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Dia:gram

Dr Suvanich Triamchanchoochai At the heart of patient care

Diagnostics in the Next Decade



DR MYAT KYAW THU Increasing access to healthcare PROFESSOR HE LIXIAN The advent of new microbiology diagnostic solutions

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Editor-in-Chief: Michelle Medeiros

Executive Editor: Shruti Bose

Assistant Editor: Patricia Anne Carthigasu

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Note from the Editor-in-Chief

What a year this has been, and we are still only halfway in.

No one could have predicted at the beginning of the year that we would find ourselves in the midst of a global pandemic, with our lives and work environments completely altered.

We began the year, like every other, planning the next issue of **Dia:gram**. This year marked the beginning of the next decade and felt like an appropriate milestone to take a closer look at the progress that has been made to rightfully place diagnostics at the foundation of sustainable healthcare, and examine how it would shape the healthcare landscape in the coming decade.

We settled on 'Diagnostics in the Next Decade' as the theme.

For the issue, we interviewed Khosrow Shotorbani on the revolution within laboratory medicine, spoke to Professor He Lixian of Shanghai's Zhongshan Hospital, a leading voice in clinical microbiology, and discussed the future of a data-powered healthcare ecosystem with Dr Franz Pfister, among others.



Nevertheless, as we have all seen, even the best-laid plans have found themselves discarded in the wake of COVID-19.

While our mission at **Dia:gram** has always been to bring the power of storytelling to the world of diagnostics and capture the tireless work of laboratory and other healthcare professionals, the launch of this issue is different.

We are all constantly surrounded, if not consumed, by COVID-19 related news and information. Every event and conference has moved to the virtual world, which is why there is no better time than now, for us to bring to you the next digital version of Dia:gram.

In times of despair, we all seek stories that uplift us, show us the heart-warming determination of countless healthcare professionals but most of all, leave us with a sense of optimism.

I hope you find that in our stories.

Michelle Medeiros

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A Look at the Past, Present and Future of Healthcare as we usher in The Decade of **Diagnostics**

Diagnosing the current state of healthcare in Asia

At the turn of the new millennium, healthcare systems around the world were reaping the benefits of strong economic growth by increasing investments in healthcare. But as healthcare costs have continued to rise over the last decade, and as the recent pandemic has shown us, governments are racing to plug gaps in access and quality. After all, low-quality healthcare not only threatens the general well-being of individuals but can also affect society as a whole.

In 2012, when Singapore's Ministry of Health launched the Healthcare 2020 Masterplan, Health Minister Gan Kim Yong said the plan would provide citizens access to affordable and quality healthcare. "This," he said, "is integral to an inclusive society."¹

While many countries in Asia are known for their exceptionally strong and well-funded healthcare systems, several are taking steps to strengthen national healthcare delivery, including the roll-out of ambitious universal healthcare programs.

Indonesia, which successfully launched the national health insurance scheme Jaminan Kesehatan Nasional, ran into implementation difficulties when its universal healthcare funding created a national budget deficit.² In response, the government announced premium hikes last year.³ While there have been mixed reactions to this, the hike could prove to be beneficial for Indonesia's healthcare system, allowing the government to possibly increase state funding towards diagnostics and other medical services in the country.

India, as another example, is still rolling out Ayushman Bharat, a universal health coverage scheme. Officially launched in 2018, it aims to provide quality care to millions without prior health coverage. While its ambitious plans will certainly improve healthcare for the masses, with millions more expected to sign on, India's lack of doctors and allied healthcare workers could become an even larger problem.

Such challenges aren't unique to developing countries, as many advanced nations struggle to improve healthcare delivery for the entire population. A key goal of South Korea's National Health Plan 2020 was to increase the healthy lifespan of its citizens to 75 by 2020.⁵ As the number of elderly and those with chronic diseases continues to rise, policy makers in South Korea may be looking at ways to improve care across the cross-section of society. New-generation diagnostic tools that can detect life-threatening diseases accurately and quickly could help to close this gap.

Even as countries edge towards this shared vision, they may create more problems. It is much easier, after all, to increase life

expectancy than it is to increase healthy life expectancy. As the elderly population grows, nations could grapple with the demographic problems they already have, but on a broader scale.

Laboratories in demand

Increasing pressure on laboratories to deliver larger volumes of patient samples, quickly and at much lower costs is therefore, inevitable.

The challenge of swathes of the population living less healthily won't go away, and neither will the proportional rise in the incidence of Non-Communicable Diseases (NCDs) that have now reached epidemic proportions. NCDs kill 41 million people each year, accounting for 71% of all deaths globally.6 "Detection, screening, and treatment of NCDs as well as palliative care, are key components of the response to NCDs," says the World Health Organization.⁶

Chronic and infectious disease outbreaks will stretch clinical laboratories, particularly as more Asian countries broaden healthcare access and more people require urgent care.7

Revolutionary change is around the corner

Moves to boost efficiency will help healthcare systems in Asia to meet demand within their limited budgets and enable laboratories to manage an increasingly high number of patient samples while delivering quick and accurate results, thus improving health outcomes.

In part, this is happening through integrated and fully automated solutions. Roche is already pioneering the approach to connectivity, integration, and automation

Diagnostics: Past, Present and Future

PAST

DISCOVERY OF BLOOD GROUPS

The development of chemical analyses of body fluids in the

created demand for laboratory tests.

