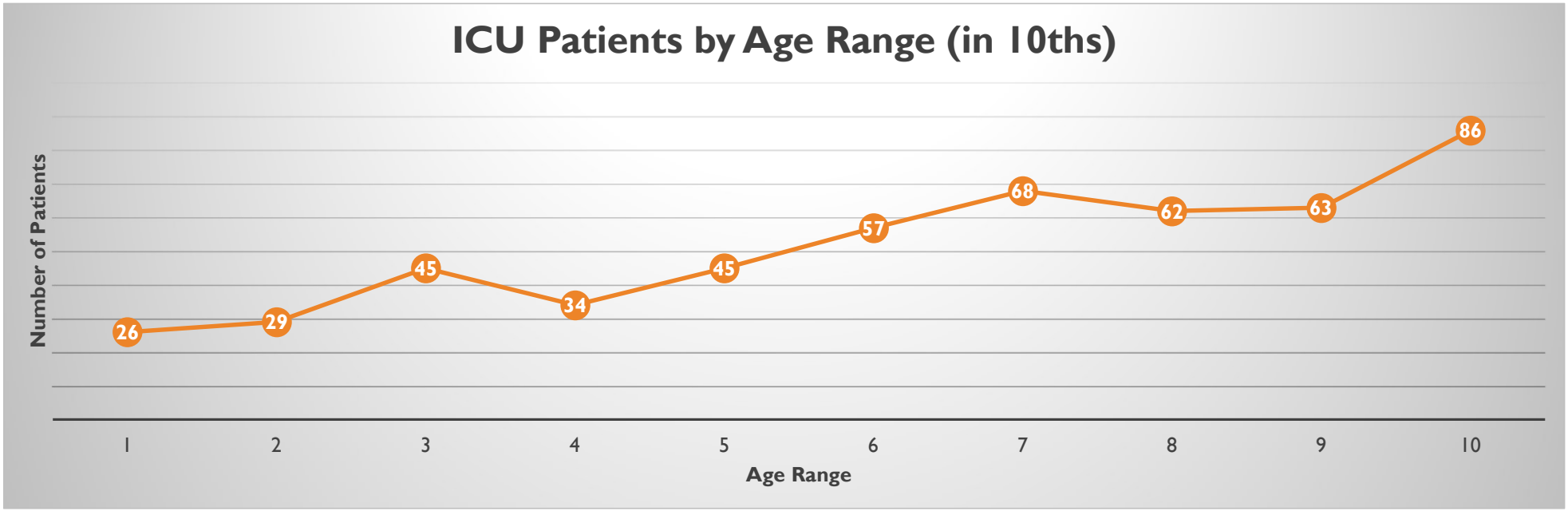
There was a roughly 51% of a patient being admitted into ICU.

ICU IDENTIFICATION TIME WINDOW



- In this chart you can distinguished the time window where the patients that was admitted into ICU.
- In most industries especially healthcare, time alone is a very expensive and important resource.





In this graph it shows which age group is primarily more high risk of becoming an ICU patients.

THE HELP CRITICAL CARE NEEDS

Identifying whether a patient needs to be admitted to the ICU sooner is key to alleviating many of the challenges critical care faces.

A predictive analysis was performed using machine learning algorithms called Random Forest based on the data study.

The model's sole purpose is to predict whether a patient should be admitted into the ICU. The model parameters are curated to perform this analysis more effectively and efficiently than any manual analysis could.

86%

The final model achieved an accuracy score of 86%. This means the model can predict which patients will require ICU admissions with 86% accuracy.

MODEL ATTRIBUTES

The model was able to decipher between useful data and data that is not as important when deciding if a patient needs to be admitted into the ICU. Below is a high-level overview of the optimization efforts that were used to build the model.

```
Fitting 3 folds for each of 10 candidates, totalling 30 fits
{'n_estimators': 100, 'min_samples_split': 2, 'min_samples_leaf': 1, 'max_features': 60, 'max_depth': 10}
Accuracy: 0.86
              precision    recall  f1-score   support

           0       0.87      0.95      0.91       272
           1       0.84      0.66      0.74       112

    accuracy                           0.86       384
   macro avg       0.86      0.80      0.82       384
weighted avg       0.86      0.86      0.86       384
```

MODEL ADOPTATION

Benefits of implementing this model into our system

- Reducing Healthcare Cost: Incorrect admissions into ICU is expensive.
- Improve patient Outcome: Patients will be able to receive timely and appropriate care
- Optimizing Resource Allocation: Utilize limited resources in a more efficient way.
- Enhancing Healthcare System: The model will help manage the overwhelming amount of data, reducing the burden on the database.

CONCLUSIONS

- Random Forest provides a powerful tool to predict ICU admissions for COVID-19 patients.
- Early identification helps in saving lives by enabling proactive critical care.
- Predictive models can be integrated into hospital workflows to optimize healthcare delivery during pandemics and beyond.
- Investment in the system implementation will return great rewards.


QUESTIONS

REFERENCES

- https://www.kaggle.com/datasets/S%C3%ADrio-Libanes/covid19
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC10692846/
- https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7780877/