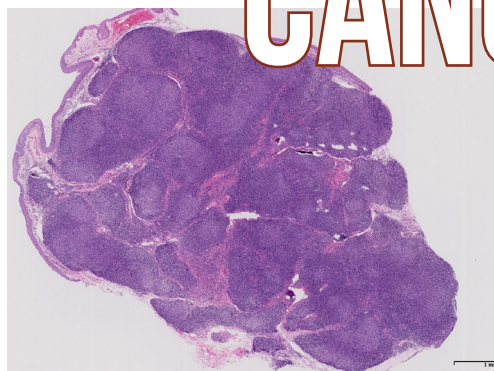
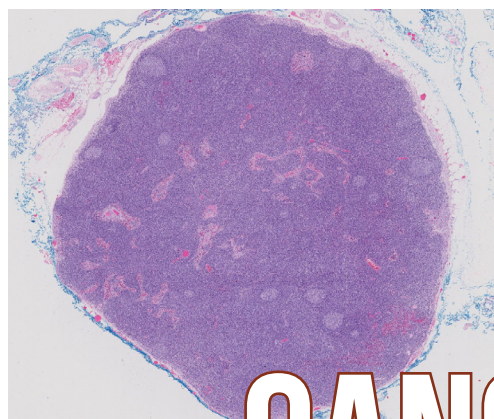




RIE NEWS

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BREAKING NEW GROUND IN CANCER DIAGNOSIS WITH AI

Using AI to differentiate reactive and lymphoma cases
Photo: Qritive

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SWISS-SINGAPORE COLLABORATION BRINGS HEALTHCARE CLOSER TO PATIENTS

WITH CHANGING GLOBAL DEMOGRAPHICS, HEALTHCARE SYSTEMS AROUND THE WORLD MAY BE IN DIRE NEED OF AN OVERHAUL, SAYS PROFESSOR NICOLE WENDEROTH FROM THE SINGAPORE-ETH CENTRE'S FUTURE HEALTH TECHNOLOGIES PROGRAMME.

The COVID-19 pandemic has put the spotlight on healthcare systems in every corner of the world. While most may have served their respective populations well in better times, the global health crisis is continuing to strain even the most advanced and efficient systems as it unfolds. But even before the most serious health event in recent history, changing global demographics have already begun to pose challenges to existing systems.

The rapidly ageing population has become a global phenomenon that is sometimes known as the 'Silver Tsunami'. By 2050, the proportion of the population aged 60 years and above is estimated at 34 per cent in Switzerland and 40 per cent in Singapore. The associated increase in chronic diseases could exacerbate the shortage of affordable healthcare services and inevitably lead to increasing costs. This means that existing healthcare models may no longer be viable in the coming decades.

To meet the challenges of the future, we need more sustainable modes of healthcare service delivery to ease the load of hospitals and other medical facilities. In short, we need to move the delivery of healthcare services out of the hospitals, towards the patients and the community.

Towards a Patient-Centric Healthcare Model

Globally, Singapore is among the first to initiate future-oriented initiatives in support of a patient-centric healthcare transformation. This is encapsulated in its vision of "beyond hospital to community, beyond quality to value, and beyond healthcare to health".

With its high technical readiness, innovativeness, and proactive strategy, Singapore is well-positioned to transform its healthcare system. This is an effort that is supported by its Ministry of Health Office for Healthcare Transformation as well as various national



Professor Nicole Wenderoth, Programme Director of Future Health Technologies at the Singapore-ETH Centre, wants to leverage digital technologies to tackle prevalent health challenges in Singapore, such as diabetes and obesity.

initiatives and programmes. The recently launched Future Health Technologies (FHT) programme under the Singapore-ETH Centre will be contributing to this transformation effort, with support from the National Research Foundation's Campus for Research Excellence and Technological Enterprise (CREATE).

Mobile digital technologies developed at ETH Zurich offer many possibilities in supporting both healthcare providers and patients in the continuum of care, ranging from prevention to management and rehabilitation.

What if mobile robots could facilitate rehabilitation

after a stroke at home? What if an interactive chatbot, which could help us reduce the risk of diabetes or depression, could be carried in our pocket? What if you could predict the risk of one falling and suffering a fracture?