THE RISE OF **MECHANISED** DIAGNOSTICS **950s** saw a move from diagnostic

tests carried out by hand to mechanical devices that could conduct one blood test per minute and give results as digital printouts.2

MEDICAL INNOVATION OF THE 20TH CENTURY

Discovered in

polymerase chain reaction (PCR) technology revolutionised molecular diagnostics and a decade later was awarded the Nobel Prize in Chemistry.³

DECISION SUPPORT The volume of

CLINICAL

Ξ

Q health data and the speed at which it is being generated have led to the development of digital tools that can convert big data into

actionable insights.



POPULARISATION OF COMPANION DIAGNOSTICS

PRESENT

THE CORE

LABORATORY

The FDA approved the first companion diagnostic (HER2 assay for trastuzumab) in 1998,⁴ paving the way for more diagnostic-partnered drugs.







DIAGNOSTICS IN THE NEXT DECADE

VALUE-BASED HEALTHCARE BECOMES MAINSTREAM

Value-based care will continue to grow and become more widely adopted, giving rise to a



preventive and predictive

healthcare delivery model that harnesses the power of diagnostics

Non-communicable diseases (NCDs) WILL REMAIN THE **BIGGEST KILLERS**

Deaths from NCDs are projected to rise to

52 million

in 2030.5 making early interventions and screenings necessary to achieve the United Nations Sustainable Development Goals.6

^{1.} Burke, M. D. (2000). Laboratory Medicine in the 21st Century. American Journal of Clinical Pathology, 114: 841-846. 2. Rosenfeld, L. (2018). Four Centuries of Clinical Chemistry.

Roche. (2020). History of PCR. Retrieved from https://dianostics.roche.com/fi/en/article-listing/history-of-pcr.html
Scheerens, H. et al. (2017). Current Status of Companion and Complementary Diagnostics: Strategic Considerations Development and Launch. Clinical and Translational Science, 10(2):84-92.

World Health Organization. (2010). Global Status Report on Noncommunicable Diseases 2010.
World Health Organization. (2015). NCD and the Sustainable Development Goals. Retrieved from https://www.who.int/

global-coordination-mechanism/ncd-themes/sustainable-development-goals/en/.

The radical shift in personalisation, brought about by big data and advanced analytics, will be key in generating value- and outcome-based healthcare, ending "one-size-fits-all" solutions forever.

through its vision for an Integrated Core Laboratory where every component is designed to work together as one, expanding the efficiency, scope, and quality of diagnostic capabilities. This gives laboratory professionals more time for value-added tasks that can directly influence patient outcomes.

Personalised healthcare powered by diagnostics

Overall, the entire routine of providing symptomatic care in a bricks-and-mortar building is about to be upended, as healthcare diagnostics continue to become far less passive and more personalised, preventive - and ever-present.

With the growing uptake of home-monitoring, embedded sensors and self-sampling techniques, the sign that change is coming is now obvious.

Today, innovative technologies are enabling the democratisation of health data, giving end-users more control of their health and data. With many non-traditional players and startup companies now entering the space, this is likely to become more mainstream

in the coming decade — as seen in the sheer number of cross-industry collaborations.

The flip side, however, is the huge amount of data generated. It is estimated that 80% of medical data is unstructured and difficult to parse for useful insights.8 Often, such information is siloed and archived, and therefore rarely gets used to inform future care.

Digital diagnostics and the smart use of analytics can turn this data into actionable results that can guide clinical decision-making. What regulations are needed to govern digital health is something many nations are trying to ascertain. Countries such as Singapore,9 China,10 and Australia¹¹ have already developed digital health guidelines, with many others following suit.

The next decade

The radical shift in personalisation, brought about by big data and advanced analytics, will be key in generating value- and outcomebased healthcare, ending "one-size-fits-all" solutions forever.

Policymakers, recognising the importance of value-based healthcare, are exploring avenues that move away from traditional "pay-per-use" reimbursement models.

Furthermore, new technologies and approaches are already challenging the current care environment, forcing it to evolve through more novel, efficient applications in the quest for better outcomes and more affordable care.

The next decade will see the convergence of several forces within healthcare that

2. Deloitte Indonesia Perspectives. (2019). Ensuring the Sustainability of JKN-KIS for the Indonesian People, 9.

inilah-tarif-baru-iuran-bpjs-kesehatan/0/berita.

4. United Nations News Centre. (2017). WHO: Early cancer diagnosis, better trained medics can save lives, money.

5. Ko, S. (2014). The Korea Institute for Health and Social Affairs (South Korea). Healthy Life Expectancy in Korea by using the Disability Weights of Diseases, 1.

8. Kong, H. J. (2019). Managing Unstructured Big Data in Healthcare System. Healthcare Informatics Research, 25(1): 1-2.

sandbox

11. The Australian Digital Health Agency. Australia's National Digital Health Strategy.

Roche Diagnostics is also exploring new approaches with such players. Together with health innovation platform Plug and Play, Roche is part of Startup Creasphere, a program that aims to connect forward-thinking corporations with disruptive startups to pilot solutions and services, drive investments and more.

will place diagnostics at the core of a new health ecosystem. One where the use of analytics on large-scale population data will bring about a shift from volume-based, episodic healthcare to personalised care that incentivises players for improved patient outcomes. And ultimately, one that breaks down silos and creates more opportunities for public and private stakeholders to collaborate even more so as to prevent future disease outbreaks from becoming full-blown pandemics.

The next decade will see the convergence of several forces within healthcare that will place diagnostics at the core of a new health ecosystem.

1. Ministry of Health Singapore. (2020). Better Health, Better Future For All. Retrieved from http://www. nationalplanningcycles.org/sites/default/files/planning_cycle_repository/singapore/singapore_healthcare_ masterplan_2020.pdf.

