Digital Health

How Governments Can Accelerate the Value of Digital Health

WORLD GOVERNMENT SUMMIT 2021

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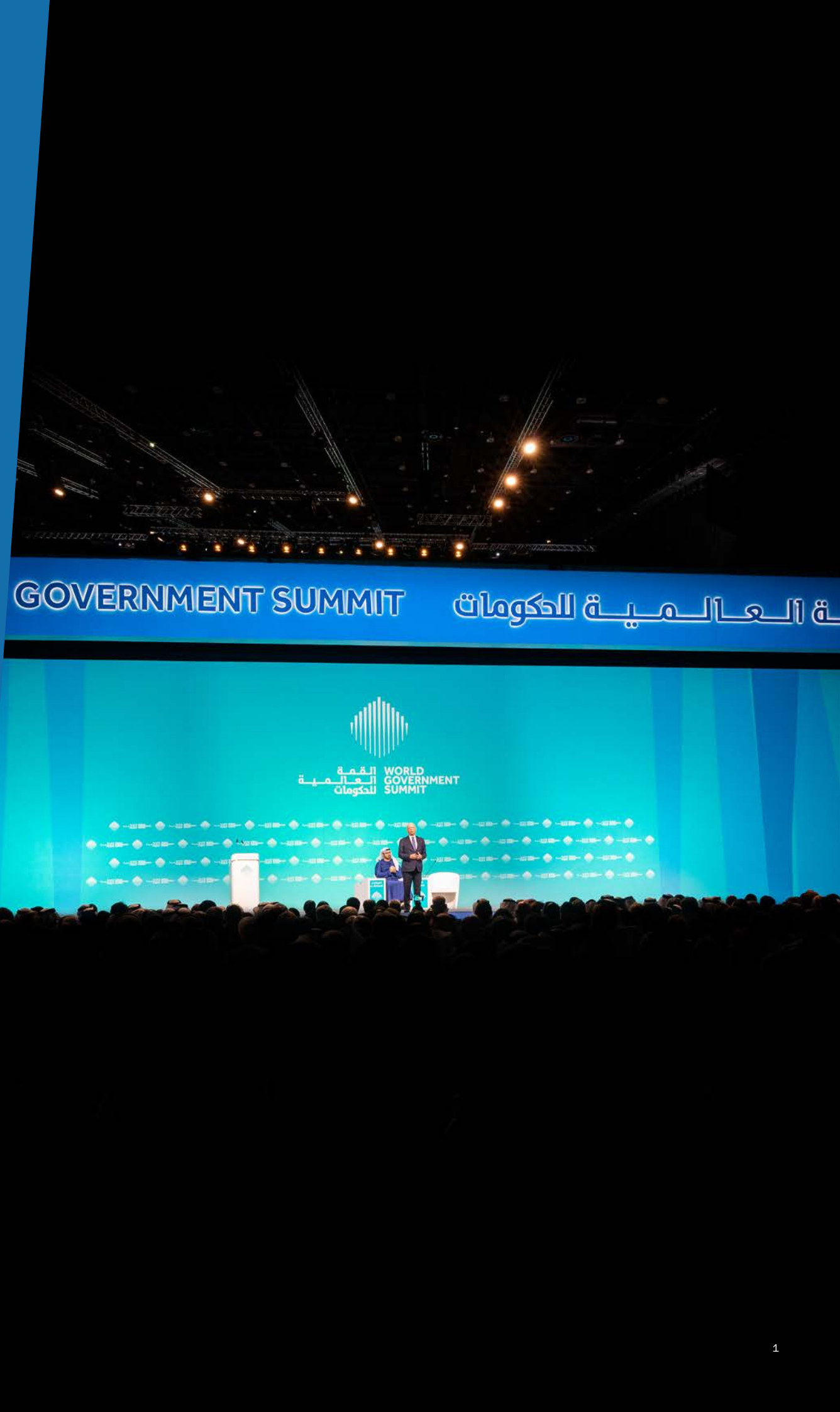
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Topics

Digital health technologies, such as patient telemedicine, online pharmacies, and wearables, increased in importance during the COVID-19 pandemic. That boost has helped digital health become better accepted by consumers, patients, and practitioners.

Introduction

This is of crucial significance given that the healthcare sector has lagged in digital adoption. **A recent McKinsey Global Institute study found that the healthcare industry was in the bottom three of 20 sectors in its digital advancement, in all three dimensions of labor, assets, and transactions.**[1,2] Healthcare was especially weak in its use of digital for patient interactions.

But attitudes to digital health are rapidly changing, unlocking an estimated **$10 billion market across the Middle East over the next five years and $230 billion globally.**[3] Digital health is likely to increase in importance in the coming years. Governments have a role to play in the degree and speed with which digital technologies are adopted and can enable or hinder progress.

We have seen examples of governments accelerating the advance of digital health. For instance, Australia developed a My Health Record for all Australians as part of its National Digital Health Strategy. The United Kingdom has expanded prescription deliveries and telemedicine with bodies such as NHSX and National Health Service (NHS) Digital that have partnered with private sector players like Babylon Health. Other government bodies encouraging digital health include the Massachusetts Innovation Fund in the United States of America and the National Health Innovation Center in Singapore.

However, there are also circumstances that are hindering the progress of digital health initiatives. These include nonexistent digital health laws, ambiguous existing laws, limited reimbursement terms, and a lack of regulations governing what may occur online related to digital health.

