



FUTURE-PROOFING HEALTHCARE SYSTEMS

This includes tackling
climate change challenges too.

by **How Choon How**

Singapore citizens have an average life expectancy at birth of 83.5 years,¹ a statistic that is amongst the highest in the world. This increase in life expectancy, also observed across many countries, is the result of several great achievements by public and healthcare leaders over the last century, including access to clean water and better sanitation, as well as improved living conditions. The challenge for us in healthcare is to sustain, or even improve these standards as we approach 2050.

The year 2050 is an important marker—by that year, the global urban population is expected to more than double its current size, with close to 70 percent of the global population living in cities.² The challenge is compounded once we consider tackling global externalities such as environmental degradation and climate change from the local healthcare industry, and reviewing the amount of energy needed to power medical facilities, as well as the resources needed by the global healthcare supply chain to provide medication, vaccines, gloves, and masks.

In this article, I aim to share about the pressing issues that confront healthcare systems. I will highlight examples from Singapore such as Healthier SG, the latest nationwide healthcare transformation that pivots our centre of gravity from solely providing healthcare services to upstream prevention and early intervention with a healthier community. Next, I discuss the role of technology and the digital world in improving health and healthcare, before ending with a mention of sustainability, an increasingly salient aspect in the coming years. Medical professionals will need to work with society to effect change and catalyse these transformation efforts.

CHANGING POPULATION DEMOGRAPHICS

Given Singapore's rapidly ageing population, its healthcare systems must adapt to not only operating with a smaller healthcare workforce, but also coping with the care of a larger number of older adults with complex health challenges and comorbidities, which is the simultaneous occurrence of several medical conditions. These will mean a significant increase in public spending for healthcare and a greater need for long-term care. These expected constraints are based on the assumptions that older adults beyond a fixed age will become more dependent on their families and society.

Singapore has taken several steps in the last decade to review the social compact of a fixed retirement age and readiness of its population to optimise the longevity dividends. This includes healthcare programmes that cater to the Pioneer and Merdeka generations³, as well as the other government initiatives to keep older adults learning and transitioning into new roles or jobs beyond their fixed retirement age according to their employment, economic, and health status.

Over the last decade, healthcare organisations have gradually extended the retirement age, enabling experienced healthcare workers to extend their prime and still contribute their expertise beyond a pre-determined age. Healthcare professionals can be role models and strong advocates to fight ageism in their respective communities. In helping the community understand the common physiological changes observed in older adults, we may be able to better realise the potential of mature workers who tend to be more skilled in solving complex problems at their workplaces. A mixed-generation workforce has also been shown to bring out optimal productivity.⁴ Allowing our people to work productively for a longer part of their lives not only secures their independence and preserves their dignity, but it also reduces dependency on public goods and services.