3. Ministry of Communication and Information Technology Indonesia. (2019). Berlaku Per 1 Januari 2020, Inilah Tarif Baru Iuran BPJS Kesehatan! Retrieved from https://www.kominfo.go.id/content/detail/22450/berlaku-per-1-januari-2020

6. World Health Organization. (2018). Noncommunicable diseases.

7. Bain & Company. (2019). Asia-Pacific: Surging Consumer Demand for Healthcare. Retrieved from https://www.bain. com/insights/global-healthcare-private-equity-and-corporate-ma-report-2019-asia-pacific/.

9. Ministry of Health Singapore. Licensing experimentation and adaptation programme (LEAP) - A MOH regulatory

10. Beckett, N. And He, D. CMS, China. (2018). China issues regulations on digital healthcare. Lexology.

Building a Data Ecosystem for Better Healthcare

Healthcare has evolved from mass treatments to personalised care thanks to sophisticated digital technologies that provide a holistic view of a person's health from a wide variety of data sources. In this era of personalised healthcare, what does a data-powered ecosystem need to sustain itself? **Dia:gram** takes a closer look.

Electronic medical records, laboratory tests, clinical trials, doctor's notes together with newer sources of digital information – such as wearable devices, embedded sensors and mobile trackers – can provide a comprehensive view of a person's health. This complex web of data has the potential to drive better patient outcomes by enabling the right diagnosis and treatment for the right patient at the right time.

In its current state, however, data can often be disconnected and unstructured making it hard to glean useable insights and even harder to make effective decisions.

Yet, as the increasing number of collaborations between non-traditional healthcare players and medical incumbents show, a collaborative approach could well solve this present-day dilemma. Take Mesh Bio for example. The digital health startup, which specialises in precision healthcare analytics, has partnered with Roche Diagnostics to develop a cardiac patient management digital solution. The solution, which brings together Mesh Bio's predictive analytics and data generated from Roche Diagnostics' products, provides clinicians with automated risk assessment and continuous longitudinal monitoring of key biomarkers, such as Roche's proprietary biomarkers.

Such insights allow healthcare professionals to provide continuous care instead of "one-off" treatments, eventually leading to better outcomes and even disease prevention. "Looking holistically at biomarkers combined with a patient's history and other complementary modalities of health data delivers much better insights and has the potential to



ABOVE Dr Franz Pfister is a Clinician, Data Scientist, and Founder of

Digital Helix.

power better care delivery," explains Dr Andrew Wu, Co-founder and CEO of Mesh Bio.

Touching on the importance of such collaborations for ongoing innovation in healthcare, Dr Franz Pfister, a clinician, and data scientist, says that startups and medical corporations each bring different strengths to the table. "Startups can be fast innovators and have the ability and risk appetite to challenge the status quo and rethink rigid processes, while established industry players bring a deep knowledge of commercialisation market and regulatory requirements, nuances in stakeholder needs and market access." Dr Wu agrees, adding that technology startups play a valuable role as they have always embraced the philosophy of lean development. "You build prototypes and test with users, refining the solutions over and over until there is a clear fit, and then you scale. This approach has historically been impossible in the traditional medical industry."

Culture of innovation

Don Mikkelsen, Service Manager of Laboratory Services at Middlemore Hospital, agrees that a collaborative approach can support this ambition. "Each player within the healthcare system can play a specialist role and use its expertise to address different, nuanced challenges." Correlating data points - connecting systems orchestrating workflows - providing insights È ® t‰

ABOVE

Dr Andrew Wu is the Co-Founder & CEO of Mesh Bio, a digital health startup that helps to manage chronic diseases through predictive analytics.

"Looking holistically at biomarkers combined with a patient's history and other complementary modalities of health data delivers much better insights and has the potential to power better care delivery."



ABOVE

Don Mikkelsen is the Service Manager of Laboratory Services at Middlemore Hospital in Auckland, New Zealand.

Citing the example of laboratories, Mikkelsen says, "They typically face problems when there is a rapid influx of patients resulting in increased demand for testing."

In response, Middlemore Hospital built a new laboratory where they could configure modern equipment, including Roche's front-end automation solutions. Mikkelsen and his team constantly tweaked the set-up for optimum results, eventually, managing to increase efficiency by fine-tuning the synchronisation of samples in the centrifuges — but that is not the end of their experimentation, he shares.

This is because "digitally controlled systems have an infinite number of

possibilities of how they can be run", Mikkelsen says. He emphasises the importance of combining data with clinical information to generate insights - valuable insights that can power clinical decisions and help physicians deliver better care.

Navigating the data landscape

To unlock the power of data, the sharing of data between different players across the industry is inevitable. Sensitivities around data privacy, data control and ownership can, however, make data sharing a tricky process. On top of that, the regulatory landscape in Asia Pacific is still very fragmented, with requirements varying from country to country. Clearly defined regulations, unified standards and rules around access of health data can enable the development of this data-powered ecosystem that will equally benefit all stakeholders, most importantly, the patient.

Perhaps the decentralisation of data can help, suggests Dr Pfister. As we move from a centralised system where data is often siloed to a decentralised system, the privacy of patients' data can be preserved, and individual ownership and control of information can be ensured and improved.

Mesh Bio's Dr Wu agrees. He adds, "The reality of healthcare is that it takes a village to care for a person. Interoperability of data is key as we cannot just think about holistic assessment from a single snapshot of time, but rather, the patient's journey through a healthcare system." This also paves the way for better patient engagement and improved trust in physicians, as they are now aware that their doctors not only know their medical history but can also advise them in terms of future healthcare plans, he explains.

