Roche

Dia:gram

Designing a
New Era of
Digital Health

Forging a
Digital Culture
in Indonesia

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Lean Thinking
for Improved
Diagnosis

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Regulators
and Innovators:
a Delicate Balance

**"Regulators can enhance, not inhibit,
digital health adoption" — HARJIT GILL**

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Note from the Editor-in-Chief

When Tim Berners-Lee invented the World Wide Web (WWW) in 1989, it was to meet the demand for automated information-sharing between scientists in universities and institutes around the world.

The internet already existed but up until that point, no one had thought of a way to link one page with another, and harness the full potential of the internet.

In many ways, we are at a similar juncture in healthcare history.

Digital tools have been in existence for years but it wasn't until the reverberations of COVID-19 jolted countries into action, that redesigning the ecosystem to be truly integrated and fit for purpose became this mission-critical.

The time to transform healthcare is upon us.

Digital health policies hold the power to unleash a revolution that can usher in a new era of personalised healthcare with more informed health decisions and improved patient outcomes, at its core. Exploring the role of regulations and the state of *Digital Health Policy Readiness* in Asia Pacific thus became a relevant theme.

Many healthcare leaders are working to make this a reality. You will find some of these inspiring stories in this edition.

Michelle Medeiros
Editor-in-Chief
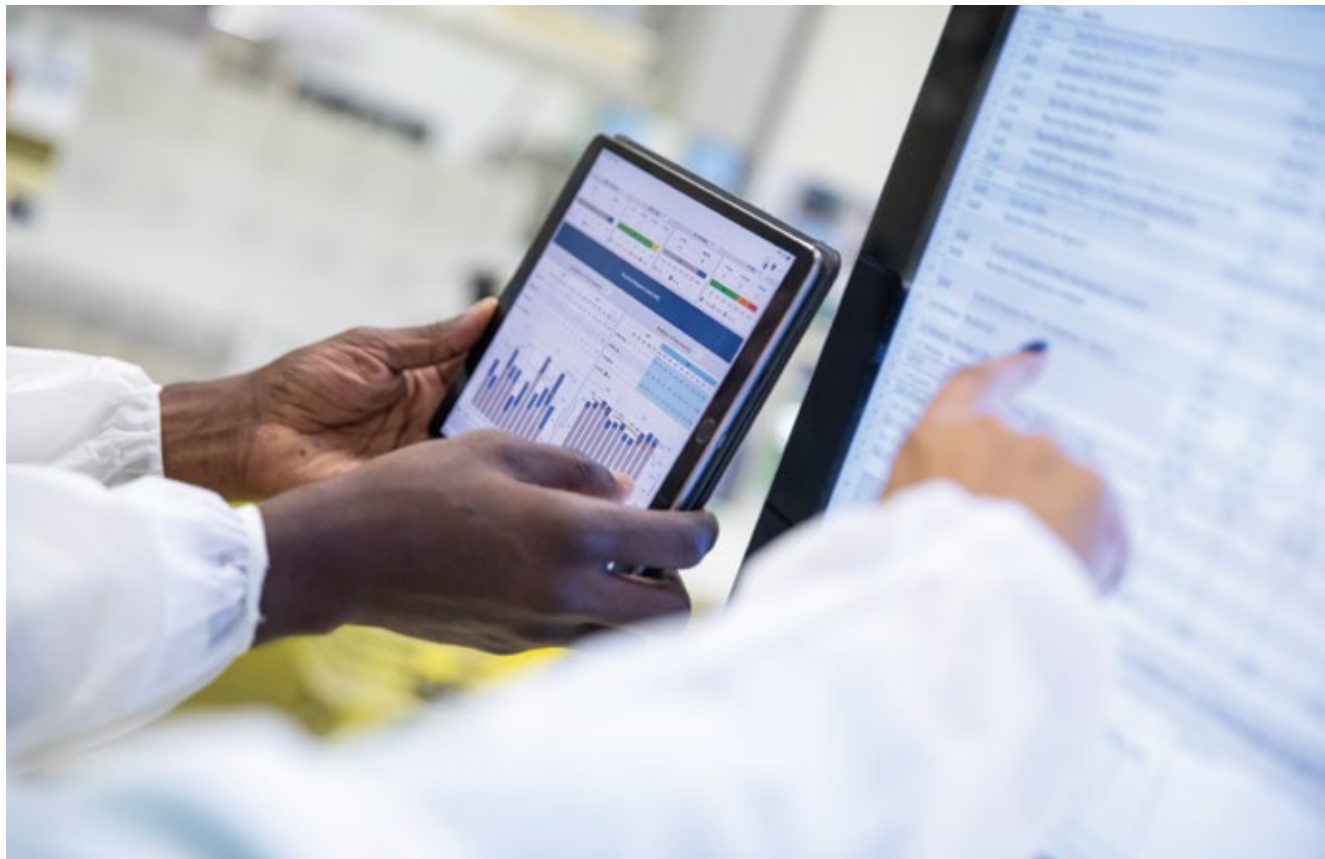
The Making of a Fit-for-purpose
Digital Health Ecosystem

The pandemic-induced "pressure test" has proven that the benefits of digital health tools far outweigh the uncertainty and scepticism surrounding their adoption. The challenge now for policymakers is designing a future-ready healthcare ecosystem that can overcome existing infrastructure and access challenges while supporting policy areas such as fit-for-purpose regulatory frameworks, interoperability, data privacy, cybersecurity and cross-border data flow.

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"Global interconnectedness has great potential to accelerate human progress, to bridge the digital divide and to develop knowledge societies," said the United Nations General Assembly in its discussion on the 2030 Agenda for Sustainable Development.[1]

Long viewed as a panacea for healthcare systems worldwide, there is growing recognition that the strategic use of digital and cutting-edge information and communications technologies will be critical. These tools act as enablers to ensuring equitable healthcare access, greater protection during public health emergencies and significant progress towards societal health and well-being.

