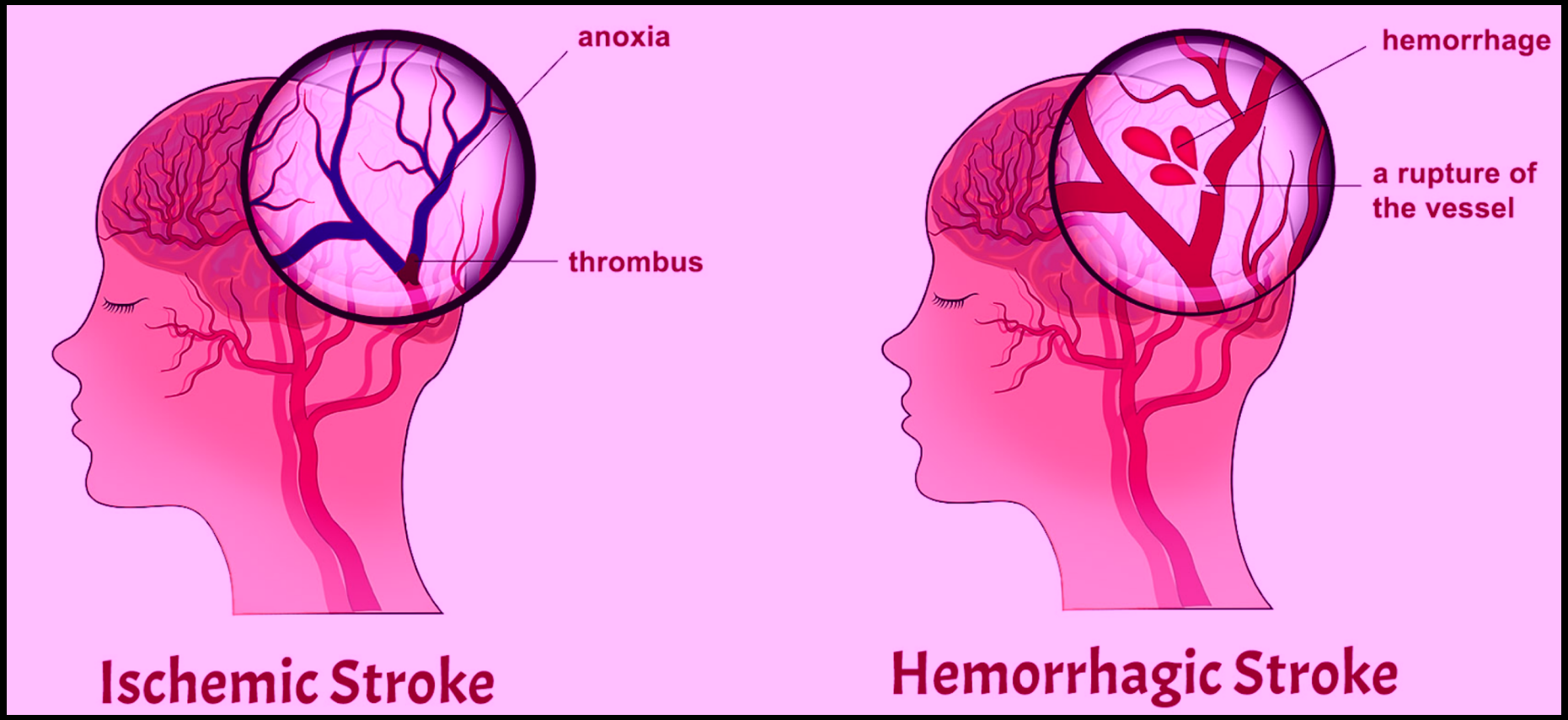
# Stroke Audit Machine Learning (SAMueL)
# Patient and Carers Involvement Group