"If you want to move towards value-based healthcare, the starting point is digitalisation," says Dr Wu.

"Many markets in Asia Pacific have the opportunity to leapfrog - as they exhibit lower barriers for health technology integration with fewer legacy systems - and can shape the way healthcare will be delivered as they develop their data-powered healthcare ecosystem," says Dr Pfister.

At the heart of it, "data is a tool for action," Dr Wu maintains.

If healthcare partners can come together to build a reasonably regulated, data-powered health ecosystem where they can share data and make sense of it all with the help of innovations like Artificial Intelligence, they will be able to move the needle and provide holistic care, benefitting patients and society as a whole.



Scan the QR code to watch the video on how digital technologies can present a holistic view of a person's health.

"Interoperability of data is key as we cannot just think about holistic assessment from a single snapshot of time, but rather, the patient's journey through a healthcare system."



Increasing Access

Dr Tedros Adhanom Ghebrevesus, Director-General of the World Health Organization summed it up well when he said, "health is a human right, not a privilege for those who can afford it."1

While tremendous progress has been made globally and in Asia Pacific in the decades gone by, health inequalities have not only persisted but, in some cases, have widened.

Today, the region is home to more than half the world's population and more than 50% of its disease burden.² Non-Communicable Diseases (NCDs) like diabetes, obesity, cardiovascular disease, and cancer have emerged as leading killers.

to Healthcare

With millions requiring lifelong care, health systems face relentless demand for their services and poor infrastructure can add to the complexity.

In the absence of universal health access, almost half of health spending is made out-of-pocket in lower-middle and low-income countries.³ According to some estimates, 100 million people are pushed into extreme poverty each year because of debts accrued through healthcare expenses, which is why Universal Healthcare can offer much-needed financial protection to vulnerable populations.4



There is no doubt that access to healthcare is a multi-dimensional challenge with no 'one-size-fits-all' solution. The level of access to healthcare varies widely from country to country and requires a concerted, multi-pronged effort to address existing challenges. Merely improving one aspect – such as infrastructure – without tackling the others, for instance, the absence of sufficient doctors and nurses, is unlikely to deliver sustainable outcomes. And when it comes to the more complex treatments for NCDs like cancer, a multi-disciplinary approach requiring accurate diagnosis, specialist skills and hospital infrastructure, becomes even more pronounced.

An ounce of prevention

Dr Feisul Idzwan Mustapha, Consultant Public Health Physician (NCD Epidemiology) and Deputy Director (NCD) at the Malaysian Ministry of Health's (MOH) Disease Control Division, has seen the problem posed by NCDs firsthand. "Malaysia has been achieving success on a lot of health indices — for example, reducing maternal mortality and child mortality. However, a significant burden is the number of Malaysians suffering from NCDs. In particular, hypertension and diabetes which continue to increase."

Through initiatives like Komuniti Sihat Pembina Negara (KOSPEN), Dr Feisul is focusing on addressing NCDs through

public education and community-based screenings. "Ultimately, you can never build enough clinics; you can never build enough hospitals," he says. "Infrastructure alone cannot improve outcomes, but changes in behaviour can." His hope is more targeted public education at the community level, which depends on building coalitions throughout grassroots activities.

Dr Feisul also believes diagnostics is critical to stemming the economic and societal costs of illnesses. "We have finite resources just like any other country so decisions always have to be based on what can create the most value, the most impact. Early diagnosis can help us to reduce healthcare costs." But there is also a human element.

"For our people, for those living with a disease like diabetes, such timely interventions can help them to maintain better control over their disease, which gives them a better quality of life. Better health means a better society," he says.

"Beyond NCDs, the role of diagnostics is particularly important during disease outbreaks," he adds. Robust diagnostic capabilities can determine the speed and effectiveness of a country's response. "If we can test the population effectively, we can reduce the prevalence and spread of certain communicable diseases," he suggests.

ABOVE

Dr Om Manchanda is the Managing Director of Dr Lal PathLabs, a key diagnostic service provider in India.



ABOVE

Dr Feisul Idzwan Mustapha, Consultant Public Health Physician (NCD Epidemiology) and Deputy Director (NCD) at the Malaysian Ministry of Health's (MOH) Disease Control Division.

"We have finite resources just like any other country so decisions always have to be based on what can create the most value, the most impact. Early diagnosis can help us to reduce healthcare costs."

This is where policy is key to making widespread diagnostics possible. Talking about Malaysia, Dr Feisul says, "Political intention is crucial. In the two decades of my life in public health and policy, I have seen several recommendations made. The successful ones have been those where action was taken."

The promise (and limits) of digital health

One such area is digital health, which has found itself on the radar of many governments and policymakers in recent years.

In India, where Dr Om Manchanda is the Managing Director of Dr Lal PathLabs, 70% of residents live in rural areas where infrastructure is cost-prohibitive. "Digital technology can bridge this gap." But he cautions, to prevent misuse or frauds, "a well-thought-through regulatory framework, patient education and public awareness are key."

In a vast country like India where the urban-rural divide cannot be solved easily, a tailored approach, using digital technologies where necessary, according to Dr Manchanda, could be the answer. "Investments in healthcare infrastructure in urban cities only serve the needs of a small population of Indians. As a solution, we ought to explore a model of graded infrastructure for different segments of people, considering affordability and geography," he says, pointing to the Indian Railways, which offer different fares for different tiers of service even though the destination is the same for all passengers. "In healthcare, this 'destination' should be equitable quality for anyone who accesses care."

