Fellowship in Clinical AI
NHS Digital Academy Programme

SMARTT: Safe, Machine-Assisted, Real-Time Transfer

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BACKGROUND AND AIMS

Decisions related to the optimal timing of discharge from the Intensive Care Unit (ICU) to a ward-based level of care are highly complex due to their multi-factorial nature. Advanced planning of patient discharge from the ICU is important to facilitate patient flow and optimise capacity.

Since 2017, a team of researchers and data scientists at University of Bristol alongside clinicians at University Hospital Bristol and Weston (UHBW) and North Bristol NHS Trusts have been developing and evaluating a machine learning (ML)algorithm aiming to standardise clinical discharge decision making, prompting safe and timely patient step down to wards.

Trained on historical ICU data, SMARTT uses patients' recent physiological data to predict if a patient is currently physiologically ready for discharge (RFD) which may facilitate patient flow and optimise the use of limited ICU capacity.

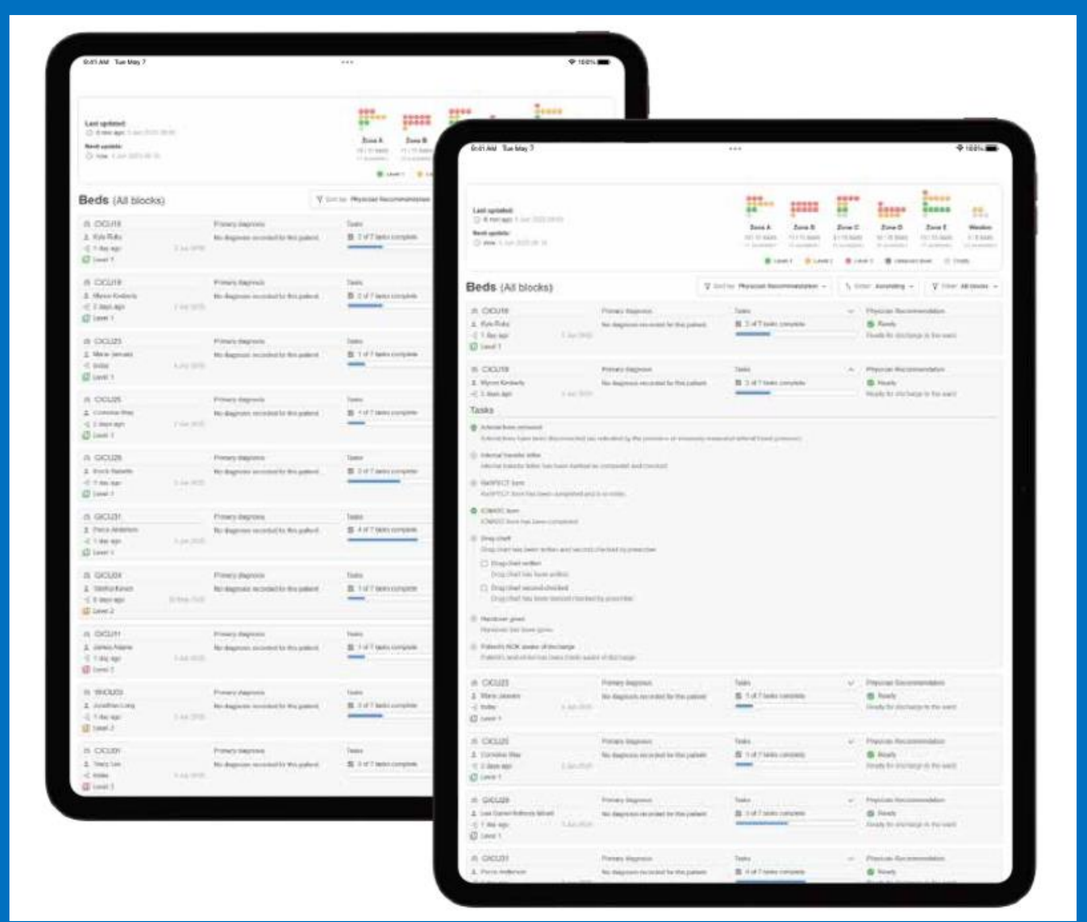

FIGURE 1 – A device mock-up presenting screenshots of the SMARTT dashboard with anonymised data. A bed list summarises each patient's progress to discharge readiness (left), which can be expanded to reveal further relevant information (right). It also showcases bed occupancy in the top right corner.

PROGRESS AND MILESTONES

The project followed on from a previous alumni of the FCAI fellowship where the focus in the previous academic year had been cantered around planning a path to commercialisation, documentation of standards and the development of a quality management system.

