AI decision support for medical triage

Predicting short and long term outcomes of stroke patients

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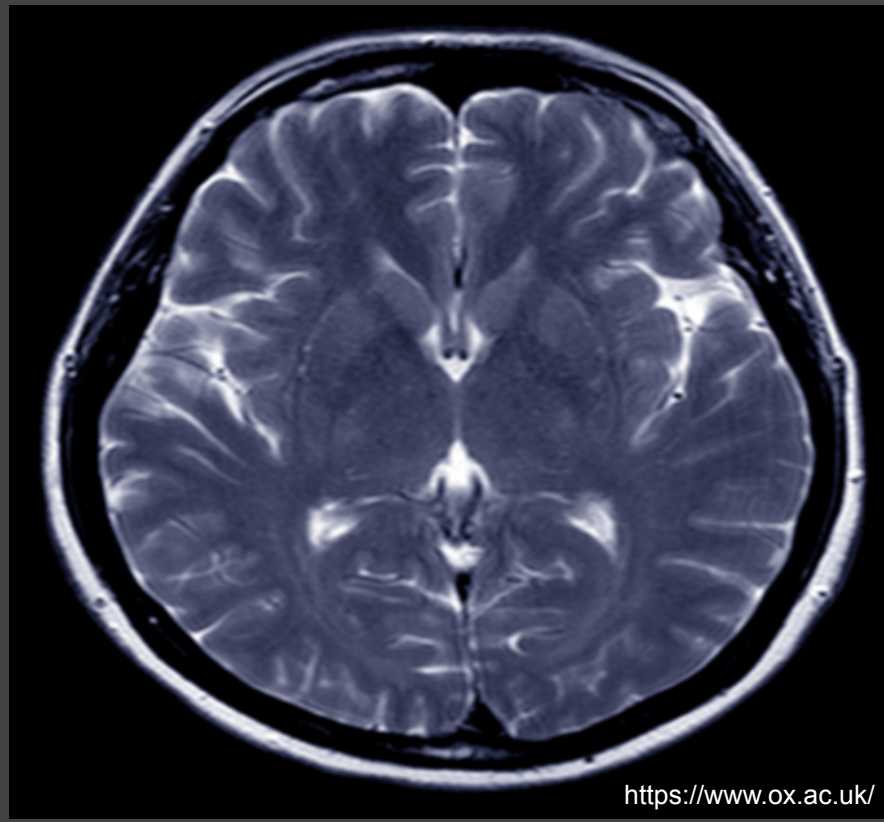
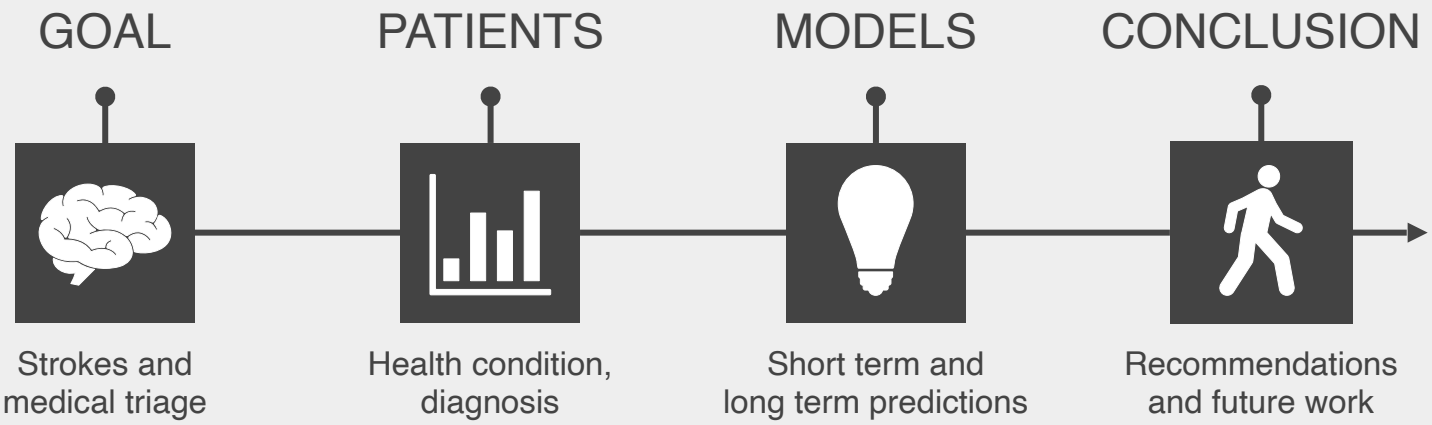