This paper considers three key questions: 1) Why the adoption of digital health is attractive for governments; 2) How digital health is likely to evolve; and 3) Innovations that governments can undertake to realize its benefits more quickly.

1 Which Industries Are the Most Digital (and Why)? (2020, September 14). Harvard Business Review.
2 Patients Seek Better Exchange of Health Data Among Their Care Providers. (2020, March 17). The Pew Charitable Trusts.
3 Grand View Research global digital health market sizing report 2020

Section 1:

Why the adoption of digital health is attractive for governments[4]

Digital health solutions can address some of the key challenges in the healthcare sector. First, there are inequities in healthcare access between and within countries. According to the World Bank and the World Health Organization (WHO), half the world's population has no access to essential care services[5]. Telemedicine and remote care solutions offer a means to reach rural communities and underserved populations. Second, healthcare system costs are rising. Government healthcare expenditures increased 4 percent per annum for the last 10 years, part of which was avoidable. For example, 2 percent of health system costs could have been avoided with proper triaging and 5 to 10 percent with good medication adherence[6].

Digital health solutions such as e-triaging, disease management applications, and pill management solutions can help address this. For example, medication adherence solutions have been shown to improve patient adherence by 50 to 60 percent. Disease management solutions such as Livongo even improve control and outcomes of chronic conditions such as diabetes. Third, there is a shortage of healthcare workers globally, and the workforce is not as productive as it could be.[7] Electronic medical record systems and clinical decision systems can enhance workforce productivity by 10 to 40 percent, depending on the professional's role[8].

The adoption of digital health solutions has accelerated during the COVID-19 pandemic, leading to favorable sentiments towards digital health from consumers, providers, and regulators. This interest is expected to persist.

A survey by McKinsey conducted in the Kingdom of Saudi Arabia (KSA) and the United Arab Emirates (UAE) found that 50 percent of consumers had used telemedicine two or three times since the pandemic's onset, and 68 percent had ordered their medications online. Collectively, 96 percent had a good experience with digital health, and 88 percent said that they would be willing to use it in the future.[9]

Our research in the United States found that 57 percent of providers view telehealth more favorably than before COVID-19, and 64 percent are more comfortable using it. Overall, providers reported a 50- to 175-fold increase in telehealth visits compared to pre-pandemic levels.[10]

As for regulators, in the United States, the Center for Medicare and Medicaid Services (CMS) temporarily approved more than 80 new services for virtual care that had been restricted for more than a decade.

Digital health can benefit healthcare access, quality of care, and workforce productivity, with a savings opportunity of 12 percent. According to the McKinsey Global Institute, this would equate to $1.5 trillion to $3 trillion in savings a year by 2030. These savings are derived from enhancements in workforce productivity as a result of automation; higher patient adherence to medications and precision management plans leading to reduced emergency department visits and inpatient stays; early access to care and enhance triaging through telemedicine. These savings range between 10 to 20 percent of total healthcare spend in global systems. The degree of these savings depends on the extent of implementation of digital health interventions and the ability of health systems to translate this into efficiencies (E.g. patient adherence increase, reduction in ER demand).[11]These values, however, do not account for the initial investments and maintenance costs of digital health solutions. They also do not account for investments to enhance digital health literacy in the population, which are key to realizing its full value.

However, with a trillion-dollar value opportunity for governments and the chance to improve health outcomes for citizens, it makes sense for them to help accelerate digital health.

4 See Technical Appendix
5 World Bank & World Health Organization press release in 2020
6 See Technical Appendix for calculation details
7 https://www.who.int/hrh/resources/global_strategy_workforce2030_14_print.pdf
8 McKinsey Global Institue Future of Work in Healthcare XX
9 McKinsey health consumer sentiment survey 2020, United Arab Emirates and Saudi Arabia
10 McKinsey health COVID-19 survey 2020, United States
11 McKinsey Global Institute: How medtech industry can capture value from digital health: https://www.mckinsey.com/industries/pharmaceuticals-and-medical-products/our-insights/how-the-medtech-industry-can-capture-value-from-digital-health

Digital health solutions can address some of the key challenges in the healthcare sector

1. There are inequities in healthcare access between and within countries

50%

Half of the world's population has no access to essential care services

Telemedicine and remote care solutions offer a means to reach rural communities and underserved populations.

2. Healthcare system costs are rising

4%

Government healthcare expenditures increased 4 percent per annum for the last 10 years.

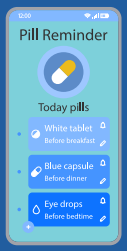
2%

2 percent of health system costs could have been avoided with proper triaging.

5-10%

5 to 10 percent of health system costs could have been avoided with with good medication adherence.

Digital health solutions such as e-triaging, disease management applications, and pill management solutions can help address this.



50-60%

Medication adherence solutions have been shown to improve patient adherence by 50 to 60 percent.

Disease management solutions such as Livongo even improve control and outcomes of chronic conditions such as diabetes.

3. There is a shortage of healthcare workers globally, and the workforce is not as productive as it could be

10-40%

Electronic medical record systems and clinical decision systems can enhance workforce productivity by 10 to 40 percent, depending on the professional's role.


92% 10:26
67 bpm

Section 2:

How digital health is likely to evolve

There are four global digital health shifts that governments could accelerate to realize greater value and better health outcomes sooner.