This also rings true for Asia Pacific, where digital health has the potential to address key regional hurdles: the unprecedented spike of healthcare costs, shortages of healthcare workers, ageing populations and the growing prevalence of chronic diseases.[2]

Digital health technology stakeholders and regulators have recognised that the current model for healthcare is not sustainable, and are increasingly leveraging digital tools to deliver better care. But what does it take to build a future-ready digital health ecosystem?

Healthcare of the future demands disruptive innovations and advanced technologies that expand beyond the "walls" of care.

An example is the move towards "digital health passports" — blockchain-powered digital wallets that not only store personal medical data like polymerase chain reaction (PCR) test results from labs securely, but also allow healthcare organisations to share and verify tamper-proof patient data. One such case is the Travel Pass mobile app developed by the International Air Transport Association, which will soon be trialled by national carriers such as Air New Zealand, Malaysia Airlines and Singapore Airlines.[6]

Finally, the culmination of a data-driven ecosystem rests on its desire to be forward-looking but equally determined to act today. Lessons from the pandemic have clearly shown that digital technology can strengthen surveillance efforts. Its use provides early disease outbreak signs, supports the continuity of care for chronic patients and meets the fast-evolving needs of society.

Diagnostic Data: the Core of Healthcare Decisions
Digital efforts that provide incremental gains, rather than sweeping changes, are just as important. In the case of labs, the growing digital push offers an opportunity to provide value in healthcare beyond the diagnostic sample result.

Today, many digital diagnostic solutions can support better integration, analytics and workflows in the lab. In turn, this empowers healthcare providers to reduce

complexity and leverage data in more powerful ways. Incentivising the adoption of such approaches, with a shift to value-based healthcare for instance, opens up possibilities that can drive tangible benefits and improve patient outcomes.

Many tools already offer opportunities to link clinicians with laboratory experts as part of multidisciplinary team collaboration. By aggregating all relevant patient data from multiple sources into one dashboard, and helping to standardise clinical workflow, labs can revolutionise how previously siloed teams collaborate.

From Traditional to Tele-monitoring
Yet, most regulations still focus on traditional medical and diagnostic technologies.

As the Digital Health Regulations white paper by the Asia Pacific Medical Technology Association (APACMed) notes, "to bring safe and effective digital technologies into healthcare at a pace that matches the speed of what's possible — and that patients deserve — we must redesign our regulatory approach to accommodate the shorter timelines and iterative nature of software development."[7]

Healthcare of the future demands disruptive innovations and advanced technologies that expand beyond the "walls" of care.[8] For clinicians, this means actionable insights that can drive

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Supported by Digital Technology, the World Health Organization's
Triple Billion Targets are for

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1 billion more people to benefit from universal health coverage,

1 billion more people better to be protected from health emergencies, and

1 billion more people to enjoy better health and well-being

....

included in the WHO's Thirteenth General Programme of Work, 2019–2023

Unlocking the Potential of Data in Asia Pacific
While health data is generated in some form or another in every country across Asia Pacific, the major differences lie in the quality of this data and the ease of access.

For emerging countries where healthcare providers still largely rely on traditional paper-based processes and outdated IT systems, data — the key ingredient that can unearth ways to design better care — often exists in silos, and is not easily accessible.[3]

Yet this very problem offers developing systems the opportunity to "leapfrog". Instead of replicating an advanced country model which could be riddled with inherent weaknesses, policymakers in developing countries can sidestep legacy issues and accelerate the development of a sustainable healthcare model that works for them.

Charting the Path to a Digitally Enabled Ecosystem
The first step to building a digital health ecosystem is the creation of a policy framework to ensure that such data lives in an integrated, interoperable environment. This is what India hopes to achieve with its ambitious National Digital Health Mission which aims to provide the necessary support for the integration of digital health infrastructure in the country.[4]

However, in this regard, developed nations have the advantage of a well-established health system and a national strategy that supports the adoption of digital technologies more widely, without limiting its use to a few sectors. Singapore, as part of its Smart Nation initiative, says this goal is "underpinned by efforts to ensure that all segments of society are able to harness digital technologies and benefit from them".[5]

But the real potential of a digital health ecosystem can only be fully unlocked when there is data at scale and more stakeholders are involved. Many healthcare players are piloting blockchain technology, popularly associated with digital currency, to connect users on separate networks and enable the secure sharing of data.

Measuring Progress towards Digital Health

Health systems need to accelerate and strengthen their capacity and resilience to stay prepared for the next pandemic. HIMSS introduced the Digital Health Indicator (DHI) to assess the strengths and key assets of digital health, demonstrated by health systems, and identify areas less well developed that could be strengthened to advance digital health.

DHI measures the four dimensions of digital health:

Governance & Workforce
Stewardship to inform policy making; transparency to create clear indicators of quality, safety and outcomes; policy and decision-making to align process and strategy; and workforce capacity and competency to advance digital health system capability.

Predictive Analytics
Personalised analytics to support person-enabled models of care, prescriptive and predictive analytics to support population health and wellness, and operational analytics to optimise health system performance, including quality, safety and cost.

DIGITAL HEALTH INDICATOR

HIMSS SOLUTION

Governance & Workforce

Predictive Analytics

Person-Enabled Health

Interoperability

Person-Enabled Health
Personalised care delivery, proactive risk management and predictive approach to supporting and sustaining health and wellness.

Interoperability
Foundational, structural, semantic, and organisation features of the health system's digital infrastructure that create a truly seamless and automated user experience.

To deliver digitally-enabled care, health systems must foster an environment that integrates predictive analytics into care delivery by transforming data into knowledge and sharing insights to inform policy decisions and support patient treatment. This will give patients more control over their health and often set personal health and wellness goals in a meaningful way.

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meaningful outcomes, and for patients it is about becoming an active and more informed voice in their own healthcare decisions.

With tele-monitoring, embedded sensors and digital diagnostics creating a wealth of information, data privacy and ownership are additional areas that governments across the region have to consider. This is where policy decisions to develop a data protection framework that balances regulation and innovation becomes a tipping point.

