

# Transforming the Status Quo Through Digitalisation and AI

For all of the extraordinary innovations made in the field of medical science, in many ways we are still working in the dark.

Take renal transplants. When it comes to selecting kidneys for transplantation, the status quo is an unsatisfactory compromise based largely on a hopeful assumption as to the health of the donated organ – primarily based on the age of the donor – with very little empirical evidence.

Were a more rigorous and forensic means of assessing the health of a kidney available on a wider scale the benefits would be immense. Not only would doctors benefit from far greater levels of information, patients in vital need of a donated kidney would have a much greater chance of survival as well as improved quality of life—reducing the need for severe, lifesaving or merely life-prolonging treatment.

Healthcare services could operate at a far greater level of efficiency and success, both in terms of the outcomes and survival rates for their patients, and the cost and time needed to achieve those outcomes.

If the status quo can be improved, even transformed, in this one field out of many, there are incalculable potential benefits to patients and healthcare systems everywhere.

## Changing the Status Quo

To that end, in May 2021 SAS UK & Ireland and The University of Cambridge completed a successful collaborative partnership. The starting objective: identifying ways in which the process of selecting kidneys for transplantation could be better delivered through AI-augmented interpretation of renal biopsies.

Beyond that, the partnership, backed up by the University's Office for Translational Research (OTR), was charged with adumbrating the potential for a first-of-its-kind digital histopathology service, fit for purpose on a national scale.

The benefits of this collaboration could go well beyond this crucial field of study. Towards a future envisaged by Professor Gavin Pettigrew, Reader in Experimental and Clinical Transplantation at the University of Cambridge, when the "state of the art computational neural network technology" we have jointly developed is "widely adopted, even beyond the UK".

This potentially transformative step forward is just one example out of hundreds where data, digitalisation, and AI might enlighten murky fields of study.

## Our Guiding Principle; Our Motivation as Professionals

If we can help to advance data-driven research and medical practice in the most intelligent way possible, the insights we can yield will enable us to see more clearly and further. In turn we will enable medical scientists and physicians to think smarter, and to act faster, to save lives and improve lives;

- We can radically improve and streamline clinical trials, saving pharmaceutical companies enormous outlays in cost and time each year.
- We can enable pharmaceutical companies to fail faster, so that trials can be wound up sooner rather than later.
- We can furnish physicians with unprecedented levels of data from those trials, backed up by powerful feature extraction tools to deliver clinical-grade insights.
- By augmenting the level of data and intelligence at physicians' disposal we can enable a generational transformation in the therapeutic journey, leading to greatly improved patient outcomes.
- We can provide doctors and nurses with levels of insight and wisdom far beyond their own experience, by aggregating the insight and analysis that huge volumes of data can provide.
- We can provide for a far deeper understanding of differentials between

patients down to the most minute metabolomic or proteomic detail, as well as looking at the wider contextual factors that might affect a particular patient's suitability for a therapeutic or medicinal course.

- We can peer through the darkness, see further and more clearly, into the nebulae of as yet intangible factors and variables, from a patient's social identity or psychological wellbeing, to their life experience.

All of these things are now within our reach. We are at a fulcrum point in the development of biomedical science, parallel to major breakthrough moments in history.

## The Next Micrographia?

In 1665 Robert Hooke published *Micrographia*, one of the most important scientific papers ever written. In it, Hooke illustrated for the first time, to the wonder of his contemporaries, the extraordinary, minute details of the natural world his endeavours with the microscope had revealed.

Yet those astonishing minutia had always been there. "The things themselves as they appear" as Hooke wrote, had been waiting to be glimpsed for the very first time, when the technology became available.

It is no exaggeration to say that data and AI, harnessed effectively, could prove as transformative as the microscope in our understanding of the minute details of biology and medical science.

Through our efforts we are uncovering microscopic details of a different kind: trillions of bits and bytes of digital data streamed in real time that, through the prism of meaningful measures and intelligent analytics, become far greater than the sum of their parts.