1) From a curative model of care to a preventative model focused on lifetime health and well-being.

The healthcare sector today tends to focus on disease cure and management rather than prevention. For example, cases of chronic disease conditions such as diabetes and heart disease, both of which have preventable risk factors, continue to rise globally.[12] With the growth in digital health solutions, there is an opportunity to shift the model of care from curative to preventative. Many digital health solutions support the delivery of care, but fewer seek to prevent diseases from occurring.[13]

The shift in focus to prevention will likely lead to a rise in health wearables and biosensors from childhood to adulthood. These solutions put health within an individual's pockets and aid in detecting disease early and achieving healthier lifestyles. The preventative model can also benefit from the deployment of artificial intelligence (AI). AI will triangulate data from wearables and biosensors; patient demographic and social data; and disease data to generate personalized prevention management plans for individuals.

We have already seen some examples of this:

- **The use of wearables to detect disease conditions:** The Apple Heart study conducted with Stanford University monitored the Apple Watches of 400,000 individuals and detected irregular heart rhythms in 0.52 percent. This condition, if undetected, could have led to adverse outcomes.[14]
- **AI deployed to predict people at risk:** In Japan, a machine-learning application identified people at high risk of colorectal cancer. They were prompted to undertake screening, which led to a higher rate of early diagnosis.[15]

Future government investments in this space could focus on prevention rather than cures. This could be done by supporting the large-scale uptake by citizens of new technologies such as wearables and biosensors, and harnessing the value of AI in health risk stratification and prediction.

2) From focused, online-only digital health businesses to larger online and offline ecosystems

Most new businesses in digital health focus on one aspect of the patient care journey and are predominantly online. This is an issue when people need to continue care or even receive care in person. For example, a person who uses a telemedicine application for a dermatology consultation may need medications, which the application cannot provide. Another issue is that if the patient needs to be seen in person, they will usually have to go to a different provider. Online digital health solutions are usually not connected to the offline or in-person worlds.

As digital health businesses continue to evolve, we expect to see a blurring of the boundaries between service segments such as pharmacies and clinics. This will lead to an unprecedented level of partnerships among new and established players; in 2020, more than half of the digital health startup acquisitions were made by other digital health companies.[16] Future systems will serve patient segments more comprehensively than ever before.

We have seen a few examples of this already:

- Healthcare providers are expanding the numbers of patients they can reach and the services they can deliver along the patient journey. For example, Teladoc's acquisition of Livongo Health allows it to grow beyond the primary care and behavioral health segments and provide proprietary devices to chronic disease patient groups.
- Online digital health providers are partnering with offline systems. For example, Babylon Health recently partnered with the UK NHS to build a system that connects the online and offline components of the

12 CDC https://www.cdc.gov/pcd/issues/2019/18_0625.htm#interviewfindings
13 Nature https://www.nature.com/articles/d42473-019-00274-6
14 Health Trends Report, Stanford School of Medicine, 2018
15 Cancer Prevention Using Machine Learning, Nudge Theory and Social Impact Bond. (2020, February 1). PubMed Central (PMC)
16 Q3 2020: A new annual record for digital health (already). (2020b). Rock Health. https://rockhealth.com/reports/q3-2020-digital-health-funding-already-sets-a-new-annual-record/

patient journey, with digital as the gatekeeper. This could improve patient experience, make outcomes more consistent, and reduce avoidable costs.

- Payers are extending into the provision of healthcare services. For example, Bupa Arabia, traditionally a health insurance company, has begun delivering health services through its Tebtom program, which offers telemedicine, prescription delivery, and home biochemistry testing to its members via Bupa's recruited doctors.
- Regulators, providers, and technology companies are forming partnerships. Highmark Health collaborates with Verily Life Sciences and Google Cloud to enhance its patient engagement through personalization. California's government has partnered with the University of California San Diego to roll out a COVID-19 exposure notification system that uses Google and Apple mobile devices

Governments, therefore, could design their digital health solutions with connectivity to the offline world in mind. They could achieve this by partnering with online-only businesses to attain a physical-digital presence.

3) From fragmented to aggregated and democratized patient data

Data in healthcare has long been an industry challenge. The adoption of electronic health records has improved its interoperability and efficiency. However, the rise in digital health solutions is leading to further fragmentation of patient data. A patient may have records in different health systems and digital platforms, none of which speak to one another within a country or across borders.

There is momentum toward digital passports that may empower patients to consent to providers sharing their medical records. We also see cross-border sharing of anonymized aggregate data.

We have seen a few examples of this already:

- New York State has developed a digital vaccine passport in collaboration with IBM, and the World Health Organization is developing standards for a Smart Vaccine Certificate.
- EU nations have shared aggregated disease data during the COVID-19 pandemic, and 24 countries share data for the 1+Million Genomes Initiative, which aims to have at least 1 million sequenced genomes available in the European Union by 2022.

Governments could consider developing national digital health architecture blueprints for businesses and encourage open application programming interfaces (APIs) for sharing medical records with patient consent and authentication. There could also be memorandums of understanding and partnerships between countries for common digital health system architectures.