Meanwhile, Dr Feisul says that in Malaysia, the initial investment in digital technology is a struggle. "Digital health requires a substantial investment upfront," he says, "and the savings are 10, 15, 20 years down the road. Maybe the solution is about not just making sure it's easy for people to access healthcare, but that fewer people will use it unnecessarily."

Dr Manchanda says in countries such as India, "the policies and processes to facilitate the change required to make digital solutions commonplace are not yet established." He urges a "methodical and planned" approach to address the disorganisation within the system.

Uniting the public and private sectors

In Myanmar, where Dr Myat Kyaw Thu serves as Director of Asia Royal Hospital, the private sector has an important role to play. "Twenty years ago, you could count on one hand the number of private hospitals in Myanmar," he says. "Today, the growth of the private sector is very important. It relieves an enormous burden off the government, and recently, public-private initiatives have been instituted to meet the needs of patients." Providing basic healthcare for citizens in public and private hospitals is the overarching goal of the country's



ABOVE

Dr Myat Kyaw Thu is the Director of Asia Royal Hospital in Yangon, Myanmar. Universal Healthcare program, so that by 2025 all citizens will have some form of basic health care, "Recently the government has started a social security program for all citizens where the cost of a hospital stay is totally subsidised by the government," Dr Thu says. "This is just the beginning of such a partnership."

Ultimately, no matter who is funding or overseeing it, Dr Feisul says that the care of the future must be more preventative in nature. And, he adds, it must be more



Scan the QR code to watch the video on Asia Pacific's challenge in access to healthcare. personal than a mass-market campaign. "People talk about precision medicine when it comes to drugs, but we need to think along the same lines when it comes to behavioural interventions." It will not be simple, he acknowledges. But it will be necessary if Asia is to overcome the challenges that it faces today — and in the future.

To what degree it succeeds will depend on the willingness of the public and private sectors to cooperate in new and innovative ways.

- 1. World Health Organization. (2018). The right to health.
- 2. Peabody, J., et.al. (2000). Policy and Health in Asia: Demographic and Epidemiologic Transitions.

3. OECD. (2018). Health at a Glance: Asia/Pacific 2018. OECD Publications Centre.

4. World Health Organization. (2017). Tracking universal health coverage: 2017 global monitoring report.



My Life

For over 20 years, Dr Suvanich Triamchanchoochai has been consulting patients with heart disease in Bangkok, Thailand. Here he shares his story of living through a heart attack and the lessons he now shares with patients.

Forty-four year old Suvanich Triamchanchoochai likes to keep active. "I spend at least 30 minutes nearly every morning swimming. Since I am always busy at work, this is my way of relaxing without interruptions."

LEFT

Dr Suvanich Triamchanchoochai

is a Cardiologist at Nakornthon

Hospital in Bangkok, Thailand.

On average, he clocks anywhere between 12 to 14 hours while at work. And as a father-of-three, evenings revolve around his children, "whether it is helping them with their homework or putting them to bed, it is the highlight of my day."

"My kids are growing up and I want to spend as much time as I can with them before they get busy with high school and friends," he says with a wistful smile and an all too common complaint among parents of pre-teen children.

As a cardiologist, Dr Suvanich has a demanding schedule.

"On average, I see about 50 to 70 patients every day." Dr Suvanich's days are packed with patient consultations, team meetings,

How I Saved

and lectures at many hospitals. "When I started 20 years ago, I chose cardiology because of the impact it has on the lives of patients. The burden of cardiovascular disease was increasing in Thailand back then, and it continues even today."

"However, the patient profile is changing," he adds. "I see younger patients in their 30s and 40s. Many patients have existing co-morbidities. All of these add to the complexity of disease management."

"But early intervention can save lives and that is the greatest reward for any cardiologist."

The call that changed my life

"I remember I was particularly exhausted by the time I got home that day."

As on other evenings, Dr Suvanich had dinner with his family but decided to sleep early. "I was on call that night, and I was not feeling too well. So I thought some rest would help."

"Up until that moment, I remained calm, gave instructions and stayed alert. I was the doctor. The diagnosis shifted something and I decided the best course of action was to leave it to the experts. I gave up control and went from being a doctor to a patient."

At 9:30 PM, Dr Suvanich got a call from the on-duty nurse. "She was updating me on a patient. I knew she was talking, but I could not hear anything. I ended the call abruptly."

Then it started. Dr Suvanich began feeling uneasy. "I vomited but that did not help. When the chest pain began, I knew."

Since dinner, Dr Suvanich had been feeling unwell which he put down to heartburn. When the tightness in his chest did not subside, he called on his wife and asked her to drive him to the hospital.

"I think I am having a heart attack." He recalls saying to his wife.

"I live close to Nakornthon Hospital Bangkok, where I work, and told her to drive us there straight away."

From the car, he called the Accident and Emergency (A&E) department at the hospital and spoke to the registrar on night shift, asking them to be on standby to prepare the medication and all necessary equipment.

Next, he called his friend, an interventional cardiologist describing the symptoms, "My friend asked me who the patient was."

When Dr Suvanich told him, "I could hear the shock in my friend's voice. As a doctor, you often treat patients you do not know. What happens when that patient is a friend or a loved one?"

"I have seen countless cases where a patient decided to wait. But in a heart attack every minute counts."