OVERVIEW


GOAL
PATIENTS
MODELS
CONCLUSION
Strokes and medical triage
Health condition, diagnosis
Short term and long term predictions
Recommendations and future work

STROKES

Ischaemic stroke:
a blocked artery

Haemorrhagic stroke:
leaking or bursting of a blood vessel

MEDICAL TRIAGE

Sorting of patients due to the severity of their condition

Intention:
Treating the sickest first

The aim of this project was to build models that predict

the negative short term and

long term outcome,

i.e. poor health condition or death,

of stroke patients.

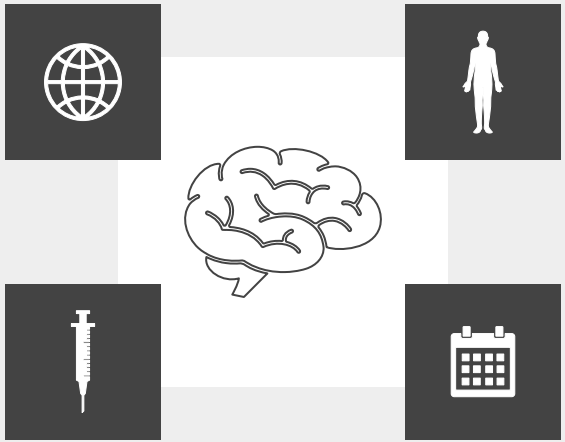
International Stroke Trial (IST)