4) From process efficiency to "digital first" in the science and discovery of medicines

Most digital health solutions today focus on improving the way care is delivered. For example, telemedicine and online pharmacies help in healthcare access, triaging, and convenience. Solutions such as clinical decision systems help process flows and diagnosis within hospitals. But we have yet to see digital health being widely used in the development of medicines. The number of clinical trials conducted in the United States almost doubled over the last five years.[17] But with the COVID-19 pandemic, it became difficult for investigators to continue many randomized clinical trials due to lockdown measures. The key obstacle was access to onsite care and monitoring of participants, which had previously been taken for granted.

In this shift, we anticipate that digital health solutions will be used at scale in drug development. For example, clinical trials can now be decentralized and conducted remotely with direct-to-patient shipments. It could also herald the at-scale use of 3D printing in drug manufacturing and digital solutions for personalized dose determination.

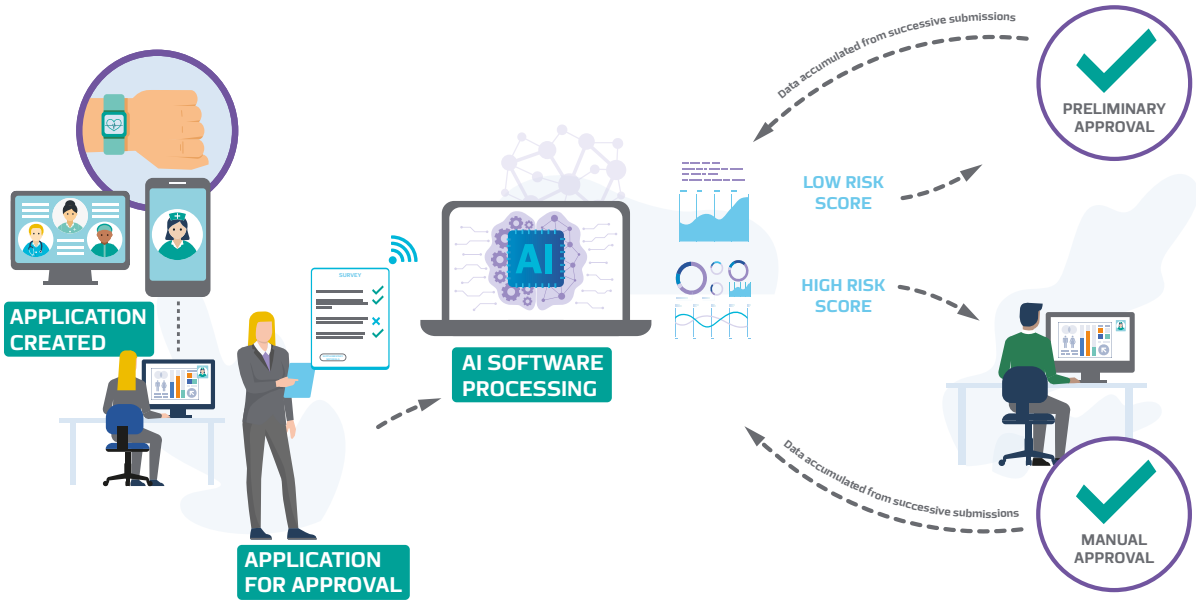
We have seen examples of this already. Pfizer ran the first remote randomized clinical trial in 2011. Patients did not have to visit the care setting to be part of a clinical trial, but rather treatment was remote with direct-to-patient shipments.

Governments could create national platforms to manage remote clinical trials. This could facilitate safe regulation, compliance auditing, standardized progress reporting, and quality assurance.

17 https://clinicaltrials.gov/ct2/resources/trends

Section 3:

Six ways governments can accelerate the value of digital health



1. Regulation of digital health solutions

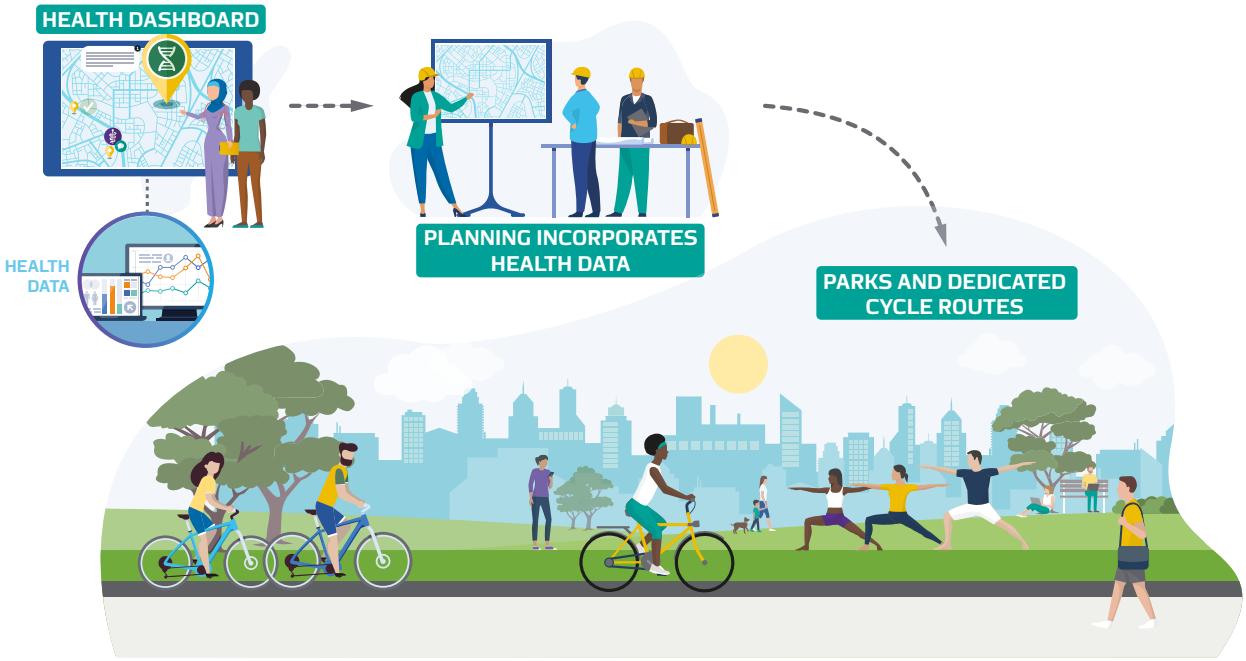
Preapprove digital health solutions algorithmically