Think of the transformative effect such powerful data could have on, say, our understanding of pre-eclampsia. There are many awful risks to mother and child that could be mitigated with greater understanding of what is going on within the womb, thereby avoiding the terrible dilemma



forced on physicians and mothers over when it is safe to deliver a baby.

Think of how much more effectively we could treat type 2 diabetes with data so powerful it can uncover new levels of information about where a patient is on their own disease pathway.

And think of what we have all been through over the past two years. The fear, the anxiety, and the great loss of life that we have endured globally.

### **If the Covid Pandemic has Proven Anything, it is the Power of Data-Driven Healthcare**

Without good data-gathering we would have been attempting to tackle the pandemic half-blind. Without data we could not have known where and when a new variant was emerging; we would not have been able to track infection rates, death rates, immunity levels, or uptake of vaccinations.

With even better data than was available when Covid-19 struck, we could have done all these things more effectively, more efficiently, and saved many more lives.

When, rather than if, there is another pandemic, we must go into it with both eyes open. The data and analytics tools that were developed and implemented during the pandemic need to be ready to be deployed immediately, anywhere in the world.

Of course, what we are talking about here raises many questions.

Such powerful data and AI empower doctors by augmenting the information on which they can make clinical decisions. But for this to happen requires a degree of state-level observation of populations that many, including myself, have concerns over.

What is the right balance between government-led monitoring and civilian liberties? Should individuals be forced to hand over data, and submit to mass observation, for the sake of the wider population?

When the next pandemic comes, should we go immediately back to the tracking systems and enforced lockdowns that have caused so much emotional strain and political discord?

There are no easy answers to these questions.

Nobody wants to allow an Orwellian state to develop as the price of freedom from a virus. And those in the pharmaceutical industry should be acutely aware, more than most, that well-intentioned and benevolent means can easily be subverted to further sinister ends. With power comes responsibility, and we must all be aware of how we handle both sides of this equation.

We are working towards a future when clinical decisions are never taken without the absolute best possible information (or close to it). In the process we must not forget the less tangible factors to be considered, that go beyond the clinical.

Inevitably during the pandemic healthcare providers and governments focused their efforts on immediate clinical needs, and the binary choices between life and death, hospitalisation and isolation, freedom and restriction.

What was perhaps unavoidable was the immense toll all of this was taking on the psychological wellbeing of people caught in the middle. We know that lockdowns severely exacerbated a number of mental health and related problems: drug and alcohol addiction, anxiety, domestic violence and abuse, loneliness. But do we really know how much damage has been done?

The true, painful consequences of the traumatic experiences of the past two years might take years to resolve, and could leave many, especially young people,

with debilitating long-term mental health struggles. But we can still analyse the emerging data to significantly improve our understanding of some of these wider impacts.

### **The Real Power of Data**

When we think of the sort of data that we and others are developing, we must never think that its uses are purely clinical, or that health can be reduced to digital binaries.

Data and analytics could and should be applied more to the more abstract variables of psychology, identity, social worth, and emotional wellbeing. If we neglect this aspect of its use, we will be overlooking areas of huge potential progress in medicine.

In any case, whether it is in the treatment of conditions with purely physical red flags such as pre-eclampsia, or procedures such as a kidney transplant, or whether it is in furthering our understanding of mental health, data has a vital role to play.

The profound potential of the technology we and other data and analytics leaders are developing is already being realised by organisations such as the OTR at Cambridge.

With greater collaboration between academics, governments, NGOs, the global pharmaceutical industry, and healthcare providers around the world, the possibilities become almost endless.



**Simon  
Tilley**

Simon Tilley, Global Lead for Healthcare and Life Science, SAS, has worked in software companies exclusively supporting the entire value chain of the pharmaceutical industry – from discovery to commercialisation through drug development and manufacturing. He has worked across all aspects of software companies – from R&D to sales & marketing through to systems design and delivery. Simon has worked extensively across Europe, the USA and Asia. He has a well-rounded and practical understanding of delivering real value to businesses using a wide range of software technologies.