DIGITAL TRANSFORMATION

NHG has a strong tradition in educating future generations of healthcare providers. Beyond enhancing data literacy in our highly motivated digital-native workforce, we have set our sights further to develop them into thought leaders in digital health, mobility-enabled productivity, and self-learning. Patient-care efficacy and empowerment are championed through relationships enabled by technology. We seek to curate and implement sustainable and connected capabilities, build digital portals, relationship management systems, and analytics platforms, to *Add Years of Healthy Life* to our population.

"Our NHG workforce will be trained to adopt new technologies, and be conscientious stewards of data; yet be imbued with the core fundamentals of the healthcare profession — ethos, empathy, and critical thinking. It is our people, and not machines, that determine the success of relationships afforded by science and circumstances."
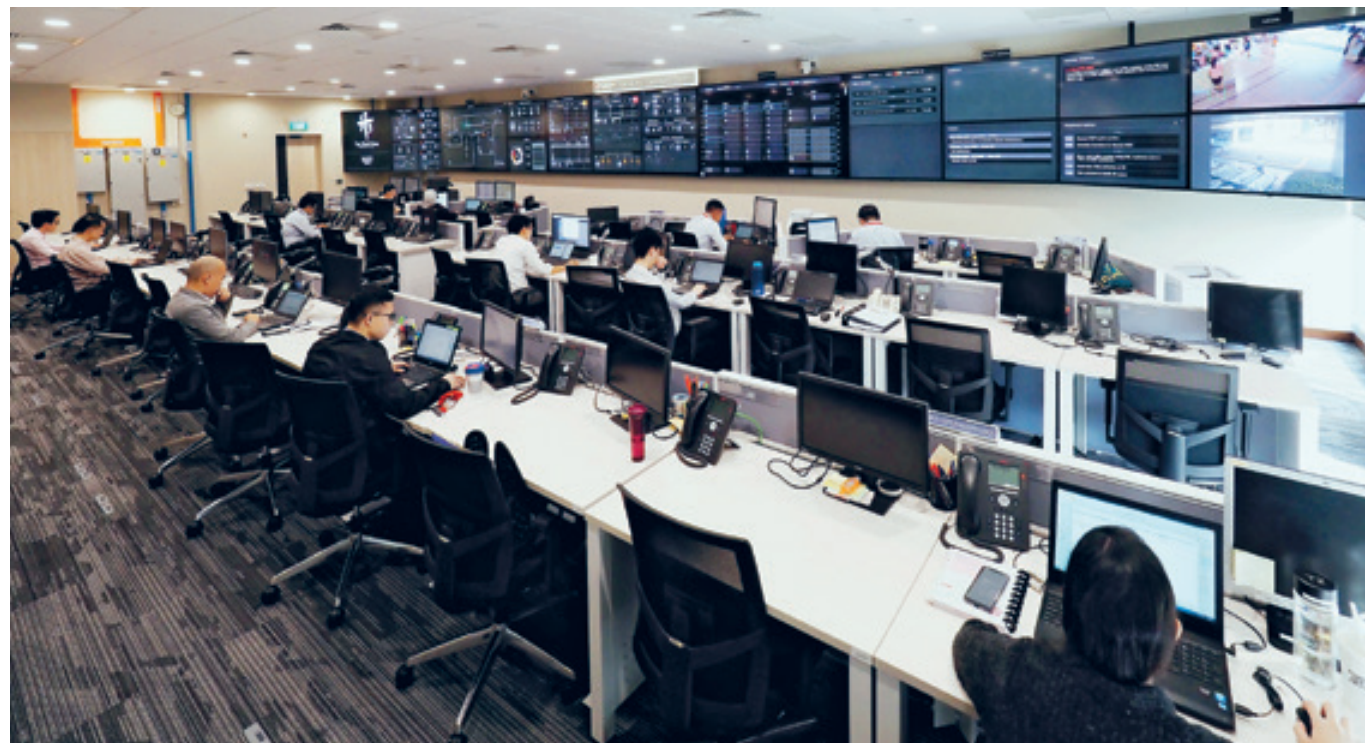
Associate Professor Thomas Lew
Group Chief Data & Strategy Officer, NHG

AI AND ANALYTICS IN NHG

Machine-learning applications in healthcare have tremendous potential that cuts across clinical decision-making capabilities, logistics, and even mundane repetitive operational tasks to improve productivity. We support our clinicians and operational leaders by creating robust test-bed environments, analytic bench tools, and trusted algorithms that are eventually built into our healthcare systems.

NHG's innovators are currently involved in a wide variety of machine-learning tools and AI-related research and operations. These include algorithms to improve accuracies of X-ray diagnoses, microscopic blood-tests screening, ophthalmology screening, and falls prevention. Algorithms are also used to drive predictive modelling for patient flow management in our facilities.