The digital health solution space is expanding rapidly. Today there are more than 15,000 mental health digital apps and tools available for download, and each is updated regularly with expanded services. This rapid expansion presents two regulatory and policy challenges: 1) approving new solutions and relicensing updated solutions, and 2) making policy in time to prevent regulatory gaps and loopholes. A further complication is that many governments require approvals from both telecommunications and healthcare regulatory authorities. The approval process can sometimes take a year or more. Additionally, in countries with less-evolved legal systems, digital health policies are often not comprehensive; digital health regulations are adapted from existing healthcare laws, and data privacy laws are often outdated.

Consequently, many regulatory bodies have created hierarchical classifications of solutions that guide which need approval. For example, the US Food and Drug Administration (FDA) has a system that prioritizes the monitoring, vetting, and approval process for the solutions it deems more harmful or risky, thereby reducing the workload. But this can create problems for data privacy; if a mental health or dietary app is low-risk and does not have to go through the process, users may have no statutory protection over how their health-related data is used.

Governments could address the approval process workload by creating national digital health units that would preapprove select solutions algorithmically. A developer would fill a standardized survey about its solution. An automated system would then run an initial scan to determine whether the product requires regulatory approval, thus maintaining continuous compliance. The regulator, in this case, would preset the eligibility and exclusion criteria for preapprovals as part of the algorithm. For example, if a solution has been approved by the FDA, then that may warrant a preapproval.

Another example where this is powerful is in systems that undergo frequent updates. In these contexts, the algorithm can preapprove and keep records of solutions rather than exempt them without some form of vetting process. The process would be confined to one platform and not require additional approvals from other authorities such as telecommunications. As data accumulates from successive submissions, the system would use natural language processing to identify areas submitters could not complete on the standardized survey, enabling the early identification of areas needing updated policies.



Promotion of healthy living, and disease monitoring and prevention

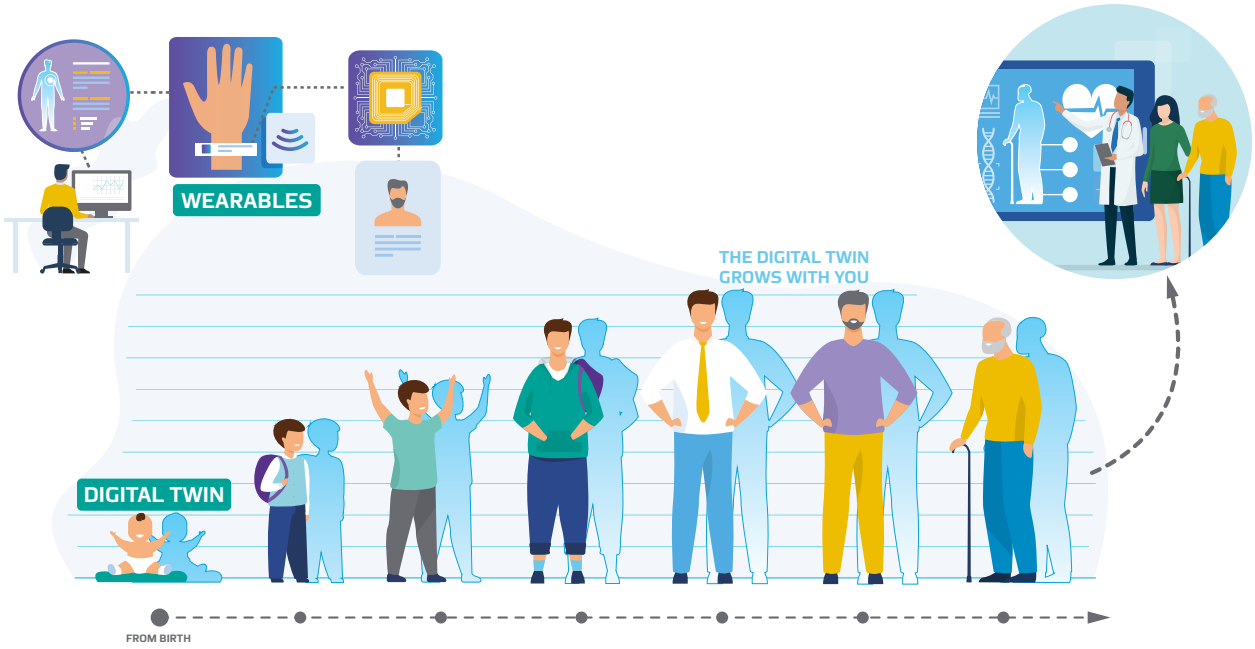
2. Inform the design of concious cities with population health analytics

Urban planning relies on a geographic model representing human behaviors and interactions to inform spatial design at the community and national levels. Public health, on the other hand, is mandated to promote healthy living rather than to design things. Contemporary public health systems do this through scientific research and running community interventions to influence behaviors.