October 2022

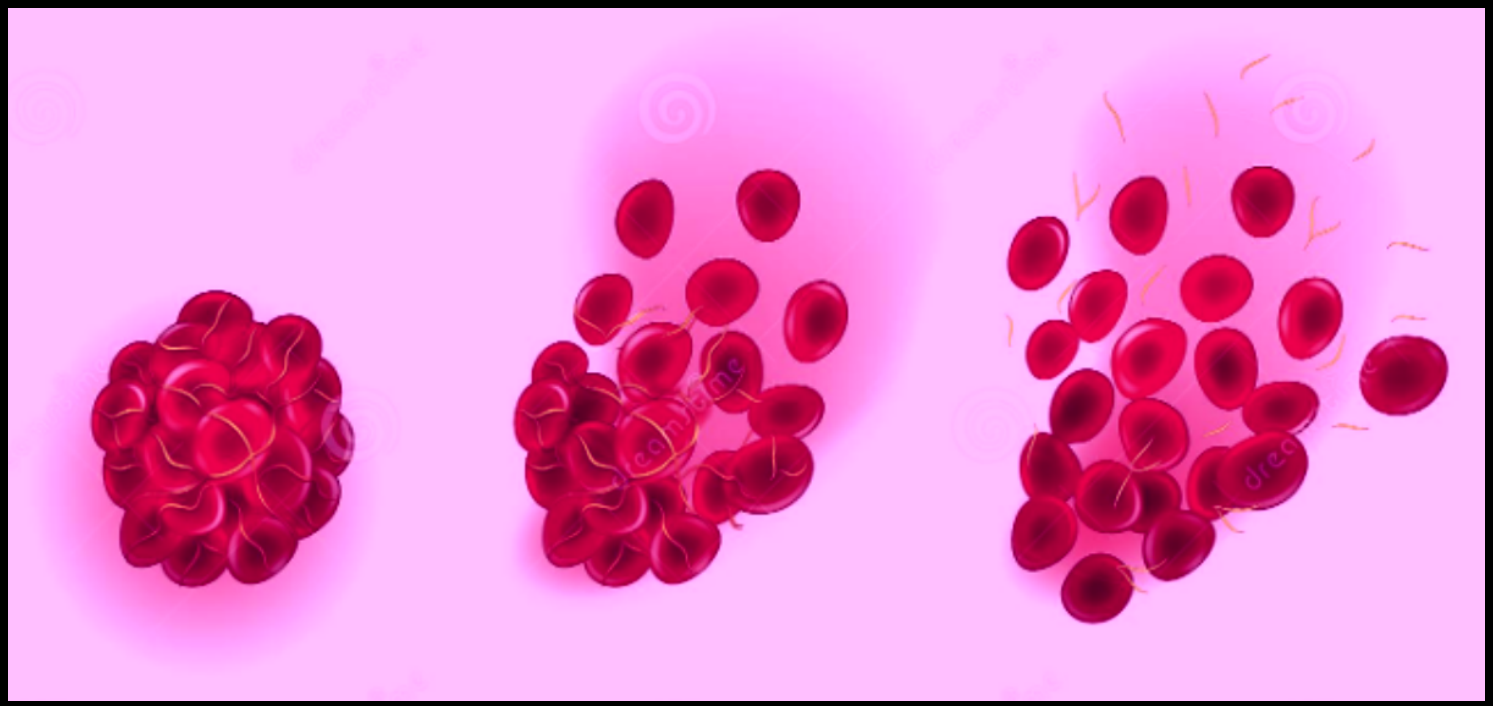
# Two types of stroke



# Thrombolysis

Thrombolysis aims to break down a clot by activating the body's own clot breakdown mechanisms.