To keep up with the changing landscape, South Korea has been actively adapting its

regulations relating to healthcare and technology. It has created new guidelines specific to digital health, touching on topics such as artificial intelligence (AI) and big data-applied medical devices.[9] In turn, these helped guide the development of new healthcare solutions, including "Dr Answer",[10] an AI-powered precision medicine platform that consolidates various types of medical data.

South Korea, once known as having the strictest data privacy laws",[11] is also accelerating deregulation to spur innovation.[12] The country's recent

amendments to data privacy laws have improved access to data, powering the private sector to retrieve pseudonymised medical data[13] — crucial in the development of patient-centric medical equipment, technologies and medicines.
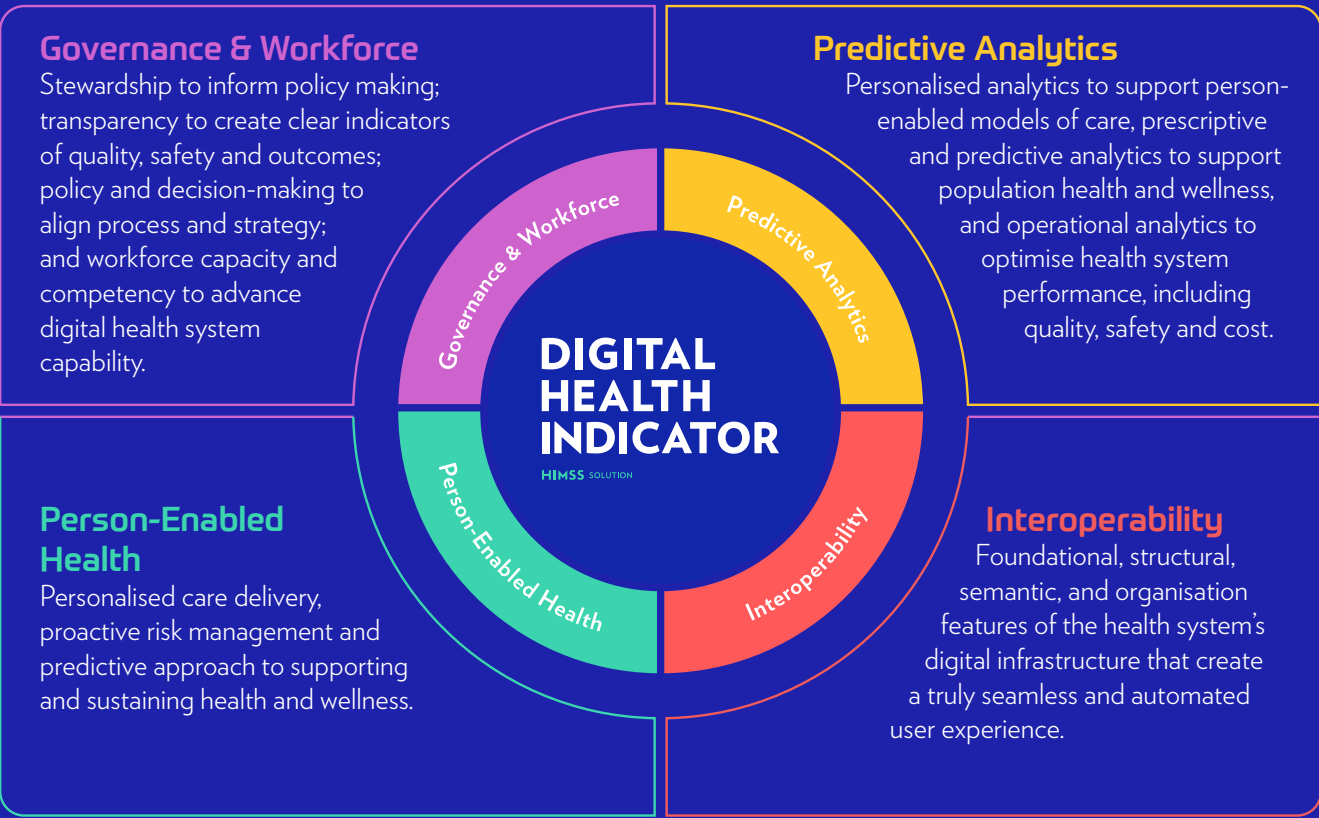
Ultimately, the transformation within healthcare cannot be solely driven by digital solutions. Stakeholders will have to work together and design a technology-driven or digitally-enabled ecosystem that is worthy of a new era in healthcare — one that has diagnostics at its centre.

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Safety Versus Speed:
Balancing Digital Health Innovation and Regulations

It's never been more crucial for health regulators and digital innovators to collaborate. Dia:gram explores the way forward.

"Necessity is the mother of all invention", as the famed proverb goes, and it is a sentiment that couldn't have been more apt in the face of a global public health emergency. The world was forced to develop and deploy healthcare innovations faster than ever.[1] And in many cases, that is exactly what happened — the first testing solution for the novel coronavirus was released in a matter of weeks,[2] not years, and multiple vaccines were developed and have since been used for mass inoculations in many countries.[3]

A report by McKinsey published at the height of the pandemic unsurprisingly found responses to COVID-19 have speeded up the adoption of digital technologies by several years,[4] and that many of these changes could be here to stay. Yet, when it concerns human health — where any decision can be a matter of life or death, the medical world tends to be cautious about "light-speed" solutions.[5]

This dichotomy is especially heightened in the context of digital health. By its very nature, technology is powered by an iterative, test-and-learn style: release a product in an imperfect "beta" form, then iron out the bugs as users explore the product. That approach might work for innocuous needs, but not when it comes to health.

A part of the inherent challenge in healthcare is the meeting of two incredibly different mindsets: the health policy

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"Regulators can enhance, not inhibit, digital health adoption."

— Harjit Gill, CEO of Asia Pacific Medical Technology Association

regulator and the medical product innovator. How can these two approaches work together to find equilibrium between governance and innovation?