NHG has established good decision-making tools in its hospitals and clinics to enhance high acuity-based care and precision in clinical decision-support, e.g., antibiotics prescriptions and monitored alerts for at-risk patients. To improve well-being and deliver appropriate care, we use our analytical capabilities to facilitate the safe transfer of patients from hospitals to step-down facilities, and identify patients suitable for community-based interventions. Our data scientists analyse trends across the population spectrum we serve, from the well to the frail, to provide evidence-based information for clinical strategies and programmes to strengthen health and avert medical complications.

Left: The connectivity of Command, Control, and Communications (C3) systems between our institutions enable closer operational integration.

ADVOCATING TELEHEALTH

Telehealth can effectively replace physical visits and promote a trust-based, long-term relationship with patients that appropriately addresses their needs. Synchronous or asynchronous modalities of clinical communications can enhance wellness, continual assessment, and influence treatment recovery such as rehabilitation. The end-to-end delivery of complementary services such as medication delivery, community-based investigations, and timely analysis of patient data must be equally well-coordinated, to enhance telehealth experiences.

At NHG, we use all modalities of telehealth tools. Institute of Mental Health (IMH) clinicians provide tele-psychiatry services to patients in nursing homes. At Tan Tock Seng Hospital (TTSH), in addition to telemedicine, clinical pharmacists conduct teleconsultations on certain high-risk medications with patients. National Healthcare Group Polyclinics (NHGP) monitors patients with chronic diseases with tele-sensors for vital signs (e.g., blood pressure monitoring), together with video and telephone reviews. These services are supported by home delivery of medication, and community-based blood tests and laboratories.

During the COVID-19 pandemic, telehealth consultations were used by Community Health Teams from Central Health and Yishun Health to screen and determine whether additional home visits were needed for vulnerable and at-risk patients. Special clinical teams, such as the TTSH Home Ventilation and Respiratory Support Service used teleconsultations to ascertain the frequency and need for visits to patients on home ventilators.

We are establishing an architecture for data generated by residents and our population, across multiple sensing systems. With consent from NHG providers, this repository will allow patients to have insights into their customised care plans via our digital applications.

"As more NHG Institutions come onboard the NGEMR, the consolidated IT foundation will allow us leverage to provide more integrated care, optimised with aggregated patient data, and help the population take ownership of their own health and future healthcare needs. This is the patient-centred care of the future."

Assistant Professor Eric Wong Group Chief Clinical Informatics Officer, NHG

USING DATA AND CLOUD TO ENHANCE INTEGRATED CARE

NHG is sharing data nationally to determine the appropriate load-levelling of services and resources to provide timely access to treatment, including demands from pre-hospital emergency services. Further connectivity of Command, Control, and Communications (C3) systems between our Institutions enable closer operational integration. For population health, we are building a common data definition, and a population health and risk registry for the future, to enable the full use of analytics capabilities across the population segments we serve. In this regard, our integration and partnership with caregivers, and community health and social services providers, is critical, as holistic information, with the consent of our partners and residents, will in turn help them to remain healthy.

In 2020, NHG Institutions augmented patient flow and service-demand management systems to meet huge surges. Stratification of patients' clinical data enabled safe right-siting of institution-based care of COVID-19 patients at the various acute and step-down facilities. Chronic disease patients who could not visit our Institutions during the Circuit Breaker were cared for remotely, well-supported by community-based services.

NGEMR "GO-LIVE" IN NHG

In 2021, NHG achieved a key milestone in its care transformation journey when the Next-Generation Electronic Medical Record (NGEMR) successfully went "live" at the National Healthcare Group Polyclinics (NHGP). NHGP piloted NGEMR at Geylang Polyclinic on 27 February, and at the rest of its polyclinics on 3 May.

NGEMR is a joint project between NHG, the Ministry of Health (MOH), Integrated Health Information System (IHiS), Epic, and National University Health System (NUHS). Pushing the boundaries of clinical care with the use of big data, analytics, and healthcare prediction models, NGEMR is a state-of-the-art IT enabler that is pivotal in driving NHG's *River of Life* population health strategy. It integrates the numerous existing systems and functionalities into a single platform, facilitating information-sharing across NHG Institutions and our partners.

Through system harmonisation, NGEMR enhances the coordination of care plans, boosts efficiency of services, and amplifies data management for research and education. Patients can access tools and services such as educational materials and self-management of medical appointments. Ultimately, NGEMR aims to improve patient/population health outcomes by revolutionising delivery of care and advocating ownership of well-being, even as it supports the growing demand for healthcare services in Singapore.