research aspiratins

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# Research aspirations

I have been working as a clinical academic first in training, and now as an NHS consultant for 15 years. I chose a path that built on using routinely collected data (e.g. the 15000 patient national study of deteriorating ward patients built for my PhD) because I firmly believe this is where the answer to the most important questions lies. The majority of these are not going to be solved by the ‘-omics’, and are not amenable to standard clinical trials designs. Who do we admit to critical care? When should we start and stop organ support? When does treatment stop offering hope and become futile?  
The opportunity that now presents itself is that the collection of data has become ‘cheap’. It took me 2 years, the support of more than 50 hospitals and research teams, and funding from across the NIHR Clinical Research network to deliver my PhD study. We collected the data by hand, processed more manually, and were never in a position to feedback evidence, or influence practice other than through academic publications. We can build predictive models, estimate treatment effects but we need to make data science a *translational* discipline. An academic (non-clinical) colleague simply stated:

“I don’t want my algorithm to die in a paper”.

While Electronic Health Records (EHR) make data cheap, they don’t make the task easy. Data collection and analysis requires methodological rigour. In particular, my work has focussed on extracting causal relationships from observational data. This excitingly requires a very close partnership between clinicians and methodologists. Without the former, the questions cannot be framed within a clinical-biological model. Unmeasured confounders will ignored, and the results will be biased. These biased results will eventually be found wanting, and the reputation of modern machine learning will be harmed.

However by combining high quality data pipelines with randomisation we have a unique opportunity. We can and should, of course, continue to hypothesis generate, search for endotypes and unexpected associations, and link with the ‘-omics’ and other novel data sources. But if we build an efferent arm to our data science tools, we can both provide decision support to reduce unwarranted variation whilst simultaneously learning where evidence is absent.

My ambition is to see this work directly influence my practice on the critical care unit. When I am next unsure of how to look after the patient in front of me, I want to know that I have resort to an agile and effective learning tool. I would like to share this ambition with the next generation of clinical academic researchers. I cannot think of a better environment than UCL’s IHI and UCLH/UCL BRC. I am proud that I have already started to build a lab group here, and found academic mentors in Professors Hemingway and Asselbergs. I am even more proud that they now see critical care and peri-operative medicine as the perfect specialty for trail blazing the discipline of translational data science.

## Research interests

* Data science training for clinicians
* Data quality, missingness, confounding and bias; and the software engineering necessary to build high quality data pipelines
* Using natural experimental design to extract causal inference from observational data
* Improvement Science and implementation (I have been a Health Foundation Improvement Science Fellow since 2017); and the fair and effective delivery of health care to at risk populations. More simply, how can we justify the enormous expense and distress associated with critical care if we don’t properly understand when it effective, and how to target its delivery