It is this question that the Asia Pacific Medical Technology Association (APACMed), a regional trade body aiming to improve patient care by uniting medical technology stakeholders, has tackled in their recent white paper.[6] Their findings suggest that better aligning expectations between manufacturers and regulators can be an important first step. By communicating more clearly, manufacturers enable regulators to understand not just how a digital solution can be used, but more critically — how it was developed. And for regulators, harmonising frameworks and recognising similar requirements for

regulatory submission dossiers can help smooth the path for the timely introduction of innovative technologies.

Harjit Gill, APACMed's CEO, notes how important it is to clear stumbling blocks in this area. "We all know that Asia Pacific, with its tremendous population size and economic productivity, lags behind in key healthcare indicators." Digital health, she notes, seeks to overcome social and geographic barriers that hinder access to healthcare. "Organisations are increasingly calling for greater attention to this unmet need as they form new partnerships along the value chain."

The absence of a single, unifying regulatory authority, however, means this is easier said than done. In a region where different

regulatory bodies can often have their own local processes and jargon, some may point to the vast differences that exist in how countries define an "algorithm" or "software".

Regulating a Continent
Asia's diversity and booming populations are part of what make it an economic powerhouse.[7] But this breadth can also create problems for a stable, holistic framework for health regulation.[8] Digital health technology is a particularly thorny area, Gill notes, because of the plethora of agencies involved.

Apart from governing bodies, other stakeholders include tech firms, diagnostics and medtech companies, start-ups, investors, payers, and medical associations, to name just a few.

"Fortunately, there is great impetus behind digital health given its potential to transform healthcare in a way that overcomes major barriers like geographic disparity, information asymmetry, and manpower shortages," says Gill. So how can those barriers be overcome? "The trick is to start simple," Gill says, and involves "aligning innovation with overall health system ambition, and achieving small wins to build trust across the entire ecosystem."

When so many stakeholders have strong opinions, neutral parties can also be vital mediators. Gill sees APACMed's role as bringing a wide diaspora of people to the table and moving the discussion forward. Such an open forum can be invaluable, considering that in a 2020 survey of global medtech company leaders, policy and regulatory issues were the second most pressing challenge for companies, after developments in technology.[9] Yet, as the report authors noted, regulations need not necessarily cause problems for companies, but can open doors to opportunity by providing clarity and levelling the field for all players.

To that end, Gill says, the near-term goal for regulators needs to be creating the pathways to allow digital health innovation to flourish. She cites Germany as a role model, where "digital health is approved (and reimbursed) for up to one year in order to gather enough evidence about the impact to make a final decision about wider adoption."

Policy support helps everyone, because as Gill explains, medtech companies in Asia Pacific typically reinvest seven percent of revenue back into research and

"Imagine this:

A drone goes directly to a patient's home and picks up biospecimens for delivery to a lab. Is that drone a medical device? What about the software that enables it?" *
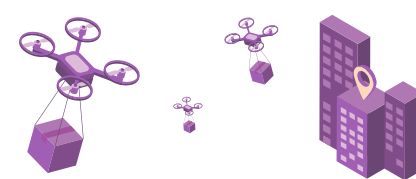
* Deloitte (2019). Winning in the Future of Medtech. Retrieved from https://www2.deloitte.com/content/dam/Deloitte/pl/Documents/Reports/pl_deloitte_medtech_of_tomorrow_report.pdf

development. By buttressing innovation, regulators can then create a virtuous cycle where companies can plough current successful product profits into birthing new, even better digital health solutions.

"Regulators can enhance, not inhibit, digital health adoption," as Gill enthusiastically puts it.

"In fact, we've seen that when new regulatory requirements are instituted, there is a 20 percent surge in medtech

filings. There are now an estimated 15,000 filings in Asia Pacific each year."

More to Be Done for the Future of Healthcare
So what other improvements are needed to shape the future of healthcare?

On a macro level, the frameworks around digital health are still not quite ideal for an industry undergoing such dynamic change. As Gill explains, they are either too loose, treating digital health like an unregulated business-to-consumer platform, or too severe, expecting traditional medical device protocols. And the lines will only get blurrier, as multiple industries evolve — and interact.

Software and data will continue to be critical drivers, but regulatory agencies must be ready to react quickly to novel tools and the flood of information that will come with their use.

Another challenge is that the "intended use" and "actual use" of medical tools (including software) may vary considerably. This calls for regulators to do some crystal ball-gazing and try to foresee what the actual uses may be — something that might delay the process of approval.

Making progress against such fundamental yet monumental challenges may seem daunting. Maintaining prudence is the key, says Gill. "Innovators must remain patient, especially those who may be new to healthcare and need to appreciate the legacy behind the highly regulated environment. In the end, we are speaking about patients' lives, so there is virtue in proper diligence."

India's Turn to Shine in
Digital Healthcare

The "first-mover" advantage is often hailed as a success mantra — capitalising on the gains of being the earliest party to shift into a new venture or technological development.

But in the healthcare world, "next-mover advantage" may be just as appropriate.

The long-held path to health system development for emerging economies was seen as simply following in the footsteps of developed nations. In recent years, however, the concept of "leapfrogging" has been growing in popularity.

For countries with limited resources and capabilities, leapfrogging allows them to pick proven strategies that work and avoid the pitfalls of unsuccessful ones.

Arun Goyal, Director – Projects with IQVIA, India says, "Designing innovation policies that help developing countries to meet local health needs and promote sustainable development, is a must."

In the case of healthcare, he notes, in recent years there has been a noticeable effort in India to facilitate the deployment of digital technologies to benefit patients.

By creating a health sharing infrastructure from the ground up and involving more stakeholders in

a collaborative manner, Goyal says, "You can leverage on the strengths and expertise from the public and private sector, across the board."

"India has taken the right approach in building a framework that suits the environment. The role of the government is in legislating and developing the right policies, but the hospital networks and laboratories will manage the anonymised data and share it within a secure national data network. Having data at scale can inform national health policies on disease burdens, treatments and diagnostic interventions."

