# TRANSFORMING HEALTH SYSTEMS IN A POST-COVID WORLD

## Three recommendations for building system resilience.

by Joshua Tan, Leonora Liu, and Jeremy Lim

**T**he ongoing COVID-19 pandemic has been devastating, with the virus causing systemic disruption unlike anything experienced in living memory. Health systems, the first to bear the brunt, continue to face repeated bouts of viral surges. Healthcare workers on the front line are tired, battle-worn, and uncertain about whether there is an end in sight. Government coffers, lighter after doling out repeated economic relief for citizens and businesses, necessitate fiscal tightening. However, health systems globally face a triple challenge—they must get through these trying times, they need to develop resilience in anticipation of future outbreaks, and they have to address longer-term challenges that predate COVID-19, such as chronic diseases and population ageing.

How should healthcare planners and policymakers respond? In this article, we discuss three ideas that health systems can adopt to progress in the post-COVID world. Although we focus our analysis on Singapore, these ideas are applicable to health systems everywhere. We also make a distinction between a health and a healthcare system in our discussion. A health system promotes healthy living and focuses on keeping the population healthy. On the other hand, a healthcare system aims to deliver medical services that improve the health outcomes of patients.

### BUILDING IN REDUNDANCY

In an era of budget constraints and spiralling healthcare expenditure due to ageing populations and the ongoing pandemic, health systems are being forced into achieving maximum efficiency and minimal waste. Just-in-time processes, cost-containment measures, and lean management practices have worked their way into health systems. Against this backdrop, the concept of redundancy is deemed the antithesis of efficiency and conceived as 'waste' that needs to be eliminated. Redundancy is, however, important in highly dynamic environments, in which adverse shocks are frequent and surges in demand are unpredictable. Sadly, the last two years have shown us that healthcare fits this description to a T, and that moving forward, redundancy should be incorporated routinely into the design of future health systems.

Consider the systems on a commercial aircraft. Aircraft are designed and manufactured in a mechanically redundant way, with several potentially identical backup systems that increase the safety margin and reduce the risk of catastrophic effects following a single point of failure. In fact, the aircraft systems crucial for flight are often triple redundant. Does this increase costs? Yes, certainly, but when the consequences of failure are catastrophic, it is a necessary price to pay. What price then are we prepared to pay for healthcare?

Throughout the COVID-19 pandemic, we have observed how healthcare systems worldwide were swiftly overwhelmed because of the absence of redundant systems and the sheer ferocity of the virus. Within a month from the onset of the pandemic, many health systems were strained to the point where the scrambling and urgent construction of field hospitals were required to meet the surge in hospitalisations.[1] At the height of the first wave, the increase in demand for healthcare-related resources soon resulted in shortages of personal protective equipment (PPE), life-sustaining equipment, and critical bed capacity. The early waves overwhelmed many health systems, resulting in excess mortality[2] and potential fatalities among healthcare workers lacking PPE. From March to August 2020, approximately one in four COVID-19 deaths in the US could be attributed to hospitals strained by the overwhelming caseload.[3] Fortunately, Singapore's carefully orchestrated COVID-19 response allowed the country to avoid significant excess mortality from the pandemic. However, its health system and redundancies were unavoidably strained.

As the pandemic drags on, its toll on global health systems has resulted in an exodus of healthcare workers. Singapore also saw a rise in healthcare worker resignations in 2021, with many expressing concerns about overwork and fatigue.[4] Burnout amongst healthcare workers is a major concern as it affects attrition, quality of care, the efficiency of the health system, and most importantly, mental health. Building in manpower redundancy will enable shorter working hours, more time for rest, and a better work-life balance, all of which will help address burnout. This may be difficult to carry out in a tight labour market where it may take a decade to train the workforce. It is thus imperative to train, recruit, and retain a sizeable healthcare corps, if we are to

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endure the long fight with COVID, and simultaneously address the health challenges of an ageing population.

Although health systems are unlikely to incorporate aviation-type triple redundancies into their processes, they can benefit from an engineering-type systems dynamics approach. The latter identifies critical areas in which redundancy can help with adapting to changing circumstances, adverse shocks, and isolated failures. Important areas to build redundancy during this pandemic include material and personnel resources. For example, OSF HealthCare, an Illinois-based integrated healthcare network, has started manufacturing masks, gowns, and other critical pharmaceuticals to mitigate pandemic-related supply chain disruptions.[5] Healthcare institutions should seek to increase their involvement in supply chains to build in redundancy for material resources. Furthermore, strategically locating shared PPE and pharmaceuticals stores, rather than hoarding these resources, can facilitate a timely, coordinated response during surges in the region.