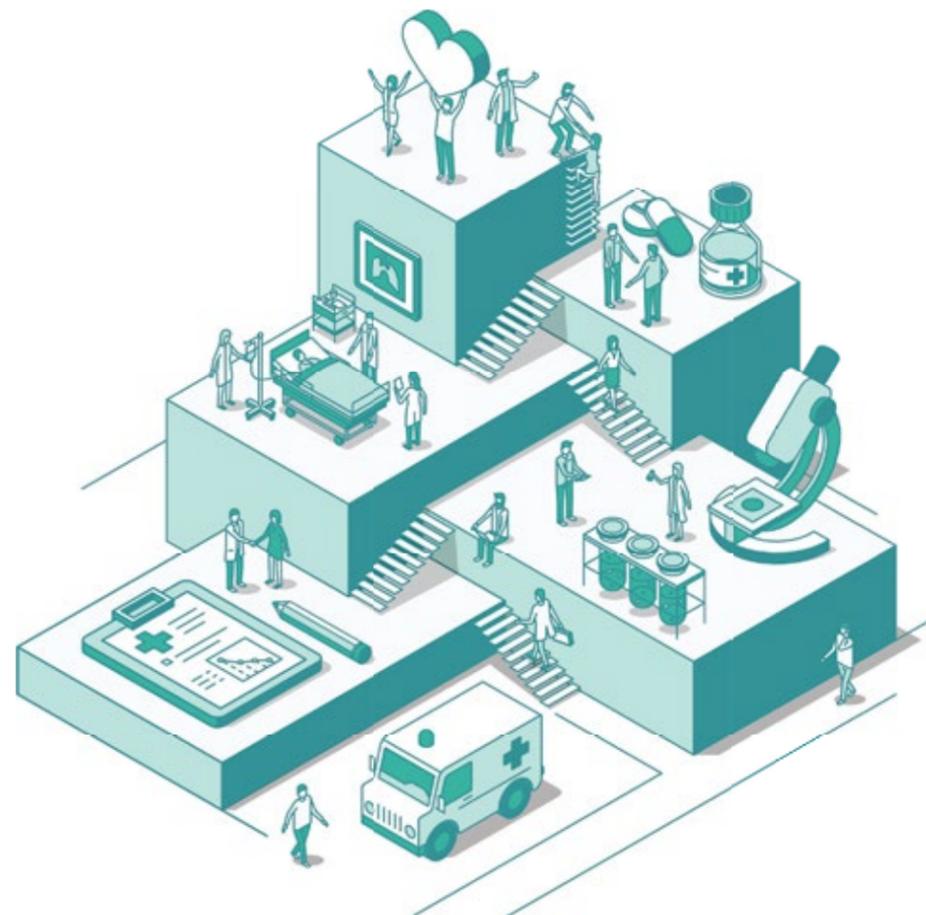
HEALTHIER SG: A PRIMER

Healthier SG marks Singapore's latest and most ambitious effort to mobilise its residents and transform the country's approach to achieve better health for all. In a nutshell, Healthier SG is a multi-year endeavour which aims to pivot from an institutional healthcare delivery-centric system towards a place-based population health model with an emphasis on prevention and early interventions anchored in our communities.⁵ What does this mean?

Within the healthcare system, the gravity will be shifted from acute care hospitals towards the Primary Care Networks that comprise general practitioners (GPs), who are supported by nurses and care coordinators. The latter two provide holistic and coordinated care to enrolled patients with chronic conditions, such as diabetes, hypertension, and high blood cholesterol. This team-based approach ensures that residents stick to their trusted health advisors and are better cared for in the community. The GPs will be integrated with the three regional health clusters: SingHealth⁶, National University Health System, and National Healthcare Group, and also partner agencies such as the Agency for Integrated Care (AIC), Health Promotion Board (HPB), Sports Singapore, and social and community partners to support the residents' health goals. Together, they will extend services to improve health through initiatives that include getting sedentary folks moving to the latest K-pop (Korean pop) music or Zumba

to social screenings for the communities. At the same time, residents can complete their regular health screenings and vaccinations, which are important for at-risk individuals and will enable timely preventive measures. As we have seen from the many waves of the COVID-19 pandemic in our country, appropriate population-level vaccination and measures are well-poised to bend the trajectories of disease burdens towards better health outcomes.

Singapore will leverage on its rising digital literacy rate and the high ownership levels of personal smart devices in its population to return agency for health to its citizens, supporting them with pushed health information that will involve and nudge them towards better health behaviours. Under the National Primary Care Enrolment programme⁷, all Singapore residents will be "invited to enrol with a family physician of their choice". Family physicians or GPs therefore constitute the 'first line of care' which supports the residents for various health needs and care episodes, ensuring continuity of care across their life-course. Additionally, by empowering citizens to achieve individual mastery of their own health, it is hoped that issues of chronic diseases and longstanding unhealthy behaviours like obesity and smoking within the communities can be addressed.



Healthier SG was scheduled to launch in July 2023 with about 1,000 GP clinics, approximately three quarters of all eligible ones. All Singaporeans would be invited to join the National Primary Care Enrolment programme in batches, starting with older adults. This integration of care within each community will involve working out new forms of collaboration between healthcare providers and community partners who have deep knowledge of and connections to the residents they serve. Many more health-related activities with an emphasis on prevention, such as health screenings, vaccinations, health and mental wellness talks, and the strengthening of social networks within our communities, are planned.