He highlights that while India studied the advanced health frameworks of the United Kingdom, Canada and South Korea, it was able to cherry-pick learnings that worked for them, without replicating solutions wholesale. While residents in the UK and Canada give consent for their data to be used by default, "In India, the focus is on empowering citizens to make an informed decision."

This is a welcome move in a country where millions are still illiterate. Conscious of this pressing issue, government authorities are working to ensure that healthcare digitisation reaches India's remotest areas, incorporating offline connectivity mechanisms where relevant.

Says Goyal, "Having a capacity building plan is another critical

aspect because it also helps clinicians who aren't digitally confident. You can't take care of those in need if you don't also support the caretakers into 21st-century digital health."

"You can't take care of those in need if you don't also support the caretakers into 21st-century digital health."

— Arun Goyal, Director – Projects with IQVIA, India

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Two Countries, One Goal:
Digital Health Readiness

Two forward thinkers in different countries share their views on healthcare's imminent evolution.

— Dewi Muliaty,
President Director of PT
Prodia Widyahusada TBK

— Dr John Thornback,
Vice President and Chief
Operating Officer of DxD Hub

The Building Blocks of a Digital Health Ecosystem

Dr John Thornback is Vice President and Chief Operating Officer of the Diagnostics Development (DxD) Hub in Singapore, a national platform hosted by the Agency for Science, Technology and Research (A*STAR) which aims to accelerate the transformation of IPs into clinically validated diagnostic devices that are ready for market adoption. He shares observations of a country that is well ahead of the health tech curve, and is now venturing into new territory — digital health governance.

Countries are still in the early days of regulating the world of digital health. The classic example is a smart watch. It is not a medical device, but there are apps within it which do have medical device uses. What part of the watch or software does the regulatory body have governance over?

Dr Thornback explains that identifying the parameters for regulatory guidance could help governments iron out the difficulties in how to classify, regulate and harness health technologies as they become more powerful and mobile.

Nurture Diagnostics by Supporting the Change-makers

Even before the pandemic, digital health was seeing an upward swing in Singapore. By some accounts, the ease of access to various resources across different stages — from funding and multidisciplinary talent,

to research and development (R&D) — gives the city-state a clear edge.

But as with any new industry, as the frenzy of development kicks off, a centralised space where ideas can be tempered into reality can make considerable difference. For Singapore, that place is DxD Hub. Its ambitious goal: to bring together various players in the diagnostics and digital health space, whether clinicians, researchers, public and private enterprise, local or overseas companies,[1] to fast track the development of clinically validated, market-ready diagnostic tools and solutions.

"What we do quite simply, is work with ideas from which we can work together with the inventors to develop products that can impact the health of Singaporeans and beyond. These could be from small companies or academic groups. We work hand in glove with them to help convert an idea to a product, and submit it to the regulatory agencies in Singapore, the US and Europe," he shares.

"That also means our focus is on aspects that are relevant to the future of healthcare, and diagnostics such as Software as a Medical Device (SaMD). DxD Hub is a unique organisation which bridges the gap between the developers and regulators, set up to help developers to quickly get their products out while meeting stringent regulatory requirements."

Tackle the Thorny Issue of Where a "Medical Device" Starts and Ends

Digital health comes to life in the objects that we now handle every day, and this is where things can get complicated. As highlighted by the Asia Pacific Medical Technology Association in its recent digital health survey, a common regulatory framework across the region would help to address issues of interoperability between systems, cybersecurity and safety of the medical devices.[2]

"A vital issue is how regulators are going to classify software that has a medical function, but is housed within a digital device that does not have a medical device function. This is where the often-cited example of the smartwatch or even smartphone comes in," states Dr Thornback.

"What the recent APACMED report proposed was that only the portion that has a medical device function needs regulatory oversight. That is an exciting concept within medical device regulation akin to that the FDA has proposed. I suspect that is perhaps what is going to happen in most cases of SaMD in other countries."

"Examples of such digital health software are those that rely on sensors included in many smartwatches that are intended for the diagnosis of conditions like heart irregularities and sleep apnoea," he adds.

Grow the Talent Base

Talent development and knowledge transfer are critical, and DxD Hub is working with ecosystem partners to cross-pollinate medical and product development skills.

"By exposing people to what it means to work in a highly regulated environment, and what it takes to develop a SaMD product or in-vitro diagnostic, we can encourage a shift towards an agile mindset, and spur innovative thinking outside of traditional sectors."

He adds, "We have been working on an initiative sponsored by a council of ministers of ASEAN countries along similar lines. We are looking to help develop their diagnostics industries, and upskill their workforce on how you develop products. We see a lot of very smart engineers and scientists here: what we do is give them skills to become product developers, quality assurance people — all the tasks necessary to strengthen the future generations of talent for the medical diagnostic and digital health ecosystem."

Keeping Up with the Digital Health Revolution

Unlike Singapore, Indonesia does not yet have a thriving digital health ecosystem.

But it has tremendous opportunities that can benefit over 270 million inhabitants,[3]

KEY TRENDS
THAT MAY AFFECT DIGITAL HEALTH ADOPTION AND ACCESS

Technological innovation does not exist in a vacuum, and digital health is no different. What are the broader social, cultural and economic developments that could help — or hinder — progress in this field?
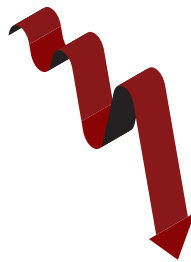
FOR REGULATORS:
A Pressing Need to Future-proof Policy

Continuously learning machine intelligence will provide unpredictable results over time as it adapts to new contexts. As artificial intelligence (AI) tools evolve in rapid and increasingly autonomous ways, regulation must change quickly to keep up.[i]

FOR MEDICAL STAFF:
Front-liners on the Back Foot

29% of healthcare organisations say their front-line medical staff lack analytical skills to unpack digital data.[ii]

FOR WORKFORCES:
Lack of Specialised Manpower

A minimum of **4.45** skilled medical personnel per 1,000 people is recommended for an effective health system.[iii] Yet much of ASEAN is still not meeting this level.[iv]

FOR MEDICAL EXPERTS:
Growing Trust in Machine Learning

In a 2019 global survey, **58%** of physicians said AI tools could increase diagnostic efficiency.[v]

FOR INVESTORS AND USERS:
More Opportunities

In ASEAN's six largest countries, healthcare expenditure is set to increase almost twofold between **2017 and 2025**, in part due to a rise in ageing and unhealthy populations. This spending will strongly bolster digital health technology[vi] innovation.