In the case of an Acute Myocardial Infarction (AMI), also commonly called a heart attack, the blood supply to an area of the heart muscle is interrupted, causing the muscle cells to die. Prompt treatment is essential as every 30 minutes of delay increases the relative risk of mortality by 7.5% in such patients.¹

Heart Attack: A Race Against Time

0 hour: Patient arrives

When a patient arrives in the Accident and Emergency (A&E) Department with chest pain, doctors have to determine whether the patient has a heart attack, which requires immediate action or if the chest pain is caused by other factors.

A heart attack, or acute myocardial infarction (AMI), is a cardiac event in which the blood supply to an area of the heart muscle is interrupted, causing the muscle cells to die. Every hour of delay from the onset of symptoms to treatment increases the risk of mortality in patients.

The Troponin high sensitive test is a reliable indicator of heart attacks and the gold standard in cardiac critical care.

The test helps to save unnecessary procedures: More than 50% of natients with chest nains do not have a heart attack.3

What is Troponin?

Troponin is a heart muscle protein that indicates hear attacks. The more damage there is to the heart, the greater the amount of troponin in the blood.

A limitation of the earlier generations of blood tests was the time required to detect the troponin rele sometimes requiring up to six hours with less sensitive troponin tests.

Scan the QR code to view this infographic online

myocardial infarction with high-sensitivity cardiac Troponin T. Ann Emerg Med. 68(1):76-87. Shiozaki M, Inoue K, Suwa S, et al. (2017). Utility of the 0-hour/1-hour high-sensitivity cardiac troponin T algorithm in Asian patients with suspected non-ST elevation myocardial infarction. Int J Cardiol. 249:32-35. 3. Twerenbold, R. et al. (2016). Eur Heart J. 37(44), 3324 - 3332. Giannitsis E et al. (2010). Clin Chem. 56 (2), 254-61.
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shorten the time for heart attack diagnosis drastically, allowing patients to get treated earlier and better use of

The test helps to identify 20% more patients with smaller infarctions.4,5

Why is the rapid diagnosis of heart attacks crucial?

Rapid treatment is essential as every 30 minutes eases the risk of mortality by 7.5% in patients.

The Troponin T-high sensitive test reduces the observation time needed to rule-in or rule-out a heart attack from 3-6 hours to just 1 hour.7.8 This test allows doctors to make treatment decisions rapidly, which can greatly impact outcomes and potentially save lives.

1. Mueller C, Giannitsis E, Christ M, et al. (2016). Multicenter evaluation of a 0-hour/1-hour algorithm in the diagnosis of

"I now speak to them in a language that I know they understand. I use my experience to lessen their fears and to let them know that I am with them on this *journey, every step of the way.*"

To act without delay

Patients with chest pain and other symptoms suggestive of AMI account for approximately 10-20% of all emergency room consultations.² "It is important for doctors in such situations to know quickly whether a patient is suffering from a life-threatening cardiac episode or if the chest pain is caused by other reasons," says Dr Suvanich.

The mortality rate of heart attacks is highest within hours of onset, so early diagnosis and initiation of treatment can mean the difference between life and death.

"Diagnostic tools such as cardiac biomarkers are crucial to support rapid and accurate diagnosis," he adds. "When I was admitted, they did a Troponin T-test to confirm that it was indeed a heart attack."

From doctor to patient

This was a defining moment for Dr Suvanich. "Up until that moment, I did everything that my years of training taught me. I remained calm, gave instructions, and stayed alert. I was the doctor."

"But the diagnosis, which wasn't a surprise to me, shifted something. I realised I had been functioning on auto-pilot and decided the best course of action was to leave it to the experts," he says.

"I gave up control and went from being a doctor to a patient."

Doctors performed a Percutaneous Coronary Intervention (PCI) on Dr Suvanich. This non-surgical procedure uses a catheter to insert a stent to open up blood vessels in the heart.

Living in the moment

"An experience like this changes your outlook."

"A year ago, 24 hours a day did not seem enough. Today, I realise you will always find time to do the things that matter."

After the PCI, Dr Suvanich decided to re-evaluate his life. "I thought of all the commitments that kept me busy, of the camping trips with my family I had not found the time for."

priority but I needed to readjust how I had been living my life. I wanted to be a good doctor but it is equally important for me now to be a good father and a good husband. Work-life balance is also important."

The hardest part was calling his 13-year old daughter who was in Singapore. "You do not ever want to make such a call. It breaks your heart when your children worry about you. I told her daddy had a heart attack but I am here now."

Putting heart in patient care

"My heart attack has made me a better doctor. Before this, I spent time counseling patients on prevention and treatment."

1. De Luca G. et al. (2004) : Circulation. 109(10) ;1223-5. 2. Mozaffarian D. et al. (2015). Circulation 131, e29-322. 3. Roffi M. et al. (2015) : Eur Heart J. Aug 29.

"As a doctor, my patients are always my

"I now speak to them in a language that I know they understand. I use my experience to lessen their fears and to let them know that I am with them on this journey, every step of the way."

"I was always active and had a fairly good lifestyle. Yet, I realise I was not getting enough sleep, I was under a lot of stress, and my eating habits were not good. A culmination of many things brought on the heart attack."

"I was lucky that night. What if the nurse had not called me?"

"So I always tell my patients do not assume it cannot happen to you. Take care of yourself, know the signs and symptoms, and go to the hospital without delay."

Progress in

Around the world, clinical laboratories are spearheading novel approaches to patient care and healthcare systems management. By leveraging their unique data and expertise, they are exploring new frontiers for the clinical laboratory profession in an era of rapid technological change.

Despite tremendous improvements in medical science and technology over the past century, healthcare systems around the world are struggling to deliver patient-centric care, at an affordable cost. Yet, new tools and business models are starting to make waves across the healthcare system and hold great promise in improving efficiency and patient outcomes.

