PLAIN ENGLISH SUMMARY

AIM

This research aims to reduce life-altering differences in emergency stroke care by identifying and addressing variations between hospitals in the use of proven clot-removing treatments. We will combine multiple modern 'AI' technologies into what is called a 'digital twin'. A digital twin in our case is a model that can mimic the behaviour of any regional stroke system in England or Wales. The digital twin will be made available to the stroke community to use as a web app. This app will allow users to ask 'what if?' questions to help them understand how care may be best improved in their region. This will help to identify what to target to improve patient outcomes and make best use of healthcare resources.

BACKGROUND

Our team uses a range of advanced methods to understand variation in emergency stroke care, especially the removal of clots causing the stroke, and the effect that variation has on patient outcomes. We have models that mimic the flow of patients through each hospital, and can identify for each hospital how improving that patient flow could improve patient outcomes. Using 'explainable machine learning' we also learn the characteristics of patients each hospital will, or will not, give clot-busting drugs to (to remove the blockage causing a stroke). Differences in decisions are a major cause of variation in treatment, and understanding these differences will help reduce this variation and improve outcomes.

PLANNED WORK

We wish to build on our current work in several important ways:

1. We will extend our work to cover mechanical removal of clots ('thrombectomy'). We will look at variation in the access to, and speed of, thrombectomy. We will compare decisions on which patients are selected for thrombectomy.

2. We will update our analysis to include new stroke care guidelines. This includes extending use of clot-busting drugs to more people who wake up having had a stroke in their sleep, or who arrive at hospital late, up to 9 hours after their stroke.

3. We will investigate how variation in treatment affects the length of time patients stay in hospital (which affects both the patients and the hospitals who provide the inpatient care).

4. We will pull all the work together in a single model called a 'digital twin'. People may select which hospital or region they wish the digital twin to mimic, and ask 'what if?' questions.

5. We have just launched a web app that allows stroke teams to see our analysis (https://bit.ly/sam2_app). We will continue to refine this app, and will expand it with all the new analyses.

6. We will use interviews and workshops to get feedback on the modelling and web app, so that we can understand and address any barriers to it being used, and design the web app to be user friendly and to maximise engagement. Additionally we will use these interviews and workshops to develop suitable training materials.

PUBLIC AND PATIENT INVOLVEMENT

We work with a highly engaged Patient and Public Involvement team. This team has been key in pushing the project to focus on outcomes and not just NHS targets.

LINK TO PATIENT BENEFIT

We have strong direct links for how our findings will benefit patients. The national stroke audit will include our findings from spring 2024, which will make the key output from our work available to all stroke teams. We are also a key member of a new project driven by NHS-England, working with stroke teams across England to improve emergency stroke care.