FOR INDUSTRY:
Modernisation Means Financial Efficiency

Digital technology is reported to cut healthcare expenses by up to **11%.**[vii]

according to Dewi Muliaty, President Director of PT Prodia Widyahusada TBK, a clinical laboratory network in Indonesia, provided the country tackles systemic issues.

While internet penetration is skyrocketing, (the number of internet users increased by 25 million between 2019 and 2020)[4], patchy health and technology infrastructure, low levels of connectivity and the lack of investment in electronic medical records suggest that the makings of a basic digital health system are far from ready.

How can the archipelago of more than 17,000 islands prepare itself for this future world?[5] Dewi Muliaty shares her thoughts.

A Booming Industry Needs Basic Infrastructure
Digital health is growing quickly in Indonesia. According to one estimate, digital health revenues are expected to grow strongly, reaching USD726 million in 2022.[6]

As digital health access grows, so will the demands on health systems. This means we must evolve on all fronts to build a strong base — as one area of digital health evolves, the others must keep up, otherwise the house of cards can fall. To enjoy the benefits that healthcare of the future can offer citizens, we have to take stock of how we contend with data security, ownership and privacy. We need strong personal data protection.

Regulation that Levels the Playing Field
Legacy healthcare institutions such as labs are easy to regulate because the role of each person is clearly defined. Every doctor that practices in our clinics must be licensed. But in digital health platforms, this isn't as black and white.

Machine learning and artificial intelligence can replace the need for expertise. But as a result, the digital world is less tightly regulated, even though it functions in the health delivery space. So that's a challenge for brick-and-mortar health providers like us. It has upended competition, bringing in non-traditional and fast-growing digital companies into the mix.

The value we can bring is the breadth of experience — in the use of innovative technologies and the deep healthcare expertise that can guide clinical decisions. By closing existing gaps and supporting a more informed patient journey, labs can strengthen the connection between diagnostics and treatment for a more personalised approach to healthcare.

Don't Just Teach Tech Skills; Build a Tech Culture
The government must work with stakeholders to ensure digital inclusion, to ensure that all citizens have the skills to upgrade to or enjoy the services of digital health. There is a real shortage of local tech talent. In fact, by 2030 the World Bank predicts Indonesia will face a lack of nine million skilled or semi-skilled information and communications technology workers.[7]

We need to increase our capabilities and the speed of embracing fast-changing technologies. If you're building a digital culture, digital skills must be embedded early, just like reading and writing, right in primary school — and onwards. Training should continue not just in university courses, but in the corporate world.

Empower, Encourage, and Involve — On All Sides
I want to see the entire diagnostics industry being consulted and empowered. The more voices we hear from, the greater chance we have of creating the next great solution, of ensuring better digital education, or more inclusive services for users.

That last stakeholder is key: whether that is the customer, in the traditional sense, or the consumer or user. If the end users feel overwhelmed or excluded from digital evolution, they are less likely to use such products. With the shift we're now seeing towards near-patient testing and self-monitoring, the goal is to maintain the quality of diagnostic results — timely, accurate and actionable.

Lean Thinking
for Improved Diagnostics and Patient Care

The face of healthcare is changing, spurred by ageing populations and logistical challenges. One doctor is leaning into this shift in healthcare delivery — with a little help from the car-manufacturing industry.

Traditional care models can hamstring the efforts of healthcare organisations in resolving challenges centred around access, quality and efficiency.[1] To improve the patient and clinician experience, the focus of care model innovation and digital health is now shifting towards patients' well-being and the ubiquitous adoption of virtual services. In Asia, ageing populations and widespread chronic diseases will also necessitate a fundamental change in care models.[2] A silver tsunami is already changing the make-up of the region, with people aged 65 and older expected to reach almost half a billion in Asia Pacific by 2025.

Reducing Healthcare Waste
Siriraj Hospital, the largest tertiary and quaternary care hospital in Thailand, is one player leading this transition in healthcare delivery. Faced with over 3.8 million outpatient and 80,000 inpatient visits a year, the state hospital used to have to deal with the traditional headaches experienced

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by healthcare institutions: long patient waiting times, overcrowding and complex care pathways.[3] An evolution in thinking was desperately needed.

In response, Siriraj adopted the Lean management philosophy to rebuild its healthcare system. Combining this novel approach with innovative solutions, Siriraj not only revolutionised digital health for its visitors, but streamlined and enhanced the patient journey in the process. But how did a manufacturing framework originally developed by car-makers like Ford (and then perfected by Toyota nearly a century ago) help reshape healthcare scenarios?[4]

Lean, at its core, is based on the idea of transforming waste into value from the customer's perspective.[5] In the context of healthcare, waste relates to factors such as unnecessary waiting time for patients and clinicians, under-usage of core staff competencies and poor infrastructure design. At Siriraj, nurses, for example, used to spend only 30 to 40 percent of their time with patients. The rest was partially devoted to hunting down information at the request of patients or family members. Venti, a user-patient tracking software developed by the hospital, empowers patients to locate this information on a handheld device, such as whether they should consult a doctor or wait for lab results. Consequently, this enables nurses to dedicate more of their time and attention to patient care.

A Lean Management Framework for Healthcare Efficiency

"To improve hospital efficiency, we need the right management framework. One is to have a design thinking process to truly understand patient needs and pain so that we can identify waste and value in the system from a customer perspective," says Associate Professor Dr Cherdchai Nopmaneejumruslers, Vice Director of Siriraj Hospital. "We then implement Lean principles to eliminate waste and provide more value to patients. With a

value driven mindset, disruptive innovation technologies such as 5G, Internet of Things, cloud, AI and mobile technology can redesign the way we deliver care to the patients with more efficiency."