In this academic year the focus of work was related to the design and delivery of clinical evaluation which was developed in two distinct phases. The initial phase was centred around comparing the output of SMARTT to real-world clinical decision making and the documentation of 'Readiness for Discharge' (RFD status) within the existing ICU electronic medical record.

Part of this initial phase required validation that the electronic medical record contained accurate RFD data as compared to 'on-the-ground' documentation – this allowed me to appreciate that data quality and the lack of clinical engagement with documentation within an electronic medical record can often be a considerable barrier to the provision of standardised data-sets which are required to train effective clinical AI tools.

The first phase of the evaluation consisted of an offline validation study, This was a prospective offline validation study comparing clinical discharge decisions to SMARTT RFD predictions for unseen ICU patients. Conducted in the Bristol Royal Infirmary during February 2025 (N=124). Data collected from the clinical information system (CIS) included clinical RFD time for patient from the CIS ward round note and patient demographics including: patient age, gender, BMI, reason for admission, co-morbidities and date of admission. SMARTT RFD time for patient was predicted by random forest using CIS data.

The headline figure from the results of the evaluation was that the tool predicted 59.2% of patients as ready for discharge within 24 hours of when the decision was made clinically.

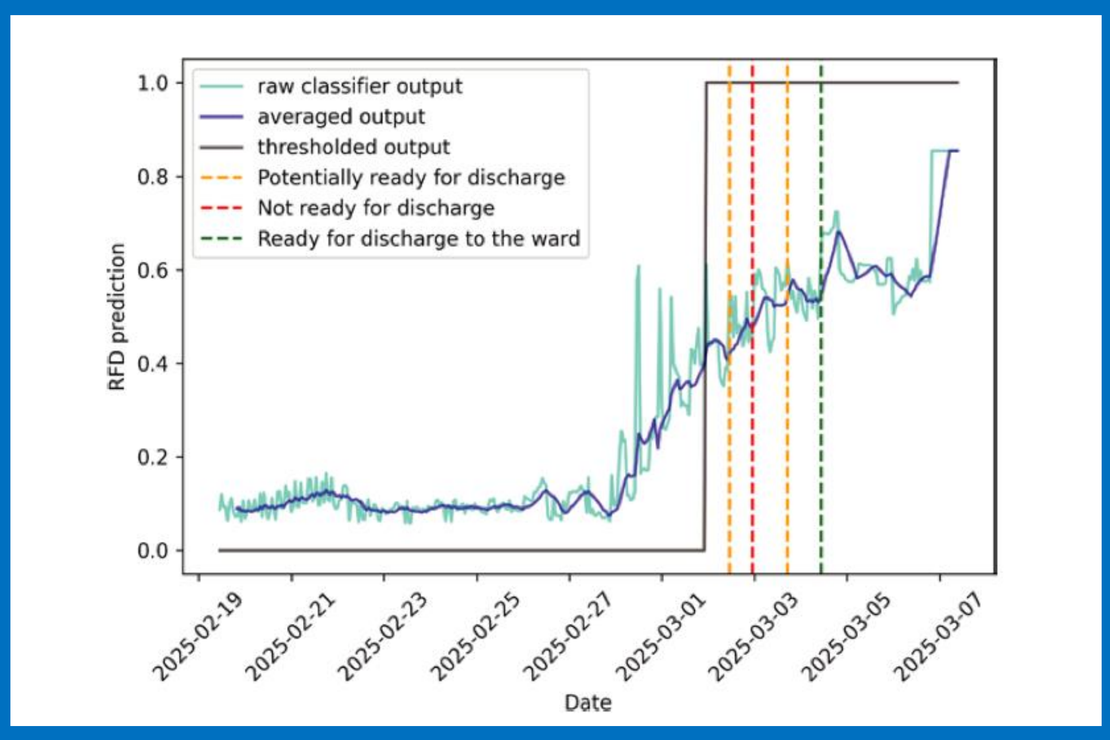

FIGURE 2 – An example time series of a patient from the cohort. RFD predictions by the ML model are plotted against time. The vertical dashed lines indicate the times of clinical decisions, as recorded in the CIS.

Work on Phase 2 of the evaluation is now in development – this will now evolve to the real-time evaluation of the model where clinicians will be engaged to directly evaluate the outputs of SMARTT and clinically correlate its output. Although it is likely that Phase 2 of the evaluation will conclude beyond the end-date of the fellowship period, I hope to remain involved with this process and support the completion of this phase of the evaluation.

During the course of the year, our team was successful in obtaining funding from Innovate UK in the iCure programme and this provided me with valuable insight into the path to commercialisation for clinical AI tools and how challenging this can be.

Beyond this project I was able to engage in an Ophthalmology related project related to the development of ML models to assess slit-lamp videos.

TEAM

A huge thanks to the entire team collaborating on the SMARTT project at the University Hospitals Bristol and Weston and Bristol University.

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