## ENABLING HEALTHCARE THROUGH DIGITAL TRANSFORMATION

Prior to the COVID-19 pandemic, the healthcare sector was a laggard in adopting technology. One need only think of our ubiquitous use of digital banking, ride-hailing, and e-commerce solutions today to realise how digitalisation has redefined the landscape in other sectors. No doubt, the pandemic has catalysed the uptake of digital solutions in healthcare in recent times–the mainstream use of

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telemedicine, for example, now allows Singaporeans to seek healthcare remotely. However, the healthcare sector still has much progress to make if it is to harness the full potential of digital innovation. With our transition to COVID endemicity and with the spotlight now back on chronic diseases and the ageing population, Singapore finds itself in uncharted territory. To address this novel mix of public health issues, the innovation and translation of digital solutions in healthcare now need to take place at unprecedented scale and speed.

For a digital revolution to be realised in healthcare, regulatory and financial environments need to enable the innovation and uptake of novel digital health devices and services.

### Favourable regulations for digital health innovations

Singapore's Health Sciences Authority (HSA) adopts a risk- and confidence-based regulatory approach for new medical devices, including hardware and software. Apart from new medical devices deemed to be of 'low-risk' and others that have received prior approval from reference agencies (e.g., regulatory agencies in Australia, Japan, and the US), many local and innovative healthcare devices will require between 100 and 300 working days for product registration.[6]

Singapore's regulation of innovative healthcare services, on the other hand, is guided by the Ministry of Health's (MOH) Licencing Experimentation and Adaptation Programme (LEAP), a regulatory sandbox initiative. It is within LEAP's test beds that telemedicine and mobile medicine have been translated from an idea into a new and innovative healthcare service in Singapore.[7] However, it took three years–between 2018 and 2021–for the telemedicine regulatory sandbox to show success and for this innovation to transition to licensing, even with the time-sensitive need for such services amidst the pandemic.

Singapore's efforts to ramp up the adoption of new and exciting digital health solutions have been commendable. However, the overarching regulatory approach has been very cautious–arguably too cautious–and may, ironically, become a stumbling block for digital innovation at a time when it should speed up.

Perhaps it is timely that we consider other ways of regulating digital health innovations. One such alternative would be through a self-regulatory framework. Harvard medical researchers Elena Rodriguez-Villa and John Torous, for example, have proposed a dynamic self-certification system for regulating digital health tools.[8] Under this system, digital health tool developers would have to answer a set of questions adapted to contextual needs after considering diverse stakeholder input. Answers to this self-certification checklist would be publicly available, giving users–such as patients and clinicians–an opportunity to comment on the validity of answers or propose changes to scoring, thus drawing on real-world evidence. The researchers argue that this public, interactive approach to regulation would facilitate the design and building of digital health innovations that meet and respond to real needs, set a standard for transparency that protects users, and empower patients and clinicians to play an active role in shaping the future of digital health. Government agencies will still play a role in conducting random audits, and those triggered by patient and clinical concerns, thereby limiting harm to patients and consumers. Through a more self-regulating approach that does away with the need for the government to endorse specific digital health innovations, government agencies will free up significant bandwidth and resources for more pressing public health issues.

On Singapore's response to COVID-19, Director of Medical Services, Associate Professor Kenneth Mak, said in October 2021 that "[Singapore is] moving progressively from the Government doing everything to the importance of self-accountability, self-responsibility, self-obligation...".[9] If Singaporeans are to take greater responsibility for their health and healthcare, learning to make more informed choices about the digital health solutions they use will surely be aligned with this shift.