In most countries, urban planning and public health are separate, but there is a huge potential in combining them. They are related by the social determinants of health defined by the WHO: economic stability; education; social and community context of living; neighborhood and physical surrounding environment; and healthcare access and quality.[18] These five determinants reframe health as a byproduct of broader environmental factors. This fuller view can facilitate better-designed cities and communities and interventions that address population subsegment needs.

One way to achieve these benefits is through the development of population health analytics dashboards. These dashboards can inform the planning of more conscious and healthy cities and communities. Publicly available population data, urban planning data, and aggregated healthcare disease and risk-factor data are visualized to identify correlations among them. These associations can be developed for parameters such as communicable disease, noncommunicable disease, area codes, neighborhoods, and types of housing. Then machine learning can develop algorithms to predict the disease risk in different communities and identify its social determinants. Governments can use this information to make evidence-based investment and resource-allocation decisions. For example, if a certain community is identified as being at higher risk of heart disease, and contributing factors include a lack of walkways, parks, or fitness centers and poor housing infrastructure, then investments can be made to address those (Figure 4).

18 World Health Organization report; Closing the gap in a generation: Health equity through action on the social determinants of health



3.

Excellence in interoperability and quality of care

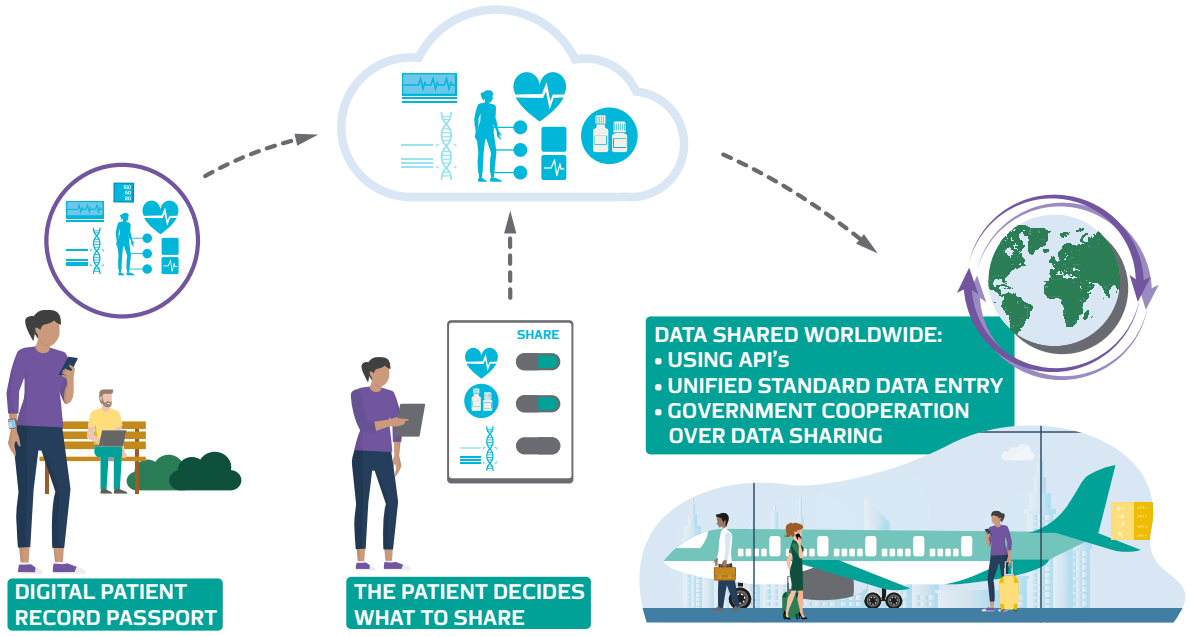
Create a lifetime digital twin for every resident

Discoveries in healthcare and life sciences have advanced how patients are treated and improved overall outcomes. However, the effectiveness of most medicines varies among individuals. For example, enzyme replacement therapies for metabolic conditions can be effective in as few as 20 percent of patients and for controlling heart arrhythmia in only 40 percent. These varying responses highlight the potential value of personalized medicine.

Realizing the value of personalized medicine can be accelerated and scaled using human digital twins. A digital twin is a real-time virtual copy of a physical process or product that enables process and design changes to be simulated to predict their effect. In healthcare, a human digital twin is a virtual version of an individual simulating his or her complex physical and biochemical processes.

The digital twin concept dates back more than 50 years, when NASA created one when the Apollo 13 mission suffered severe damage from an explosion in its oxygen tanks while it was in space. At that time, the twin was a simulation in the form of physical and mathematical models rather than the precise virtual renderings that can be created today. The twin allowed the NASA team to run simulations of Apollo 13's behavior while it was in space before making the correct intervention to save it.

A human digital twin can be used to predict disease risks for an individual and to personalize preventive interventions and treatment plans. It could be updated in real-time with data from wearables. And in its most sophisticated form, a digital twin could be detailed to the level of a specific organ to inform surgical interventions. The application of this digital twin can begin right from birth with the twin growing as the human does.



