Virtual patients for therapeutic drug trials

Using modelling, different doses of drugs can be given to ‘patients’ to test effectiveness.

**Virtual Patients**: Modelling and simulation allow clinical research to be reimagined for individualised therapy, while maximising therapeutic benefits and minimising risks.

**Drug Trials: The Current Approach**

Therapeutic drug trials involving human volunteers have been the gold standard in validating the safety and efficacy of new or existing treatments. However, research involving human subjects is risky. Hence, human clinical trials are conducted under stringent regulatory review and approval. As a result, studies in vulnerable subgroups such as the elderly, pregnant women, or children are often excluded.

Even when performed successfully, clinical trials are often limited in describing the "average" response to therapies in a large group of patients exposed. In generalising group outcomes, a one-size-fits-all treatment solution results. But no two people are the same.

The reality is that many therapies administered to a large group of patients tend to work better for some people than others. Recent advances in diagnostic capabilities and the growing availability of health data have given us unprecedented glimpses into the unique profile of each patient as genetically, physiologically, and pathologically distinct individuals. We would also expect these patients to be given different combinations of medications based on their underlying medical conditions.

This recognition that individuals are unique is driving the paradigm shift to precision medicine, which aims to deliver the right medication, at the right dose, to the right patient and at the right time.

**In the real world, we envision a landscape where healthcare and technology will converge in perfect synergy to direct and inform precision medicine – not just for subsets of patients, but for individual patients. Each person will have a virtual self, based on their genes and characteristics, who can participate in virtual clinical trials on behalf of the real person.**

**Miss Eleanor Cheong** is a PhD student at NUS. Her research project focuses on the optimisation of pharmacotherapy in atrial fibrillation and metastatic castration-resistant prostate cancer using PBPK modelling.

**Associate Professor Eric Chan**, a pharmaceutical scientist and the Dean’s Chair in the Department of Pharmacy, Faculty of Science, National University of Singapore (NUS), is a council member of the International Society for the Study of Xenobiotics, which is the study of chemical compounds such as consumer products and food ingredients, environmental pollutants, drug or pesticides that are foreign to a living organism. He is also an adjunct principal investigator at the Singapore Institute for Clinical Sciences, as well as a platform lead under the Innovations in Food and Chemical Safety Programme at the Agency for Science, Technology and Research.