### Financial support for digital innovation

We can consider adopting two perspectives on the financing of digital health innovation: (i) funding the innovation process; and (ii) ensuring the financial viability of digital health solutions resulting from such innovation. For the former, and much to the credit of the government, Singapore continues to recognise the importance of research, innovation, and enterprise (RIE) in its knowledge-based and innovation-driven economy.
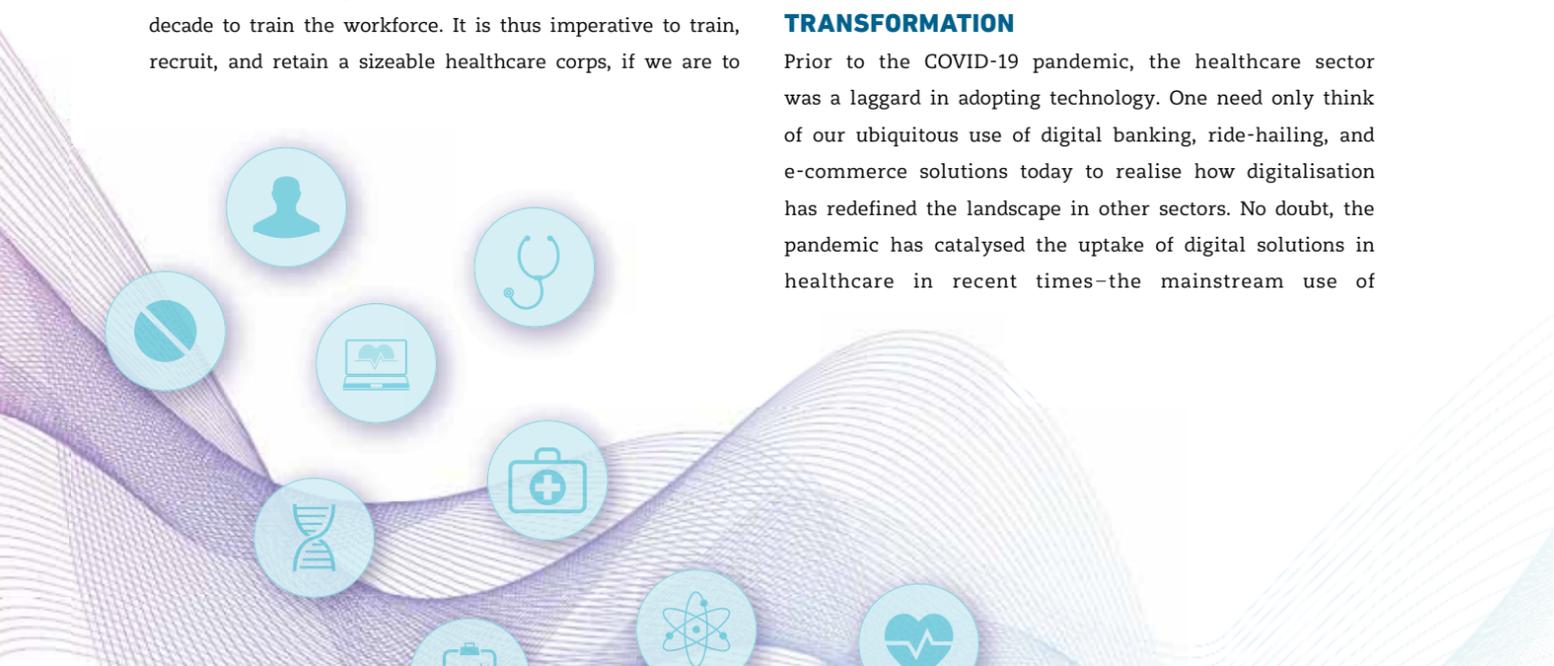
The commitment of S$25 billion–or about one percent of the nation's gross domestic product–to Singapore's RIE 2025 plan[10] is indicative of the magnitude of fiscal support that the nation and industries, including healthcare, have for innovation. For the latter, innovators would benefit from buy-in and financial support from a more varied pool of stakeholders, including patients, clinicians, healthcare institution leaders, innovators, and policymakers, if they are to achieve rapid and widespread market uptake.

Assuming developers have innovated in response to existing demand, developed a useful digital health solution, and showed proof of concept through seed funding, the next big challenge for innovators is launching the product on the market and achieving sufficient market reach. This challenge may be particularly daunting for small health technology start-ups or businesses, whose budgets are smaller and business operations limited by a smaller workforce. To overcome this, collaborations among smaller players or start-ups and healthcare institutions, organisations, and government agencies will be a strategic move. By forging these mutually beneficial alliances, innovators can achieve the economies of scale needed for fiscal health, while clinicians, patients, healthcare leaders, innovators and policymakers reap the benefits of the digital healthcare solution.

## MAKE HEALTH PART OF POLICY FORMULATION

All policies developed within and outside the healthcare sector affect health through multiple pathways and determinants,[11] and the need for considering the health implications of every policy is our third overarching recommendation. Traditional 'non-health' sectors and settings drive socio-economic, cultural, and environmental conditions which in turn impact health. To illustrate, consider the myriad ways COVID-19 has exploited vulnerabilities in society. In many countries, individuals of low socioeconomic status and blue-collar workers faced the greatest health risks and had fewer opportunities to minimise

their exposure to the virus. As white-collar professionals were shielded from the pandemic with work-from-home arrangements, blue-collar workers continued to return to their workplaces with little to no protective measures in place. This led to large outbreaks in agricultural and processing facilities, and a higher death rate amongst these workers.[12,13] In addition, consider how environmental conditions such as crowded and unhealthy accommodations led to outbreaks in the migrant worker dormitories in Singapore. COVID-19 has demonstrated that policies, or the lack thereof, can exacerbate health inequalities.