WHEN & WHERE

In various countries from 1991 to 1996

WHO

Randomized group of patients that had a stroke within the last 48 hours



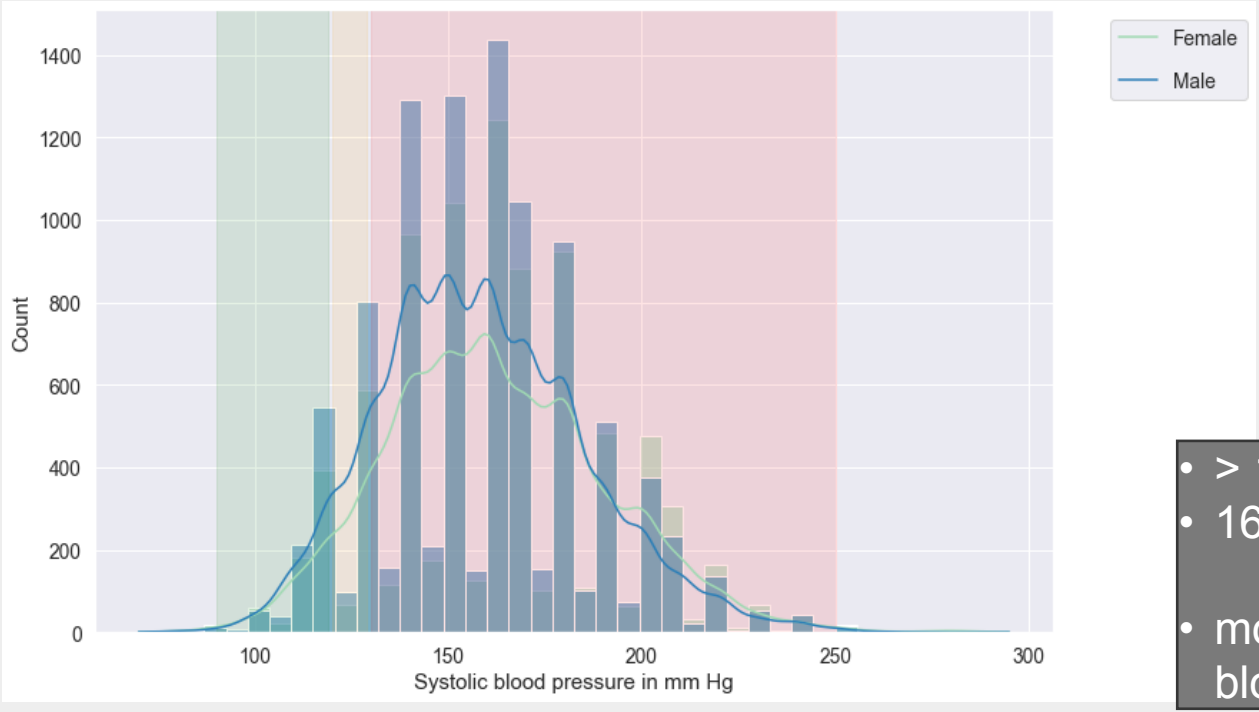
WHAT

Administering heparin and/or aspirin shortly after stroke

WHEN AGAIN

