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# Cardiac intensive care: Machine learning to improve patient flow

**Submission date**
17/11/2017

**Recruitment status**
No longer recruiting

**Registration date**
08/12/2017

**Overall study status**
Completed

**Last Edited**
05/01/2018

**Condition category**
Circulatory System

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

## Plain English summary of protocol

Background and study aims
Patient flow describes the movement of patients throughout the ward. Entering the ward, having surgery, being moved back to the CICU, and recovering over a period of around 5 to 10 days. Self-learning machines refer to machines that are capable of taking feedback into account. If a self-learning machine predicts that a patient will take five days to recover and then is informed that it was correct, it will strengthen its prediction algorithm. If it predicts a similar patient to take five days to recover but they instead take eight, it will investigate the differences between the patients more closely in order to determine the cause of its failure and change its algorithm in order to take this into effect. As this machine is trained on 35,000 patients, this will eventually lead to accurate predictions for many different types of individuals. The study aims to improve patient flow through the cardiac ICU (CICU) via analysis of patient recovery times. Self-learning machines will be developed to adjust to patients and predict accurate recovery times, allowing inefficient planning methods to be revised and fine-tuned in order to provide accurate bed, pharmaceutical (medication), and staff management.

Who can participate?
Patients in the CICU

What does the study involve?
This study uses a NHS database to access routinely collected data about those who are in the CICU and have had heart surgery. The data from 2009 until present is collected about patient flow in the CICU in order to train the self-learning machines.

What are the possible benefits and risks of participating?
There are no benefits or risks of participating

Where is the study run from?
Bristol Royal Infirmary Cardiac Intensive Care Unit (UK)

When is the study starting and how long is it expected to run for?
January 2017 to September 2020

Who is funding the study?
National Institute for Health Research (UK)

Who is the main contact?
Mr Duncan Shillan
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# Contact information

### Type(s)
Public

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Mr Duncan Shillan

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# Additional identifiers

### EudraCT/CTIS number

### IRAS number

### ClinicalTrials.gov number

### Secondary identifying numbers
1

# Study information

### Scientific Title
Application of machine learning to improve patient flow through the cardiac intensive care unit

### Study objectives
The study aims to improve patient flow through the cardiac ICU via analysis of patient recovery times. Self-learning machines will be developed to adjust to patients and predict accurate recovery times, allowing inefficient planning methods to be revised and fine-tuned in order to provide accurate bed, pharamceutical, and staff management.

### Ethics approval required
Old ethics approval format

## Ethics approval(s)
Not provided at time of registration

## Study design
Observational cross-sectional study

## Primary study design
Observational

## Secondary study design
Cross sectional study

## Study setting(s)
Hospital

## Study type(s)
Diagnostic

## Participant information sheet
Not available in web format, please use the contact details to request a patient information sheet

## Health condition(s) or problem(s) studied
Patient flow

## Interventions
There are no interventional components to this study. Machine learning systems are being developed in order to show hypothetical increases in patient flow throughout the ward (meaning that beds are at near full occupancy with some left for emergencies etc).

This study uses routinely collected observational data. These patients are all from the cardiac intensive care ward and will have had heart surgery. As this study only uses routinely collected observational data, absolutely nothing happens to the patient as part of this trial. The data is collected from gaining access to an NHS database. The data from the original state of patient flow from 2009-present. Data is taken to see if machines can learn to analyse data from the Cardiac Intensive Care Unit and that could improve patient flow management.

## Intervention Type
Other

## Primary outcome measure
Bed occupancy in the Cardiac ICU (CICU). This is to be kept close to full, with room for emergencies, and with beds neither empty nor double-booked due to bad estimations of patient recovery times.

## Secondary outcome measures
Prediction of potential complications in patients with preventative measures recommended to hospital staff.

## Overall study start date
01/01/2017

**Completion date**
01/09/2020

# Eligibility

**Key inclusion criteria**
Patients of the CICU

**Participant type(s)**
Patient

**Age group**
All

**Sex**
Both

**Target number of participants**
35000, data from 2009 - present

**Key exclusion criteria**
There are no participant exclusion criteria

**Date of first enrolment**
01/08/2017

**Date of final enrolment**
01/08/2018

# Locations

**Countries of recruitment**
England

United Kingdom

**Study participating centre**
**Bristol Royal Infirmary Cardiac Intensive Care Unit**
Bristol
United Kingdom
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# Sponsor information

### Organisation
University of Bristol

### Sponsor details
University of Bristol
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### Sponsor type
University/education

### ROR
https://ror.org/0524sp257

## Funder(s)

### Funder type
Government

### Funder Name
National Institute for Health Research

### Alternative Name(s)
National Institute for Health Research, NIHR Research, NIHRresearch, NIHR - National Institute for Health Research, NIHR (The National Institute for Health and Care Research), NIHR

### Funding Body Type
Government organisation

### Funding Body Subtype
National government

### Location
United Kingdom

## Results and Publications

### Publication and dissemination plan
Planned publication in a high-impact peer reviewed journal around the end of 2020.

## Intention to publish date
31/12/2020

## Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are/will be available upon request from Duncan Shillan, ds17453@bristol.ac.uk.

## IPD sharing plan summary
Available on request