4.

Protection and standardization of patient data

Sponsor global and intelligent patient passports

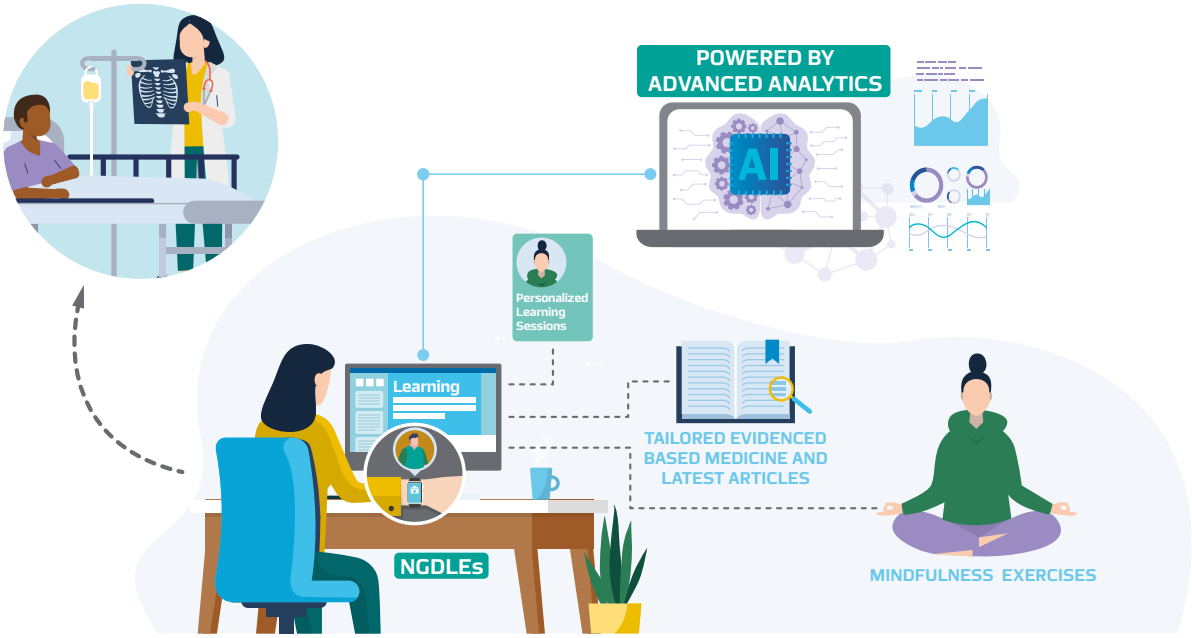
One of the most important healthcare systems issues is data interoperability and liquidity. Most patient data is fragmented and scattered across different healthcare providers, sometimes even among several belonging to the same health system. This occurs because different systems often have limited capability to share data between them (interoperability), and data entered in one system does not populate other relevant systems without additional entry (liquidity). Consequently, it is difficult to assimilate all the data for a single person, particularly if that data resides in multiple geographies.

If all of a person's medical data were gathered under a single portable health passport, it could be used between health systems, including those outside the person's home geography.[19]

Medical records could be transformed from historical data into mobile, intelligent, and personalized treatment plans. The passport could be connected with the person's social determinants of health, allowing doctors to define treatment plans beyond just medications. The record system might leverage advanced analytics to give recommendations to people who have more than one condition.

This would require that every existing service operates with open APIs. It would also demand unified standards for data entry. And third, it would need regional and international government cooperation over data sharing.