To achieve these plans, the speeding up of the scale and adoption of telemedicine by GPs is critical. There were many examples of telehealth and remote monitoring deployed during the pandemic. For example, Covid@Home was launched on the DrCovid app to monitor the health of vulnerable patients through a common local chat service that was supported at the backend by clinical management software.⁸ Telemedicine and remote monitoring have become widely accepted, laying the foundation to include more inpatient conditions in our Hospital@Home initiative across our acute care hospitals.

Unsurprisingly, global attention is on Singapore, as it is the first country to embark on such a whole-of-country healthcare transformation effort. It must also be noted that all these efforts build on the successful primary care services and funding programmes established within the last two decades, from the Chronic Disease Management Programme to the Community Health Assist Scheme⁹ (CHAS)¹⁰ and the Primary Care Networks.

WE NEED ALL OF THE MACRO, MICRO, AND NANO

At the macro level, we have achieved so much in health outcomes. And as medical science continues advancing, we can look forward to diving deeper into how our body works. However, an old truism—"as we learn more and more about less and less, soon we will know everything about nothing"—reminds us that the never-ending specialisation in medicine can be both a boon and a bane. I also remember an old quip that we may

soon have 'organ' specialists who sub-specialise to only look after the left pinky. Therefore, as we develop precision medicine involving more micro, or even nano interventions (with the ability to predict and treat at the genetic code level), we also need to learn and collaborate across domains and industries. For example, while medical advances enabled the quick development and delivery of the various COVID-19 vaccines, the successful execution of public health measures and the high level of community participation were equally important in saving lives during this pandemic. Likewise, regarding the unhealthy lifestyle choices adopted by our ageing population and the social pandemic of obesity, we must re-imagine how healthcare services can be improved, particularly by working with all stakeholders to enhance health at a personal and community level for our population.

Working towards this end, Singapore has commissioned its three regional healthcare clusters to be every resident's community health manager. This may require the healthcare community to adopt a more holistic approach, while cross-disciplinary collaboration with academics, including sociologists, psychologists, and those from other social science disciplines and the humanities, will help guide our involvement with businesses, employers, grassroots leaders, and community partners as we work together to put Healthier SG into action.

The heaviest yoke may fall on Changi General Hospital (CGH), the 'anchor' hospital in eastern Singapore that will be accountable for the highest number of older adults in neighbouring Bedok and Tampines estates. CGH had recognised this and got a head start in going macro with community initiatives over the last decade like its Neighbours for Active Living and Friend A Senior programmes. These programmes mobilise the older retired adults with time at hand to befriend a peer with poorer health in their neighbourhood. The programmes have not only strengthened community connectedness, but the volunteers also helped their frailer neighbours. Together, they have helped reduce the hospital readmissions and hospitalisation days of older patients.¹¹

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TECH SHOWS THE (PARTIAL) WAY

We should begin incorporating evidence-based practices into the clinical management systems across our primary care and long-term care facilities. These practices, which were captured in clinical algorithms that were developed in our Artificial Intelligence (AI) projects, can be automated prompts or decision aids that help reduce the cognitive burden on our healthcare professionals. With the widespread adoption of commercial options of health wearables, the same clinical algorithms can also be adapted to help people make informed behavioural choices to achieve better health outcomes in their everyday lives. A successful example is LumiHealth, an engaging collaboration between Apple and HPB that incorporates challenges and health nudges through gamification.¹²

Setting up HealthHub, the national population enablement platform for digital health, is another significant initiative that will help connect all actors as one community to maintain the good health of all individuals. Timely behavioural nudges through the Healthy365 app via their smart devices will also extend the reach of Healthier SG efforts to every resident. These national apps will be paired seamlessly with, for example, SingHealth's HealthBuddy app, for residents to view evidence-based health and wellness information, access health records, and perform transactions like bill payments across public healthcare clusters.

The various regional healthcare clusters will also be exciting test beds to validate new technologies for health promotion and monitoring. In 2012, CGH, one of Singapore's leading 'smart' hospitals,¹³ established a dedicated office to oversee innovation efforts.¹⁴ Then in 2015, it set up the Centre for

Healthcare Assistive and Robotics Technology to spearhead tech-centric transformations. These are important initiatives to reduce mechanical work for healthcare workers, and there should be many more of such opportunities for health start-ups to develop innovative solutions and new technologies to forge the way ahead into a more sustainable future of healthcare.