Improving health and reducing population health risks require consideration of the wider impact of policies and decisions in all sectors. This concept is embodied in 'health in all policies' (HiAP), an intersectoral approach to public policies that systematically considers the health implications of decisions, seeks synergies, and avoids harmful health impact to improve population health and health equity.[14] HiAP reflects the principles of legitimacy, accountability, transparency and access to information, participation, sustainability and collaboration across sectors and levels of government. HiAP is not a new idea, having been first described in the 19th century and routinely championed by the World Health Organization and other organisations in recent years.

However, a recent global status report by the Global Network for Health in All Policies demonstrated that advances in HiAP have been uneven, with disparities in political support, governance, and resources for HiAP across the globe.[15] Furthermore, using COVID-19 as a litmus test, past failures to adopt a HiAP approach have exposed key vulnerabilities in important policies, and further disregard for the benefits of HiAP will perpetuate past failures.

Leaders in public and private institutions should embrace HiAP and engage medical and public health professionals routinely for major initiatives. Much like the environmental impact assessment done for major infrastructure projects, a simple

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health and public health impact assessment could be implemented, given the lessons learnt from the ongoing pandemic.

In practice, application of HiAP to urban infrastructure and public transport policies is required in the immediate future. In urban spaces, human-to-human connectivity associated with overcrowding of places, rather than population density, is a key factor for COVID-19 infection.[16] Compact city development is key for cities to ensure people can access services, health amenities, and daily necessities within easy walking distance from their residence. Intuitively, reducing urban density seems like the foremost solution to consider. However, moving away from urban density to protecting public health will likely negate the various benefits accrued from the economies of scale brought about by compact living. Instead, a concerted effort to address urban inequalities, and develop healthy and sustainable urban environments is required. In the context of COVID-19, this could mean grassroots services to identify and support vulnerable individuals (e.g., those living in crowded housing or having multiple illnesses) and provide accessible physical distancing and sheltering-in-place facilities, so that exposed or infected individuals can isolate themselves from household members.

New policies for healthy urban environments could require new residential and business developments to incorporate healthy building designs with improved ventilation through higher ceilings, larger windows, and use of antimicrobial technology systems.[17] Airflow studies could be conducted in existing buildings, which could then be retrofitted with engineering control preventive measures to mitigate

COVID-19 spread. In the interest of environmental sustainability, natural ventilation systems such as cross-ventilation or buoyancy-driven ventilation should be considered as alternatives to energy-intensive air-conditioning systems. Healthy building design will not only keep people safe from disease, but also reduce costs and improve worker performance and productivity.[18]

Public transport policies too need to be reviewed. As a result of the pandemic, there has been a reduction in mass transit due to work-from-home arrangements and fears of contracting the virus. As workers return to the office, there might be a rise in the use of personal vehicle transport and private hire vehicles. New public transport policies and infrastructure are therefore required. The bicycle has been recognised in many cases as a competitive alternative to mass transit. However, the uptake of cycling has been mostly limited to recreational activities, and widespread adoption of commuting by cycling has yet to gain traction in Singapore. Developing policies and improving the built environment to allow safe commuting by cycling is prudent from a HiAP perspective. Cycling will improve cardiovascular health, reduce obesity, avert crowding on mass transit, and reduce fossil fuel consumption and emissions.