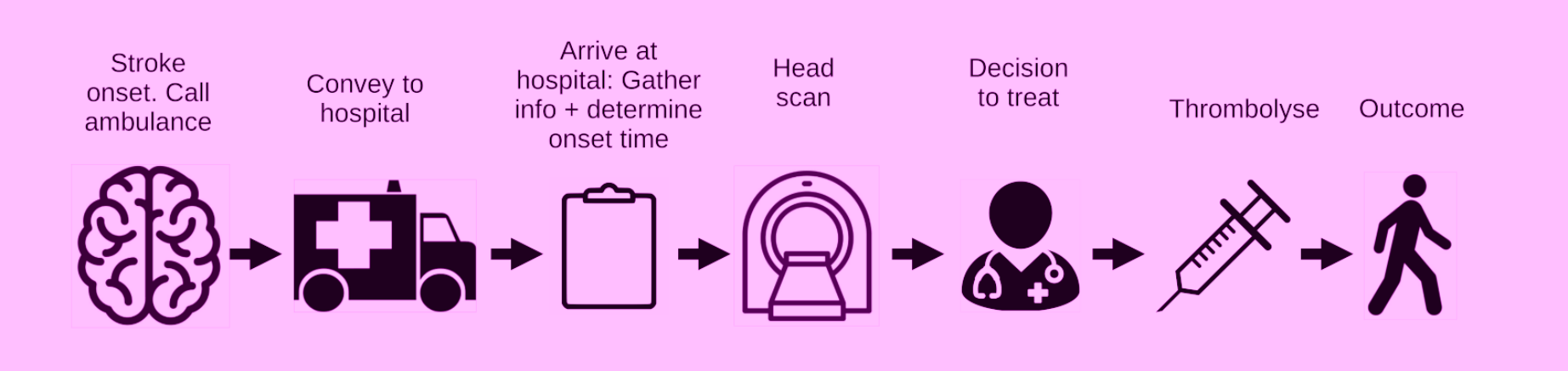
Thrombolysis is given as an injection followed by an infusion (*drip*).



# What is the problem?

- Expert clinical opinion is that one in five people (20%) should be receiving thrombolysis.
- In England, about 1 in 9 people (11%) actually receive thrombolysis.
- Nearly half the people who *could* benefit from thrombolysis do not currently have the opportunity.
- Use of thrombolysis in England has been stable for 10 years.

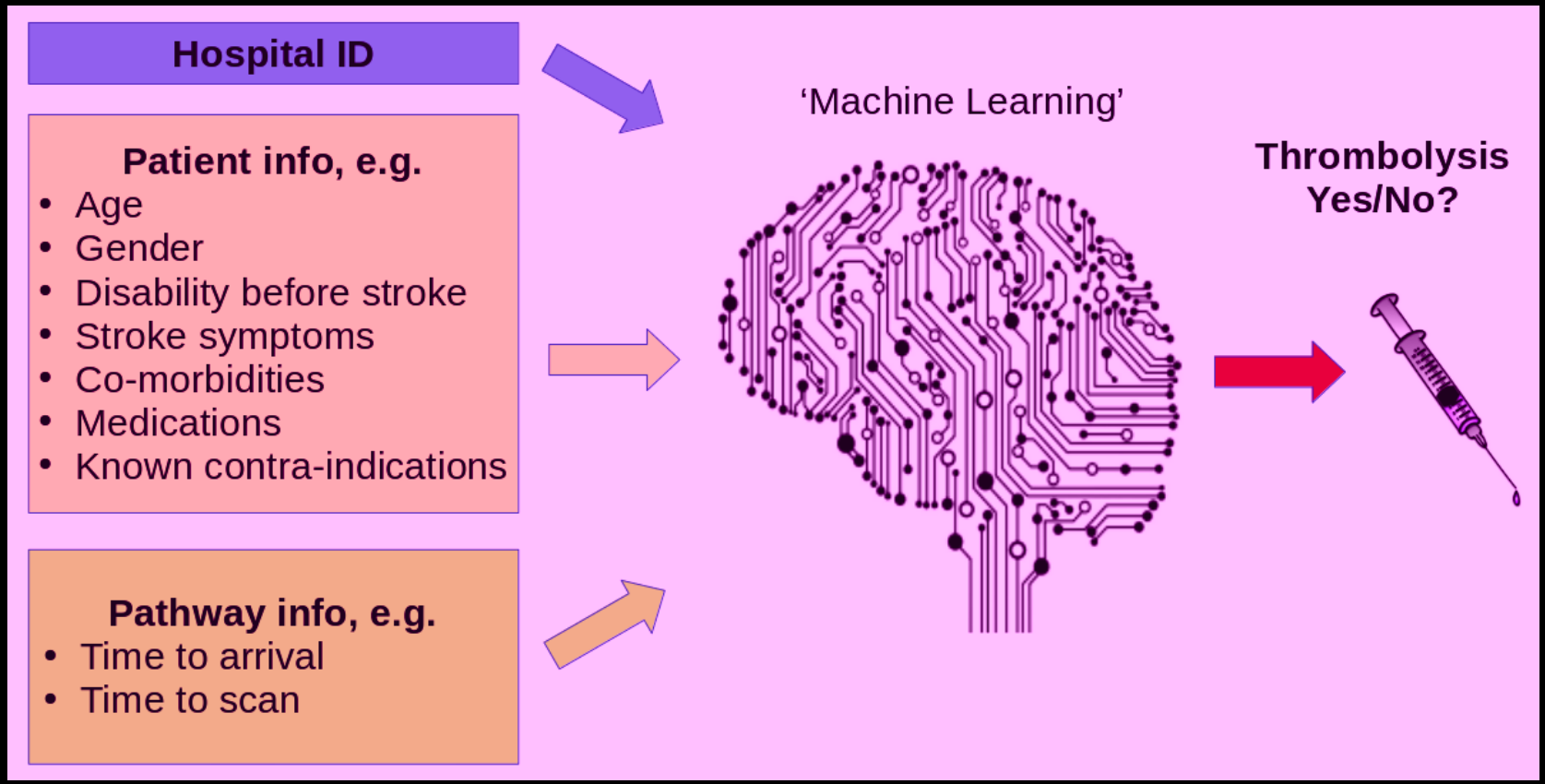
# Breaking down the emergency stroke pathway into key steps