Among these innovations is Siriraj Connect — a mobile app which enables patients to get the most out of Siriraj's services while reducing wait time within the hospital. First introduced in 2019, the app provides visitors with personalised features. Patients can use it to schedule, track, register and confirm their medical appointments.

They can also monitor their blood collection and drug gathering queues, as well as utilise telemedicine and make online payments through mobile applications.

Continuous flow,[6] according to Dr Nopmaneejumruslers, is another tenet of the Lean principle. "It means we have to ensure value flows towards the patient without interruption. According to the key features of the mobile application, it helps control the number of patients visiting the hospital, balancing the amount of patient visits to the hospital and the number of

"We have to ensure value flows towards the patient without interruption."

— Associate Professor Dr Cherdchai Nopmaneejumruslers, Vice Director of Siriraj Hospital

clinicians availabilities. Therefore, it helps cut bottlenecks and waiting times for patients, to improve continuous flow," he adds.

As the COVID-19 pandemic wears on, this app allows patients, especially the elderly, to cut the number of visits to Siriraj and the amount of time they stay at the hospital for medical appointments. Using the app's remote monitoring system, doctors are also able to observe the patient's health condition or call them via a video chat to answer medication questions following discharge from hospital.

Running an Efficient Diagnostic and Pathology Lab

Prior to Siriraj's digital transformation, dispatching blood samples to the lab was a laborious process and prone to human error. Today, it is largely automated. Patient information on the Siriraj Connect app is fed to the hospital's information system, which programmes the auto labeller. The labels are then pasted on the test tubes and sent via a conveyor belt to the pathology laboratory.

Lab technicians place the test tubes in a pre-analytic instrument and the sample tubes move seamlessly from here to the analysers, finally completing the journey in a post-analytic instrument. The revamped laboratory automation system now enables Siriraj to efficiently process up to 5,000 sample tubes each day.[7] "With this, we achieved a turnaround time of 75 minutes when it used to take more than

two hours. Productivity increased by 18 percent as well," Dr Nopmaneejumruslers explains, proudly.[8]

Effective automation has allowed Siriraj to deliver accurate results to clinicians in a far more efficient manner. This allows lab technicians and clinicians to collectively improve patient care and provide timelier diagnostics and treatment accordingly.

Paving the Way to a 5G Future

As technology evolves, so must healthcare services to ensure better patient outcomes. Leveraging AI and 5G's high bandwidth and low latency capabilities, Siriraj has plans to collate pre-hospital data from diabetes and high-blood pressure patients on their physical activity, sleeping patterns and the types of food they consume. "We can then upload this data to the cloud. By applying AI algorithms, we will be able to predict and recommend the appropriate solutions through AI chat bot thereafter. These innovations and technologies must work together to provide value to the patient, while decreasing the number of visits to the hospital," he emphasises.[10]
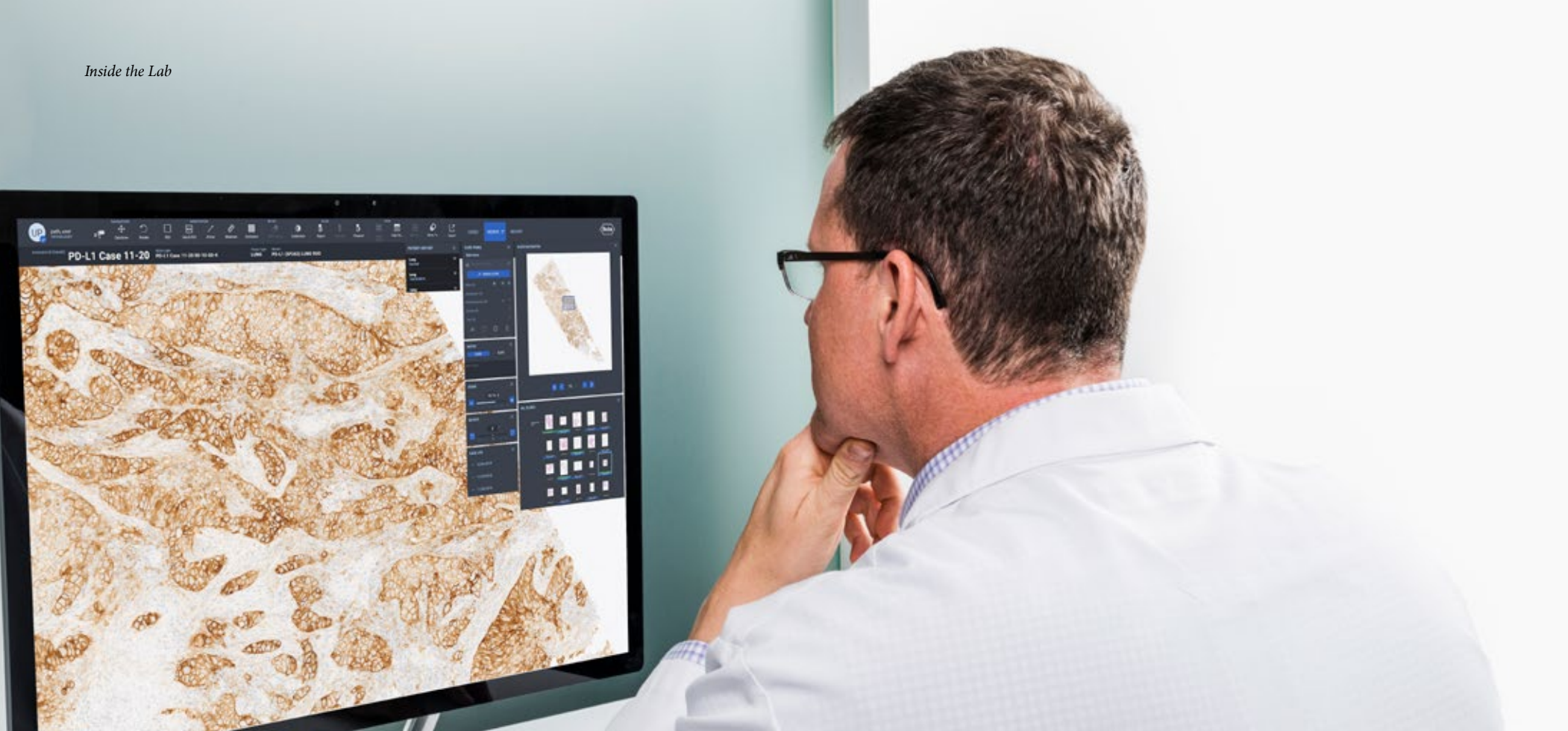
Driven by an ageing demographic and rising healthcare costs, the value of the medtech industry in Asia Pacific is expected to reach USD 157 billion by 2022.[11] "Over the next 10 years, healthcare costs in countries like Thailand will increase due to the ageing population. More than ever, the goal of healthcare in the future is to provide value through data — based on prediction, prevention and personalisation," concludes Dr Nopmaneejumruslers.[12]