14 days and 6 months after (first) stroke

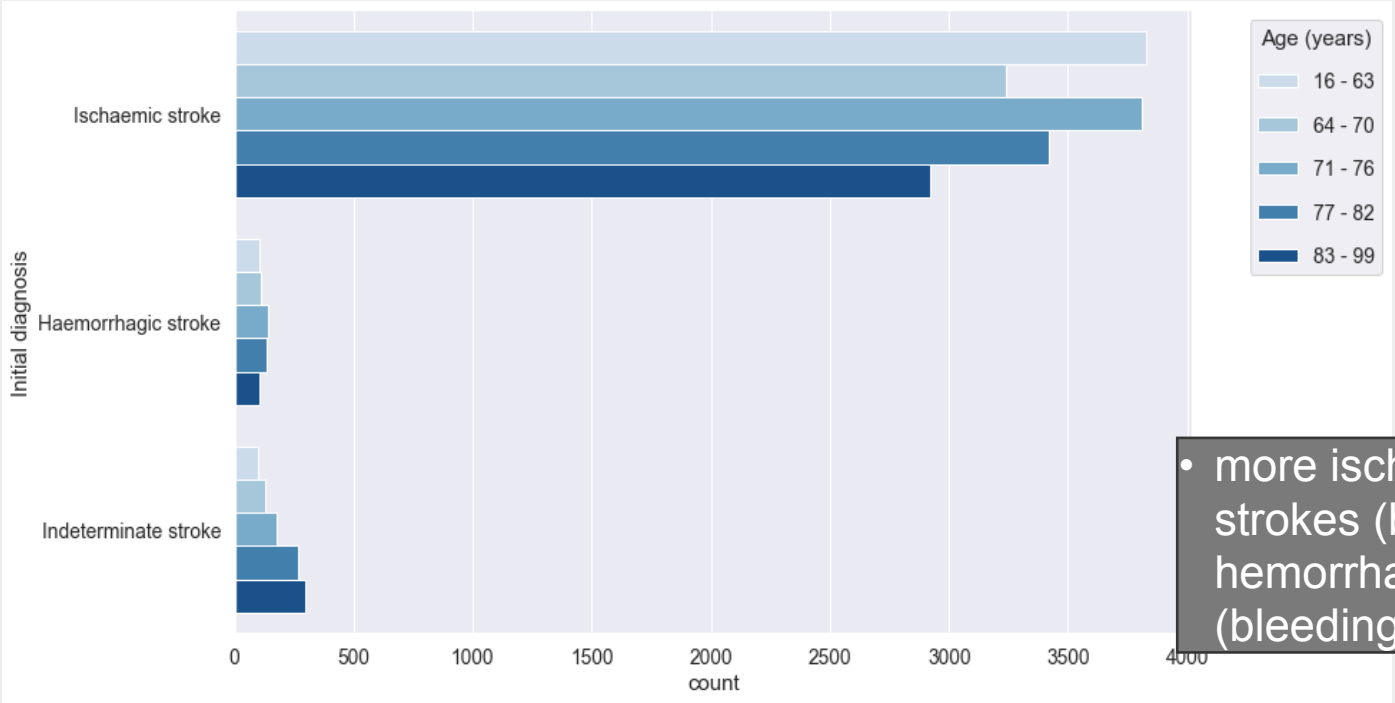
PRE-RANDOMIZATION



- > 19.000 patients
- 16 to 99 years old

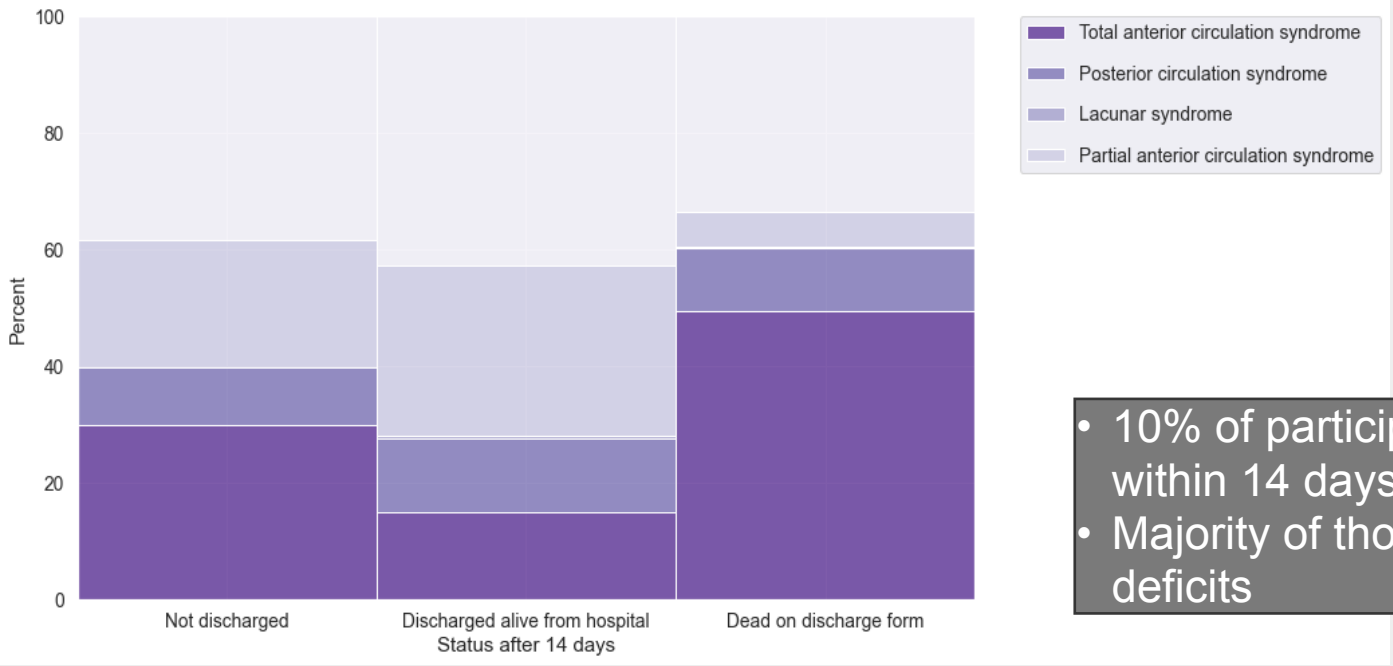
- mostly high systolic blood pressure

Participants