With rising digital literacy and the prevalent use of individual smart devices, we need to learn to move effectively beyond the brick-and-mortar healthcare institutions and deliver health information, monitor diseases, and realise the potential of self-help services in more effective, efficient, and sustainable ways. We have much to learn from the successful transformation of digital banking about how the financial institutions secure our individual digital financial data that is just as confidential as individual medical records.

PEOPLE, PEOPLE, PEOPLE

At the centre of all change management efforts is the people. They include policymakers, healthcare professionals, and residents. Our policymakers are working to garner sufficient attention and buy-in to the shared vision of a healthier Singapore. The willingness to collaborate across government agencies, voluntary organisations and grassroots, and the journey to success envisioned in Healthier SG should never be taken for granted.

On the healthcare providers front, even before the COVID-19 pandemic, there were real tensions, in terms of attention and time, between maintaining high standards of clinical 'business-as-usual' operations vis-à-vis diverting resources to embark on healthcare transformation. There are

no clearer priorities for healthcare providers beyond attending to patients who need care urgently today, but they must also attend to future challenges. Healthcare transformation requires strong leadership sponsorship, teams, and offices dedicated to these causes. These efforts should be guided by evidence-based recommendation, data-driven insights, and delivery methods widely accepted by our population.

Healthcare systems have for the longest time been, by design, specialist-driven and hospital-centric, with a high proportion of inpatient care. Working efficiently in a cost-effective healthcare system requires healthcare professionals to work together in teams. The correct professional mix of doctors, nurse clinicians, health coaches, and care coordinators is needed for success. If the primary care provider or hospital is neither adequately resourced nor integrated, it will not be able to effectively manage chronic illnesses and comorbidities as a system. Such healthcare delivery models will either increase out-of-pocket costs for the patients or severely strain the sustainability of public health financing.

BRINGING SUSTAINABILITY INTO HEALTHCARE

Inevitably, national healthcare systems need to deal with the (environmental) 'elephant in the room'. The healthcare sector is responsible for 4.6 percent of global greenhouse gas emissions.¹⁵ In Singapore, the hospitals generate about 5,000 tonnes of waste annually from the use of disposable supplies as part of infection control and other single-use medical and biohazard wastes.¹⁶

Healthcare as a system generates carbon footprint directly or indirectly through its provision of services. Healthcare-related traffic involves moving patients, healthcare workers, and healthcare supplies to and from healthcare institutions. Without compromising high standards of care, we must review our processes and re-design them with appropriate technological innovations to reduce our carbon footprints. The COVID-19 pandemic has also accelerated a critical review of how much travel can be replaced by technology, such as telehealth. Many patients could actually be cared for from their homes. We thus need to further review the inpatient characteristics and service requirements of our acute hospitals and other intermediate and long-term facilities.

Healthcare institutions will also need to continue working with academics and industrial leaders through research and collaborations to speed up their efforts to make positive environmental impact and optimise the digital realm to deliver healthcare effectively and efficiently to the masses—much as how online shopping, digital banking, and social media have

permeated our daily lives. In fact, many countries like the UK have already included environmental sustainability in their medical school curriculum.

Another aspect of sustainability is our healthcare capacity and redundancy to cope with acute stressors, like pandemics and mass casualty events, such as natural disasters. We have experienced the Severe Acute Respiratory Syndrome (SARS), H1N1, and COVID-19 pandemics within a mere two decades. This is a sober reminder of the speed and extent of spread of infectious diseases, despite our improved capabilities to identify and develop treatment for novel infections. Many countries have shared their experiences from the COVID-19 pandemic and several academic papers have been published to disseminate these important lessons. All these will not be enough if there is no effort to make structural changes or investments that build resilience and redundancy in preparation for the next pandemic. Disease surveillance for novel zoonosis, like avian and swine flu, especially with suggestions of human transmissions, will require active collaboration across many countries and open sharing of information coordinated at an international level, such as that conducted by the World Health Organization. These must be coupled with swift and decisive preventive measures to minimise the risks when it is detected.