We can model key changes to pathway:

- What if the pathway were faster?
- What if hospital determined the stroke onset time in more patients?
- What if clinical decision-making was like that of *benchmark* hospitals? (Predict what treatment a patient would receive at other hospitals).

# Machine learning overview




Machine learning (and nearly all *artificial intelligence*) is based on the simple principle of recognising similarity to what has been seen before.

We accessed 240,000 emergency stroke admissions in England and Wales over three years. That is a lot of examples to learn from!

# SAMueL-1 Summary: What is the problem?

There is a gap between target thrombolysis use (20%) and actual thrombolysis use (11–12%) in emergency stroke care

Clinical expert opinion on what *should be* happening

What *is* happening?

Unknown onset time or arrived too late to treat

Not suitable for treatment with thrombolysis

Treated with thrombolysis

Potentially treatable, but not treated with thrombolysis

# SAMueL-1 Summary: What did we test?

We used clinical pathway simulation and machine learning to analyse a series of *what if?* questions:

- What if arrival-to-treatment time was 30 minutes?
- what if all hospitals determined stroke onset time as frequently as an *upper quartile* hospital (a hospital ranked 25 out of 100, for determining stroke onset time).
- What if decisions to thrombolyse were made according to a majority vote of 30 benchmark hospitals?

For each hospital we use their own patients to ask these questions, to allow for differences in local patient populations.