19 Patients Seek Better Exchange of Health Data Among Their Care Providers. (2020, March 17). The Pew Charitable Trusts.



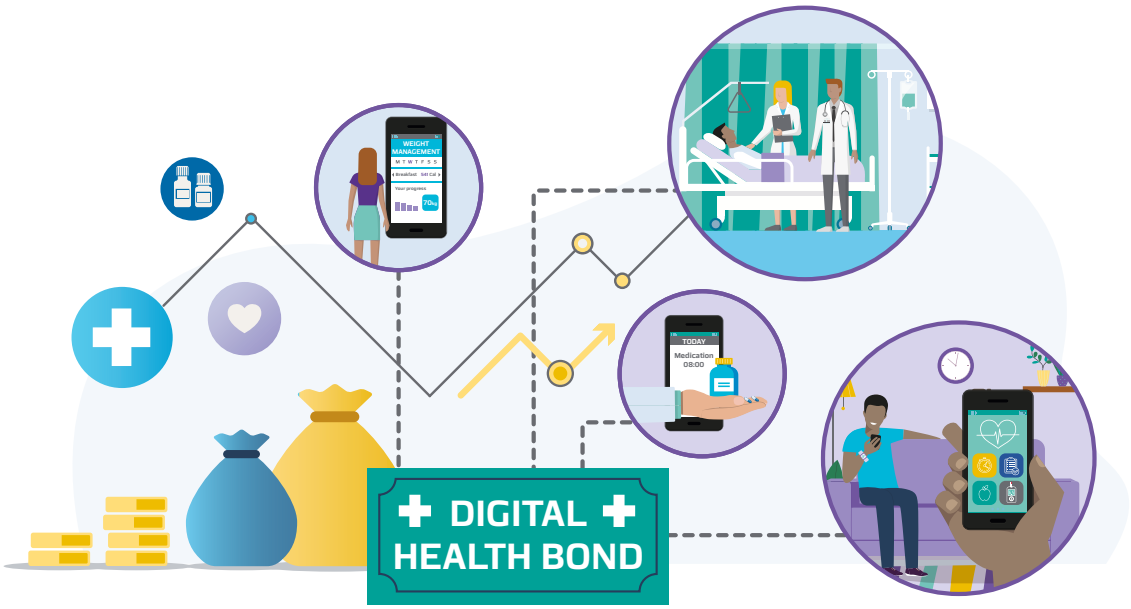
5. Continuous skilling of the workforce

Support next-generation learning powered by analytics

Continuing education plays an important role in keeping medical professionals abreast of the latest advancements in medicine. This is essential to facilitate high-quality outcomes at a time when value-based care is on the rise. Nonetheless, continuing medical education is not as impactful today as it could be. Most studies of continuing medical education worldwide conclude that it is not doing enough to deliver evidence-based teaching for professionals nor using interactive and adaptive methods based on adult learning pedagogy[20]. Next-generation digital learning environments (NGDLEs) offer a potential solution. NGDLEs provide a vision of what current learning management systems (LMSes) could do beyond merely digitizing education interactions.

NGDLEs curate educational content and create personalized reminders. In healthcare, a national learning platform could be created for continuous learning and development. For example, a learner might be an interventional radiologist running procedures and assisting care teams in making diagnoses. If machine-learning algorithms are automating many of the radiologist's tasks, the NGDLE could link to the radiologist's patient list and curate a feed of courses based on the frequency and rarity of cases that the radiologist has seen over the last few weeks. This content could be linked to journals to showcase the latest research and guidelines for managing those conditions. The NGDLE would also be able to understand the learner's burnout level at work and, for instance, suggest exercises in mindfulness. Finally, based on the learner's job, the NGDLE could suggest specific digital skills education, such as the basics of machine learning in radiology and how to use it. From a systems perspective, the behavioral analytics of learners could aid in the tailoring and design of courses. It could also serve as a platform for workforce data sharing and interaction

20 https://policymed.typepad.com/files/globaleducationgroup cme crossroads 2010.pdf



6.

Promotion of investments through partnerships and innovation funds

Create digital health bonds

In its global digital health strategy, the WHO highlighted the importance of digital solutions to its sustainable and millennium development goals of health and well-being.[21] Digital solutions are especially urgent given that almost half of the world's people lack access to essential health services because they live in remote or underdeveloped locations.[22] The WHO action plan prioritizes the acceleration of digital health investments in health-system infrastructures to improve access and quality of care. This will require significant investments.

Green bonds were created in 2007 as a funding instrument for climate- and environment-conscious projects. They have raised over $500 billion since and contributed to achieving environmental, social, and governance (ESG) targets. This led to the acceleration of emissions-reducing projects and investments in clean energy. For example, in the United States, total energy-related carbon dioxide emissions declined 12 percent over the last 10 years.[23]

Healthcare could benefit from issuing analogous digital health bonds. Government healthcare authorities could issue bonds for building digital health infrastructures. The bonds could be linked to specific patient outcome targets, such as the digitization of medical records and patient management in a healthcare system, or a reduction in prescription errors and patient adverse events. Reimbursement could depend on how quickly results are attained.

A target-linked bonds system that requires transparent outcomes reporting, for instance, can help ensure that the promised patient outcomes of a digital health solution are fully realized.

21 World Bank and WHO: Half the world lacks access to essential health services, 100 million still pushed into extreme poverty because of health expenses. (2017, December 13). World Health Organization.
22 World Bank and WHO: Half the world lacks access to essential health services, 100 million still pushed into extreme poverty because of health expenses. (2017, December 13). World Health Organization.
23 https://www.epa.gov/newsreleases/latest-inventory-us-greenhouse-gas-emissions-and-sinks-shows-long-term-reductions-0

Bringing it all together

Digital health can unlock tremendous value for governments in enhancing health systems' operational efficiency, patient experience, and patient outcomes. However, to unlock this value sooner, there are several accelerator actions that governments may consider implementing. These can help governments start scaling their digital health services to nudge the full system towards adoption.

The six innovations that governments may consider adopting are:

- In regulation and policymaking, governments can consider alogorithm-based approvals and screening for digital health solutions. This can help ensure that the pace of solution innovation is matched by regulatory standards, particularly for patient safety.
- In promoting healthy living and public health, governments may begin to leverage population and health analytics dashboards to inform urban planning activities.
- Lifetime digital twins can be created to help streamline excellence in care delivery.
- Intelligent global patient passports can be developed through open API access mandates and intergovernment data corridors.
- Next-generation learning systems can be deployed to maintain continuous upskilling of the health workforce.
- Public systems can launch digital health bonds to attract larger amounts of investment in a digital health infrastructure and to ensure accountability for the benefits of such solutions.

Technical appendix

Measuring the adoption rates of digital health for select countries around the world

We used a high-level approach to estimate the digital health adoption rates in China, the United States, the United Kingdom, India, and the Middle East. We mapped out the largest telemedicine companies in each of the geographies. Then we used company reports, financial statements, investor reports, and media searches to find the total number of teleconsultations delivered on those platforms in 2019 and 2020. We took the total number of outpatient consultations within each country from government data. Then we divided the number of teleconsultations in each country by the number of outpatient consultations in the same year.

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