Healthcare transformation requires strong leadership sponsorship, teams, and offices dedicated to these causes. These efforts should be guided by evidence-based recommendation, data-driven insights, and delivery methods widely accepted by our population.

In Singapore, sustainability is becoming one of the top priorities for healthcare organisations and institutions. SingHealth, for example, has set up an environmental sustainability shared services group to review and work on the four priority areas of energy utilisation, water efficiency, waste disposal, and carbon emissions. We should act to create a positive impact on our environment, including adopting measures towards becoming carbon-neutral, reducing food waste, promoting recycling, and making sustainable procurement decisions.

CONCLUSION

I have highlighted several issues that will challenge healthcare systems, such as that of Singapore's, in the coming decades. The changing disease burden and population demographics can potentially be tackled with upstream preventive interventions at the individual level with timely screening and behavioural nudges towards healthier lifestyle choices to reduce premature complications and cut increasing healthcare spending across the world.

There is much wisdom and experience from other industries that healthcare can draw from, e.g., digital banking and finance, and in the process leapfrog them in bringing information and prompts into our everyday lives. This transformation required in our healthcare systems also offers opportunities for start-ups and technological solution companies to step forward to co-create the future of health and healthcare for everyone. ^{AM}

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This article is written in the author's personal capacity and the views are entirely his own. They do not necessarily represent the views of the organisations he is affiliated with.

Endnotes

- ¹ Singapore Department of Statistics, "Death and Life Expectancy", February 24, 2023.
- ² The World Bank, "Urban Development", April 3, 2023.
- ³ The Pioneer Generation refers to Singapore citizens who turned 16 years old or were older (i.e., born before 1950) when Singapore gained independence in 1965. The Merdeka Generation refers to Singapore citizens who were born in the 1950s. These individuals are entitled to various health subsidies and benefits. See for example, Singapore Ministry of Health, "Merdeka Generation Package", for more information on the health subsidies for the Merdeka Generation. 'Merdeka' means independence in Malay.
- ⁴ Angela Mulvie, "Learning and Development for a Multigenerational Workforce: Growing Talent amongst Age Diverse Employees", Routledge, 2021.
- ⁵ Vanessa Lim, "Healthier SG: What You Need to Know about Singapore's New Healthcare Reform Plan", CNA, October 5, 2022.
- ⁶ A regional healthcare cluster like SingHealth would have several hospitals, polyclinics, community hospitals, and specialist centres under its umbrella.
- ⁷ Singapore Ministry of Health, "Promoting Overall Healthier Living while Targeting Specific Sub-Populations", March 9, 2022.
- ⁸ SingHealth, "SingHealth and A*STAR Co-Develop Smart Chatbot to Enhance Care for COVID-19 Patients at Community Care Facilities", June 24, 2020.
- ⁹ CHAS is a public healthcare programme that allows Singapore citizens to receive subsidies for medical and/or dental care at participating GP and dental clinics.
- ¹⁰ Primary Care Pages, "Community Health Assist Scheme (CHAS)".
- ¹¹ Yuen Sin, "Initiatives to Tackle Frequent Hospital Admissions See Results", The Straits Times, March 10, 2019.
- ¹² CNA, "Singapore Partners Apple on New LumiHealth App to Promote Healthy Lifestyle Changes", September 16, 2020.
- ¹³ Newsweek, "World's Best Smart Hospitals 2021", 2021.
- ¹⁴ In 2021, CGH was ranked 32nd in Newsweek's World's Best Smart Hospital, the highest ranking amongst Singapore hospitals in the list.
- ¹⁵ Matthew J. Eckelman, Kaixin Huang, Robert Lagasse, et al., "Health Care Pollution and Public Health Damage in the United States: An Update", Health Affairs, 30(12), 2020.
- ¹⁶ Singapore Ministry of Health, "Amount of Medical Waste from Hospitals and Clinics in Past Year Compared with Five Years Ago and Measures to Reduce and Manage Such Waste", May 10, 2021.