

Calling data scientists, mathematical modellers and more to help doctors care for critically ill patients with COVID19!

Background

UCL has just been awarded an EPSRC hub for mathematics for healthcare called **CHIMERA**: Collaborative Healthcare Innovation through Mathematics, Engineering and AI. A primary focus of the hub is to use mathematics and AI to establish when patients in ICU that are under assisted, ventilator life support can be safely weaned off breathing support.

CHIMERA'S purpose is to **foster multidisciplinary collaboration** between mathematicians developing new biomechanical models, clinicians who measure and interpret **intensive care data** to treat patients, and statistical and computational scientists to bridge the two-way translation between model output and real-life data.

CHIMERA is a partnership between UCL Institute of Healthcare Engineering, Mathematics, Computer Science, Mechanical Engineering, the Clinical Operational Research Unit and two hospitals: UCL Hospital (UCLH, Dr Steve Harris) and Great Ormond Street Hospital for Children (GOSH, Prof Mark Peters & Dr Samiran Ray). Both UCLH and GOSH store routinely collected data from patient bedside monitors for the duration of their stay on an intensive care unit (ICU). CHIMERA is led by Prof Rebecca Shipley (PI) and Prof Christina Pagel with Prof Vanessa Diaz, Prof Simon Arridge, Dr Nick Ovenden and Dr Alex Diaz.

The COVID19 workstream

CHIMERA's main launch is in October but given the relevance of the hub to the current extraordinary circumstances, we are now adding an emergency workstream to start as soon as possible to analyse data from COVID19 patients on ICU at UCLH (and potentially other UK hospitals). UCLH is already treating many COVID19 patients and numbers are expected to increase significantly over the coming days and weeks (even months), putting immense strain on UCLH and ICUs all over the country.

COVID-19 is a new disease and much is unknown about its clinical course. Also some risk factors for severe illness are known (such as older age and other health problems such as diabetes) the effectiveness of different supportive care strategies (e.g. type of oxygen support, position of patient (face up or face down), use of corticosteroids) in different patient groups is unknown.

There are preliminary suggestions from the Chinese and Italian experience that there are complex relationships between how well patients convert Oxygen into Carbon Dioxide and other factors such as age and other health conditions. Understanding this relationship better could help in determining whether a patient would benefit from invasive or non-invasive breathing support. There is also some evidence that pronating patients on ICU (lying them face down) can help their recovery – but pronation is difficult and resource heavy for clinical teams (requiring e.g. 4-6 people per patient to turn them over). Under extreme resource strains such as the NHS is likely to face, being able to identify which patients benefit most from pronation could be extremely helpful.

The UCLH Data

The main UCLH data set we will be using comes from the bedside ICU monitors. This will include heart rate, breathing rate, temperature, oxygen saturation and blood pressure recorded every 5 minutes for the duration of a patient's stay on ICU. Additionally, we are planning to have treatment information and patient information (weight, age, other health conditions, sex) and outcome (survival, length of stay on ICU) for each set of patient ICU measurements. The monitor data will have gaps and artefacts in it. Vital signs will be correlated with each other and autocorrelated over time. We are also looking to add other hospitals' ICU data when we can.

How you can help

Given the urgency, we have no time to recruit new researchers for this workstream. We are looking for researchers to help us for about **four months starting April 2020** who have experience of

advanced data science (including statistics, machine learning) or mathematical model building (particular biomechanical models of physiology that could be applied to understanding how COVID19 affects patients' bodies).

For researchers who are PDRAs or PhD students, we can apply for a limited amount of funding to buy you out of your current projects for those 4 months. This can only be done with the permission of your PI / supervisor and the funder.

We are particularly keen to hear from researchers who have experience of analysing complex time series data and / or clinical data sets.

What to do next

If you are interested in helping, please fill out our online form using the link below as soon as possible (**preferably by noon Friday 20 March**).

<https://www.surveymonkey.co.uk/r/VSPB7C>