The FHT programme will leverage such digital technologies to tackle prevalent health challenges in Singapore, including diabetes, obesity, depression, stroke, and fractures. Based on the research outcomes, customised preventive and curative measures will be defined and implemented. In addition, health technology assessments will be routinely performed to estimate and monitor the overall value and costs of such interventions.

The Challenge of a Data-Rich Healthcare System

In the future, effective and efficient healthcare delivery will increasingly depend on the collection and analysis of huge amounts of data, made possible with sensors and other mobile devices. As such, the future of healthcare, much like the future of smart cities and smart factories, will be driven by data.

This brings us to a question: how can we gain public trust and acceptance of these technologies? At the core of this question is the topic of health data governance.

The FHT team will define a 'trustworthy data governance' concept that is applicable to the legal and regulatory framework in Singapore. It covers areas such as privacy protection, data ownership, and accountability. At the same time, the concept allows researchers to analyse health data and build more accurate models to forecast patients' health, predict patients' response to treatment, and to better estimate overall value and cost.

Working with established partners in Singapore, FHT will take a holistic and evidence-based approach to providing relevant solutions. We don't just want to know if, say, a particular sensor is functioning properly. We also want to define a process that highlights what is necessary for new technologies to truly improve health and well-being in a clinical environment. This process should also identify which barriers stand in the way of an application and how these can be overcome. In examining these issues, we will flesh out ethical standards and take regulatory concerns into account – two aspects that are essential to gaining public acceptance and trust.

Collaboration Knows no Borders

With health and technology coming together, interdisciplinary borders only get in the way of a solution-oriented approach. The research programme not only brings together leading Singapore- and Swiss-based researchers and clinician scientists, but also disciplines including health engineering, medicine, computer science and artificial intelligence, economics, bioethics, social sciences, neuroscience, and rehabilitation science.

The FHT programme is established by ETH Zurich (Swiss Federal Institute of Technology Zurich), in partnership with Duke-NUS Medical School, Nanyang Technological University, National University of Singapore, National Healthcare Group, National University Health System, and SingHealth.

In the next five years, researchers will work closely with local agencies, clinical partners, industry and other relevant stakeholders, to develop digital tools that are relevant to the healthcare needs of Singapore's population and that can be integrated into its healthcare delivery workflow.



THE ONGOING CORONAVIRUS PANDEMIC HAS SENT SCIENTISTS AND RESEARCHERS INTO A GLOBAL RACE FOR A VACCINE – BUT EXACTLY WHAT DOES THIS ENTAIL? PROFESSOR OOI ENG EONG FROM THE DUKE-NUS MEDICAL SCHOOL'S PROGRAMME IN EMERGING INFECTIOUS DISEASE EXPLAINS.

What are vaccines, and how do they work?

Vaccines work by mimicking the features of a live virus in order to “educate” an immune system to recognise and develop a memory against these viruses. Upon an encounter with the respective wild-type viruses after vaccination, the memory immune cells can be rapidly activated to react against these viruses and prevent infection.

Vaccines have been developed to prevent influenza and adenovirus. They have also been shown to be especially useful in preventing viruses that infect us via the respiratory tract, such as measles, mumps, rubella and chicken pox.

What is the process of developing a vaccine like?

There is no cookie cutter approach to vaccine and drug discovery. Vaccine and drug development needs to be guided by scientific evidence.

However, there are challenges that are universal in vaccine development. Firstly, vaccines must be safe and not cause intolerable side effects. Secondly, vaccines must elicit the right types of antibodies and cells and to sufficient levels so that the immune response would protect against infection for a long time. Thirdly, they will need to be in forms that can be developed and manufactured without costly

modifications to existing methods, so that the price of the vaccines would not be prohibitively expensive. These requirements make vaccine development challenging but not impossible.

Could a vaccine be developed against COVID-19? Would it help to curb the pandemic?

Vaccine development typically takes approximately 10 years or more. However, we are now facing a pandemic and this process will need to be sped up considerably. We (Duke-NUS and SingHealth) have been working on using molecular tools to evaluate the safety and potency of vaccine candidates so that we can make better decisions on which ones to invest in for further clinical development. We hope to be able to use these tools to support the global effort in vaccine development to help overcome COVID-19.

However, I think we will eventually need both vaccines and drugs to fight COVID-19, as there is unlikely to be a silver bullet solution to this disease. As such, in parallel with vaccine development, efforts are also underway to find antiviral treatments to prevent severe disease in COVID-19 patients.