So, where does clinical laboratory fit in this gradual, but inevitable, transformation?

For years, laboratory professionals have worked tirelessly to improve the quality, speed, and cost of laboratory services. By embracing new laboratory technologies and

Taking the Lead in Healthcare Innovation: Laboratories in **Asia Drive**

Patient Care

lean management techniques, they have improved the accuracy of their results and the productivity of their operations, leading to better services at progressively more affordable prices.

But, many experts argue that operational excellence, while crucial for laboratories to effectively fulfil their core responsibility of processing samples and returning results, is no longer enough to secure the future of the clinical laboratories. They believe that laboratories have both an opportunity and an obligation to play an even greater role in driving quality and efficiency in healthcare delivery.

Lessons from the Western world

As one of the world's leading hubs for healthcare innovation, the United States (US) offers many clues about the place of the clinical laboratories in the future of care. Some of those clues can be found in the work of the Project Santa Fe Foundation (PSFF), an American non-governmental organisation (NGO) that helps laboratories in the US and around the world to redefine their value proposition for healthcare systems.

"Laboratories generate a vast amount of information about patients," says Khosrow Shotorbani, President and Executive Director of PSFF. "But we are only scratching the surface of what is possible for that information in terms of clinical prevention and intervention leading to procedural cost avoidance."

To help clinical laboratories fulfil their potential, PSFF encourages them to adopt a "Clinical Lab 2.0 business model" that uses longitudinal laboratory data to help manage population health. The organisation argues that clinical laboratories are uniquely positioned to do so because their data is highly actionable, predictive, has zero latency, and touches more patients than any other ancillary healthcare service.

"Clinical laboratories can be the active meteorologists of disease progression," adds Shotorbani, who also serves as CEO and Founder of Lab 2.0 Strategic Services, a consultancy. "More than anyone else, we have the capability to predict the onset and the velocity of disease, and to detect who needs intervention at the individual or population level."

Shotorbani previously served as CEO and President of TriCore Reference Labs, the largest clinical laboratory operator in the American state of New Mexico, where he ran a pilot that showcased precisely how clinical laboratory data can support population health management. Conducted in partnership with a major statewide payer, TriCore focused on addressing care gaps and managing costs related to prenatal care and several other highly prevalent chronic conditions.

The pilot began with a basic risk stratification exercise in which TriCore analysed laboratory data to find situations where high-risk pregnancies were not being identified and managed effectively. By creating dashboards that visualised data and protocols for early intervention, the pilot drove major improvements in maternal health outcomes, including a 73% improvement in care gaps, 30% reduction in pre-term delivery rates, 33% reduction in neonatal intensive care units, and a 10% reduction in emergency room visits due to lack of adequate primary care.

While many clinical laboratories in Asia still lack the expertise, infrastructure, and incentives to conduct pilots like this one, the situation is rapidly evolving. Advanced equipment and information technologies

ABOVE

Khosrow Shotorbani is the President and Executive Director at the Project Santa Fe Foundation (PSFF), and the CEO and Founder of Lab 2.0 Strategic Services. are being deployed across the region, opening new possibilities for the next generation of laboratory professionals in any country to contribute meaningfully to population health management.

Laboratories in Asia look to the future

Most of the major projects in the Clinical Lab 2.0 community are currently happening in the US, where pressure to reduce healthcare costs has reached astronomical proportions. While some Asian countries — such as Japan and Singapore — outperform the US on many key measures of healthcare system efficiencies, most of the region faces similar pressures associated with rising costs and insufficient outcomes. Clinical laboratories in Asia may be able to learn from case studies in the US, but they will also need to develop their solutions, according to experts here.

With a large ageing population, a shortage of healthcare workers, and the rising burden of chronic diseases, healthcare systems in the region cannot rely on lessons from Western Europe or the US. Solutions designed for this part of the world must address unique challenges and local needs. In Singapore for example, the country is pushing ahead with a National Electronic Health Record (NEHR), which aims to provide a consolidated view of every patient's health record across every

"More than anyone else, laboratories have the capability to predict the onset and the velocity of disease, and to detect who needs intervention at the individual or population level."

interaction with the Singapore health system — including laboratory tests and results — from birth to death.

At the clinical laboratory at the National University Hospital (NUH), an 1100-bed tertiary teaching hospital in Singapore, the team, which comprises technologists, clinicians, and scientists from all specialties, works together to provide testing and consultancy services, including the correct test selection, interpretation of test results, and solving potential problems related to possible interferences.

Other health systems around Asia have also launched similar initiatives. The public health system of Hong Kong, for example, operates a national-level electronic health record system that facilitates the sharing of patient data across both public and private hospitals. Like Singapore, it has a strong focus on leveraging patient data to improve care.

Longer-term, the rise of biosensors and wearable health trackers present further opportunities for laboratories to co-create new models of care. Many laboratories in Asia have been participating in pilot programs that combine connected medical devices with telehealth services to optimise chronic care management.

Within the healthcare ecosystem, clinical laboratories hold the most data on patient health. Digitalisation is the future of laboratory medicine and healthcare systems management. How laboratories utilise this data to create value could place them at the forefront of patient care.

Scan the QR code to watch the video and hear from the expert directly.