Urban infrastructure and public transport policies are some of the public policies that need to be revised in a post-COVID world. Taking health into consideration during policy formulation will be beneficial to improving health for the whole population for the future and reducing the risk of future pandemics.
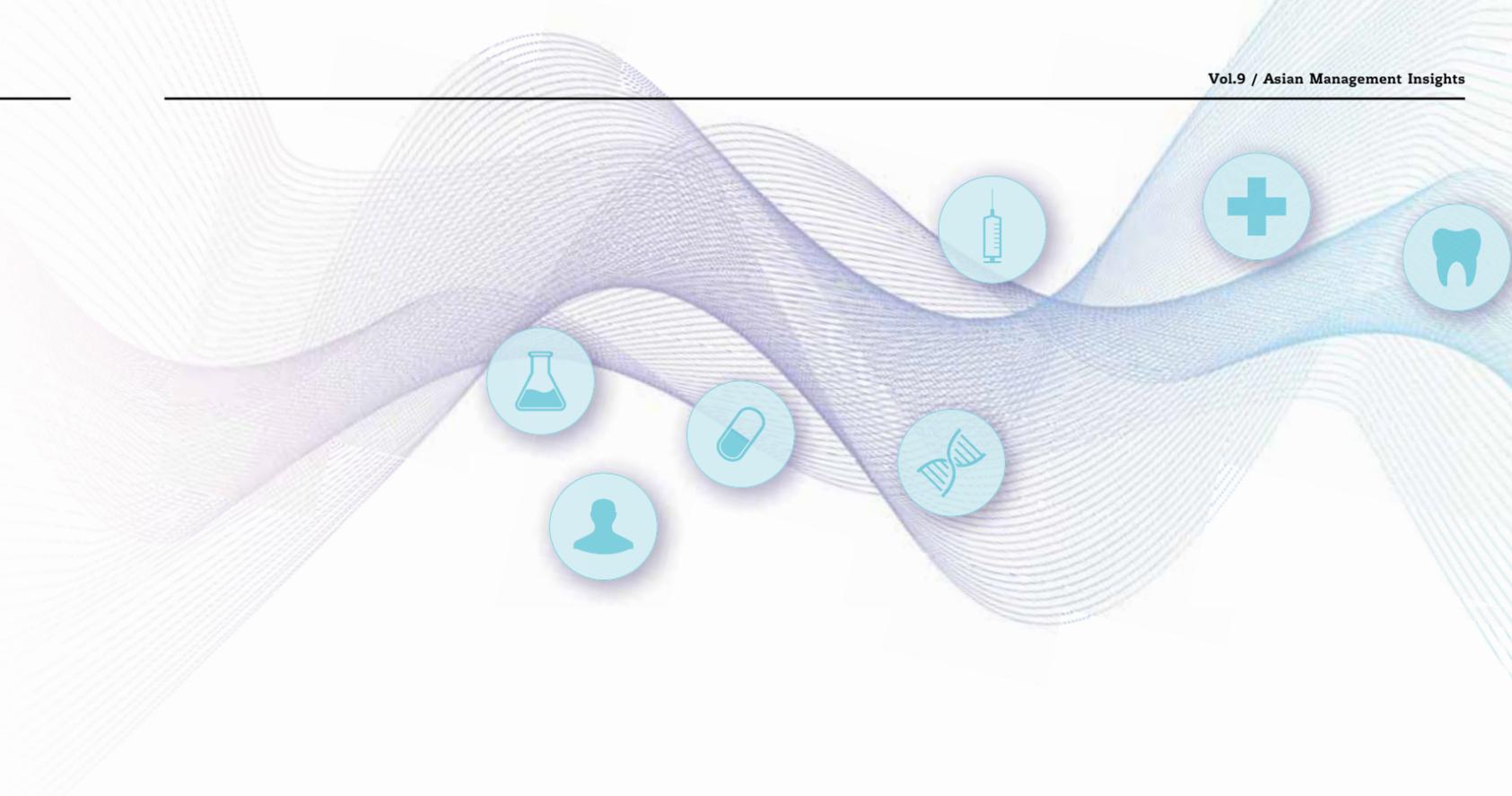
As Winston Churchill famously said, "Never let a good crisis go to waste". We should capitalise on the momentum of change to effect further transformation that will strengthen our healthcare systems.

## CONCLUSION

Implementing the above is no easy feat. It will require fundamental shifts in our mental models, acquiring of new skills by personnel in healthcare and non-healthcare settings, overhauling traditional manpower and space-planning norms, and finding novel ways of regulating and financing health innovations, among other changes.

Will our recommendations cost the world much more and divert resources from other sectors? Yes and no. There is a cost to building up system resilience, but as Indonesian President Joko Widodo noted in calling for a global health agency, "The costs [of doing so] are clearly much smaller than the world's losses due to the fragility of the global health system".[19] Furthermore, the improvements in population health and the leaps in productivity from digitalisation will offset much of these upfront costs in the medium to long term.

As Winston Churchill famously said, "Never let a good crisis go to waste". We should capitalise on the momentum of change to effect further transformation that will strengthen our healthcare systems. If done well, our efforts to future-proof our health systems today will herald a golden era of healthcare in time to come. **AMI**

**Endnotes**

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