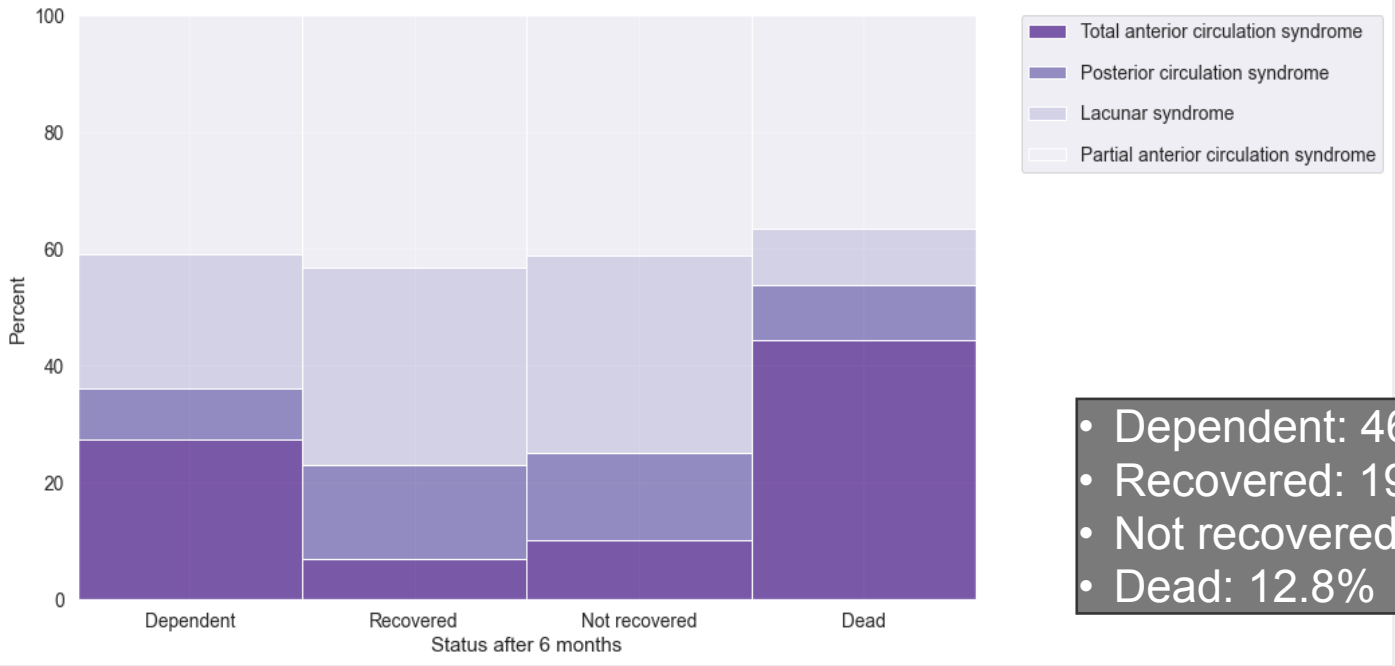
- more ischaemic strokes (blocking) than hemorrhagic strokes (bleeding)

Short term outcome



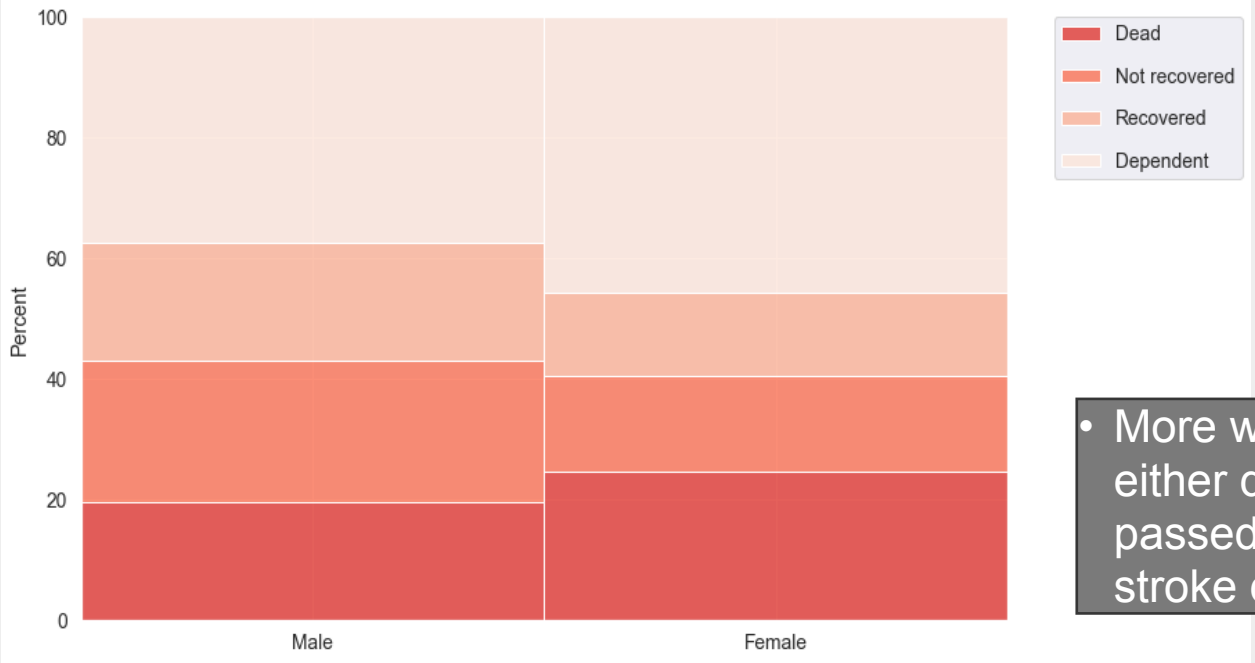
- 10% of participants died within 14 days
- Majority of those with severe deficits