The Emerging Importance of **Microbiology Diagnostics**

Now more than ever, infectious diseases represent an enormous challenge to global health. The recent COVID-19 outbreak has demonstrated how startlingly susceptible we are to a devastating pandemic. Furthermore, antimicrobial resistance (AMR) — the phenomenon of disease-causing pathogens becoming resistant to antimicrobials that were once

ABOVE

Professor He Lixian of

Zhongshan Hospital in

Shanghai, China, is a

infection and intractable

respiratory diseases.

renowned expert in pulmonary

Clinical Conversations

In the fight against antimicrobial resistance, microbiology diagnostics will play a central role in winning the battle.

effective treatments — is an everpresent and growing concern. Addressing these problems will take a broad-based effort and a full arsenal of weapons. Chief among them will be microbiology diagnostic tools. According to leading academics and experts, they will be essential to overcoming the threats posed by infectious diseases.

Fighting an age-old foe

For centuries, a primary focus of modern medicine has been to protect humans from disease-causing microorganisms. Such pathogens are nothing new; they have been around since life began on earth.

Our fight against these old foes continues today. But now, another fight — one against new and emerging pathogens — is of growing importance. Clinicians must improve their ability to identify these newcomers, and effectively treat those affected by them. And many experts believe that innovative microbiology diagnostic tools are critical to achieving that goal.

According to Professor He Lixian of Zhongshan Hospital in Shanghai, China, traditional testing methods, while effective, have significant limitations. "Bacterial culture is still a classic method in etiology diagnostic technology," he says. "It is highly reliable and suitable for a drug-sensitivity test, but it is time-and labour-consuming and cannot provide help for early clinical treatment."

Newly developed non-culture diagnostic technologies such as immunology (antigen and antibody) detection technology, mass analysis technology, and DNA detection etiology technology have shortened the detection time and provided some help for early treatment. But, Professor He says, "there are still many limitations, such as technical complexity, high-cost, and low specificity." For those reasons, non-culture technologies should be considered to be supplementary measures — at least for now. Other new options, like GeneWEAVE's Smarticles technology, are showing promise. Smarticles detect drug-resistant infections by utilising engineered particles that bind to specific bacteria for identification and antibiotic resistance. This way, healthcare facilities get earlier answers about infections and can pinpoint treatment directly from clinical samples.

Next-Generation Sequencing (NGS) technology also has the potential to shift diagnostics from culture-based methods. Providing rapid and real-time analysis, NGS methods show universal identification potential without requiring predetermined pathogens by identifying pathogens through nucleic acids present in bacteria, fungi, and viruses.

Meanwhile, research and development of biomarkers, especially Procalcitonin (PCT), have opened up a new field for the evaluation of host response to infection and anti-infection treatment.

Professor He notes that while such measures reduce the utilisation rate and duration of antimicrobial therapy, they do not solve the problems of improper selection of antibiotics.

Tackling a stubborn problem

The improper use — and overuse — of antibiotics continue to be a serious problem, as it strengthens the very enemy we are trying to fight.

How Emerging Diagnostic Innovations Test for Drug-Resistant Organisms

To tackle the rise of MDROs, innovative diagnostic tests are needed to enable the quick identification of such organisms, improving the control of infections and alleviating the strain on the healthcare system.

World Health Organization. (2019). Situational analysis of antimicrobial resistance in the South-East Asia Region, 2018.
ResistanceMap. Center for Disease Dynamics, Economics & Policy (CDDEP).

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Rapid and accurate diagnosis is critical

for the effective treatment of infectious diseases such as bacterial infections, Tuberculosis (TB), malaria and Human Immunodeficiency Virus (HIV). Patients infected with Multi-Drug Resistant Organisms (MDROs) are at an increased risk of developing serious complications, that can result in mortality.

The region will have the highest burden of antimicrobial resistance in the world. Out of the **10 million deaths** estimated in **2050**, **47% are from Asia**.¹

Newly developed non-culture diagnostic technologies have shortened the detection time and provided some help for early treatment.

Professor Peter Dedon, Lead Principal Investigator of Antimicrobial Resistance IRG (AMR IRG) at the Singapore-MIT Alliance for Interdisciplinary Research Group (SMART), says patient-doctor dynamics have helped perpetuate antimicrobial resistance. "When you go to the doctor, you obviously expect the doctor to do something," he says. "And you are very upset if you get a bill and all he told you was to go home and have a cup of tea." That is why, he says, the development and dissemination of rapid point of care diagnostics are so important.

Professor Peter Preiser — from Nanyang Technological University (NTU) and the AMR IRG at SMART — is optimistic that soon, diagnostic tools that distinguish among virus, parasite, and bacteria, as well as identify drug resistance, will be available. But, he says, they must be available to a wide audience to be effective.

"How do you get it into the doctor's office?" he asks.

Professor Preiser adds that outreach is also critical to addressing the problem. His researchers have set up programming that joins education with engaging activities so that kids can discover the basics of AMR with their families. "It's kind of a trickle-up process of enculturating antimicrobial resistance."

Education will be a crucial part of any strategy to prevail over the threat posed by not only AMR but infectious diseases in general. At the height of the COVID-19 outbreak, for example, it became clear that educating the public on basic preventative measures was key to stemming the tide of infections.

More important still will be the widespread availability of innovative microbiology diagnostics that will enable rapid detection and diagnosis of new disease-causing microbes. Because, as we have learned in the past year, the most deadly threats facing the global population are the ones we do not yet know about.

Diagnostics for Smarter Decisions

Every person is unique, and in many ways, so are diseases. Roche is bringing together a unique understanding of human biology with new ways to analyse health data. Across the patient journey, from diagnosis to therapy decision, treatment and medical monitoring, our innovative diagnostic solutions are transforming the future of care.