# SAMueL-1 Summary: What did we find?

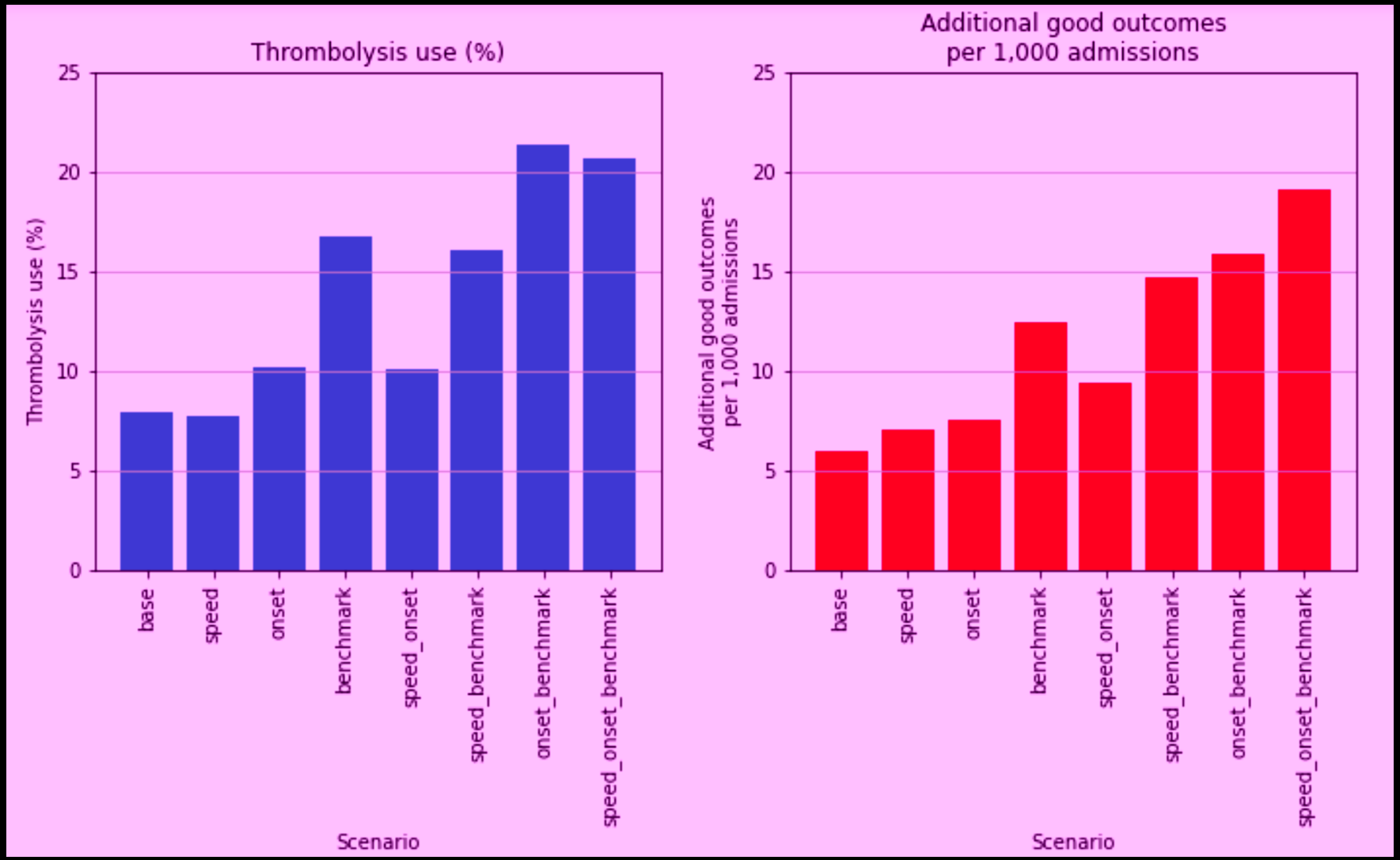
We found that making all these changes would increase thrombolysis use in England and Wales to 18–19%. Out of every 10 patients who were potentially treatable but did not receive treatment, we found the cause to be:

Hospital processes were too slow

Stroke onset time was not determined when it potentially could have been

Doctors chose not to use thrombolysis when other higher-thrombolysing hospitals would have done

# Applying our models at hospital level



# What questions are we asking in SAMueL-2?

- What patients do clinicians agree and disagree on, when considering when they should receive thrombolysis?
  - We'll discuss that at our next meeting!
- How do *organisational factors* (such as use of specialist stroke nurses) affect the thrombolysis pathway and decision-making?
- How best can we engage clinicians in our work, and prompt them to reconsider their emergency stroke pathway and/or decision-making?
  - Communication of general findings.
  - Web application for individual hospitals.
  - A 'hospital profile' for each hospital.