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occurrence[7]), we can move away from this vicious cycle of "disaster-respond-rebuild-repeat"[8] by adopting digital processes in anticipation of disruption.

Dr Robert Yoshiyuki Osamura, MD/PhD, Chief of the Diagnostic Pathology Department at Nippon Koukan Hospital in Japan and President of the International Academy of Pathology (IAP), believes there is good reason to consider a digital approach for laboratories. For example, in comparison to traditional microscopes, digital measures make highlighting issues easier.

"On the screen, we can see the entire image in a single glance, no matter

make it easier for professionals to get used to the hands-free approach.

Pairing Digital with Jugaad
Jugaad — a Hindi word that refers to an innovative, often improvised, solution using few resources[9] — can help resource-starved hospitals and laboratories fight back against large-scale emergencies. Remote care is a prime example of jugaad thinking at work.

In July 2020, the P.D. Hinduja Hospital and Medical Research Centre in India introduced COVIDCARE@Home. This home isolation tele-consultation service is fully supported by a team of nurses, doctors and administrative staff to help

Navigating Disruption with the Help of
Digital Diagnostics

With lab tests influencing more than 70 percent of medical decisions,[1] it is no exaggeration to say that laboratories are the backbone of our healthcare systems. Dia:gram provides an inside look at how clinical laboratories can continue to operate even in the face of unprecedented, large-scale disruption.

"A good number of pathologists are staying at home and using digital pathology to make diagnoses remotely."

— Dr Robert Yoshiyuki Osamura, MD/PhD, Chief of the Diagnostic Pathology Department at Nippon Koukan Hospital and President of the International Academy of Pathology

Laboratories are currently operating in one of the most challenging environments to date. Infectious outbreaks and natural disasters (which are increasingly severe[2] and prevalent[3]) have made it clear that disruption is the new normal. All this attests to the fact that the medical diagnostics industry is currently facing pressure to do more with less — from resources and budget, to staffing and time. Here are some of the solutions to ensure that

healthcare systems keep functioning in an increasingly unpredictable world.

Less Physical, More Digital
One solution is to rethink our reliance on physical infrastructure. Going at least partially digital will make laboratories more agile and resilient when responding to emergencies.

Take natural disasters for example. Laboratories, crucial to testing and often carrying priceless samples, run

the risk of being damaged or destroyed in earthquakes, hurricanes or other natural disasters — not only setting research back but also taking a huge psychological and emotional toll on the medical and research professionals involved.[4] Natural disasters can also cause disease outbreaks in their aftermath,[5] adding strain to an already burdened healthcare infrastructure.[6]

Instead of reactively picking up the pieces post-disaster (a common

how the pieces are scattered around on the slide," he says. "We can go up to high magnification without any blurring and come back to a particular fragment any time we want."

As a start, Dr Osamura has implemented digital pathology at Nippon Koukan Hospital, but only for certain types of specimens, such as small biopsies. This is a good way for laboratories to evaluate digital technology without having to make a large commitment and it can

people who are asymptomatic, or only mildly symptomatic, but have tested positive for COVID-19.

"When in the whole of Mumbai there was a shortage of hospital beds, we augmented the total number of beds outside the hospital," explains Joy Chakraborty, Chief Operating Officer at P.D. Hinduja Hospital and Medical Research Centre. "It was our way of creating additional infrastructure and avoiding stress from hospital admissions."

"Every patient who gets admitted gets a tele-consult from a psychiatrist to deal with mental health issues that may arise from the situation," he adds. "Think from their perspective: they are away from their families, surrounded by doctors and nurses in full Personal Protective Equipment (PPE), and cannot see a human face. It understandably causes a lot of fear and anxiety." Chakraborty believes that tele-consultations give patients the strength to fight back against the virus.

India is not the only country to practice remote care in light of COVID-19.

"In Japan," says Dr Osamura, "I heard of a good number of pathologists staying at home and using digital pathology to make diagnoses remotely." While Dr Osamura's lab was not subject to a lockdown, those of his colleagues in the US and other countries

were. In such cases, the value of being able to make a diagnosis without being physically present in the lab became clear.

A Digital Future

As we have seen, more can be done to accelerate the adoption of digital technology to constructively help and support healthcare professionals in the diagnostics community.

Going digital in the labs has allowed them to remain nimble by reducing reliance on physical infrastructure and improving response time to emergencies. Meanwhile, easy-to-use dashboards and data-driven reports on laboratories or hospital operations can help to improve operational effectiveness while managing diverse challenges. The end result: increasingly individualised medical treatment, from prevention to follow-up.[10]

"Every patient who gets admitted gets a tele-consult from a psychiatrist to deal with mental health issues that may arise from the situation."

— Joy Chakraborty, Chief Operating Officer at P.D. Hinduja Hospital and Medical Research Centre

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Partnering
in the digital era

Partnerships around data,
analytics, and apps are
a critical component to
improving patient care.

Roche