6 MONTHS FOLLOW UP



- Dependent: 46.2%
- Recovered: 19.0%
- Not recovered: 22.1%
- Dead: 12.8%

6 MONTHS FOLLOW UP

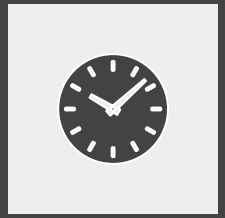


- More women than men are either dependent or have passed away (relation to stroke diagnosis)

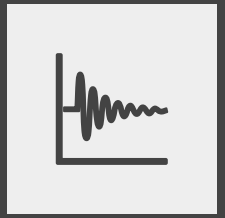
POOR HEALTH

- Short term (14 days)
  - Dead
- Long term (6 months)
  - Not recovered, dependent, dead

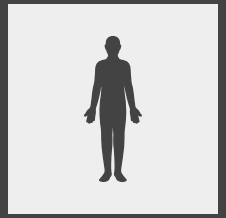
FEATURES (short term)



Age



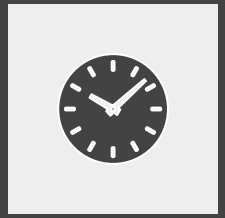
Blood pressure



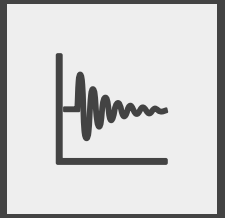
Deficits

Arrhythmia

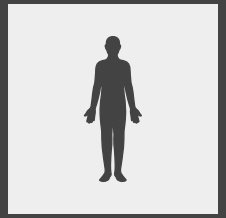
FEATURES (long term)



Age



Blood pressure



Deficits

Arrhythmia

Recurrent Stroke

EVALUATION METRIC

Identify patients with poor health condition

As few false negative identification as possible.

RECALL

(Sensitivity)

ALGORITHMS

- Supervised Learning
  - Dummy Classifier
  - Logistic Regression
  - Decision Tree
  - Random Forest
  - Extra Tree
  - XGBoost
  - Support Vector Machines

- Unsupervised Learning
  - Principal Component Analysis
  - KMeans
  - MiniBatch KMeans
  - Agglomerative Clustering
  - DBSCAN

- Semi-supervised Learning
  - Gaussian Mixture

MODELS

- Short term outcome (Logistic Regression)
  - 70% of patients that had poor health were correctly identified
- Long term outcome (Random Forest)
  - 89% of patients with poor health were correctly identified

Important features: age, blood pressure, dysphasia, hemianopia

CONCLUSION

Dummy Classifier identified 50% of patients with poor health

IMPROVEMENT BY MODEL SELECTION

Short term model ⇨ 20% more patients correctly identified

Long term model ⇨ 39% more patients correctly identified

LIMITATIONS & FUTURE

ADD. FEATURES

Smoking, alcoholism, birth control medicine, obesity, genetic preposition, ethnicity

TREATMENT

International Stroke Trial 3, medication

DRAWBACK

False positives

APPLICATION

What is needed?
Ethical considerations!

Your questions

EnHaHB/Stroke-Outcome