IMS INSTITUTE FOR HEALTHCARE INFORMATICS

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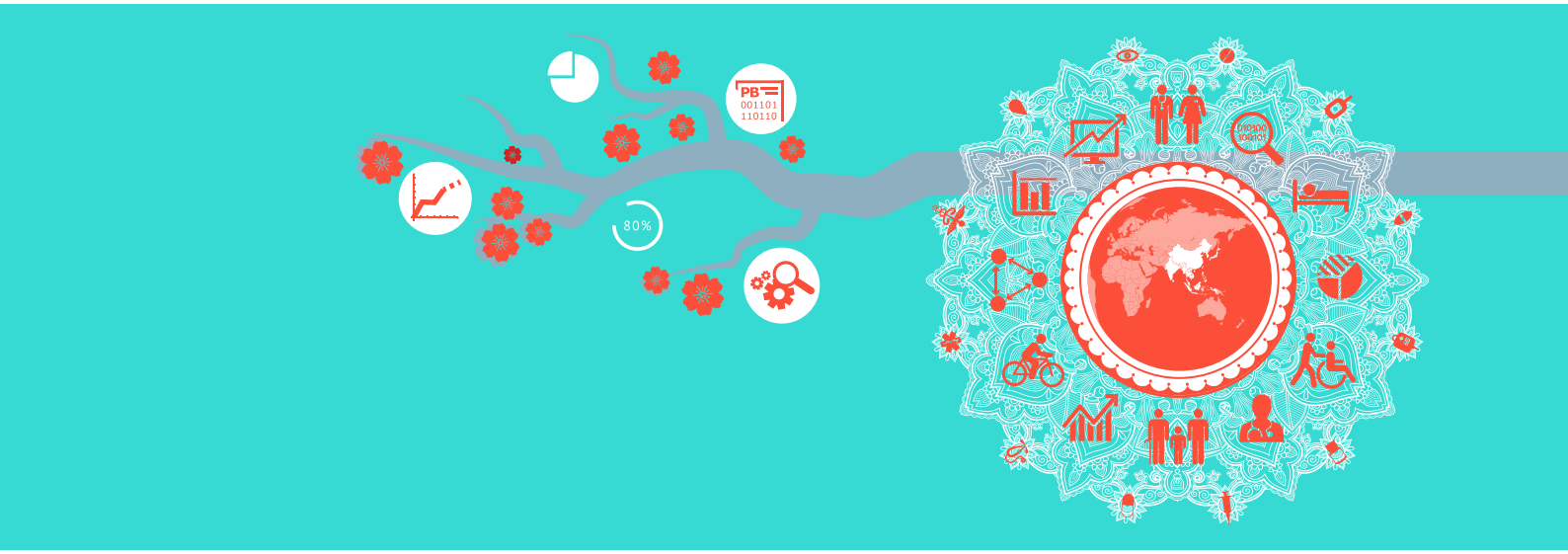
Advancing Value-Based Healthcare in Asia

Using Decision Modelling to Inform Clinical and Public Policy Decision-Making



Introduction

Every healthcare system in Asia is struggling with rising costs and uneven quality of healthcare delivery. Over the past years, there has been a fundamental shift in expectations for healthcare systems: that they transform from supply-driven healthcare systems to patient-centred systems organised around what patients need. To address this shift successfully in Asia, all stakeholders must shift their focus from the volume and profitability of services provided—physician visits, hospitalisations, procedures, and tests—to tailored services (including health-related social services) that, subject to local resource constraints, optimise patient outcomes. The new goal of health systems is to achieve what has been called "the triple aim": population health, patient satisfaction, and sustainable service costs.

The IMS Institute for Healthcare Informatics is the first collaborative platform in Asia intended to foster technology-enabled, analytics-driven approaches to improve health outcomes in Asia, and bring together relevant stakeholders to shape clinical and public policy decision-making in order to optimise outcomes for patients.

This report is intended to introduce the concept of value-based healthcare and illustrate how real-world data-driven decision modelling approaches can improve management of diabetes and stroke, as case examples. Finally, we call for action by all healthcare stakeholders to accelerate collaboration and progress in implementing value-based approaches in Asia. This report was prepared independently by the IMS Institute for Health Informatics in Asia without external funding. The contributions to this report by Professor David Matchar (Duke-NUS) are gratefully acknowledged.

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Value-based approach to healthcare

- Healthcare actors are under pressure to maximise value for money and optimise patient outcomes
- Value-based healthcare (VBH) models come at a crucial point for Asia as the region is home to healthcare systems struggling with rising costs and uneven quality
- Health informatics and decision modelling are tools to aid understanding of healthcare as a complex, interconnected system, and to allow simulation of the degree to which various sets of policy or clinical choices result in potential desirable and undesirable health and economic outcomes

The need for VBH in Asia

Demographic transition is taking place at among the fastest rates in Southeast Asia compared with other regions of the world, whether in terms of fertility reductions, population ageing, and rural-to-urban migration. Rapid epidemiological transition is also occurring, with the disease burden shifting from infectious to chronic diseases.[1] These chronic conditions, if unmanaged, frequently lead to poor patient outcomes and hospitalisations that are key drivers of costs to healthcare systems.

To manage the resultant cost increases currently experienced across health systems, both worldwide and in Asia, there is a need to restructure those systems towards a goal of maximising patient outcomes. Optimising outcomes—whether through preventative health initiatives, efforts aimed at shifting patient health behaviours (such as by increasing patient access, convenience and customer service), or numerous other strategies to improve care provided—can mitigate the most significant drivers of costs in the system, such as acute events and repeat hospitalisations.[2,3,4,5] This value-based healthcare approach that emphasises attaining greater value for the patient while maximising the value for healthcare dollars spent is critical, and a shift to this model has begun worldwide. Care providers, institutions, payers and other key stakeholders in the healthcare industry are now being tied into this new paradigm where value is defined and measured before goals and incentives are set, and before anyone is compensated.

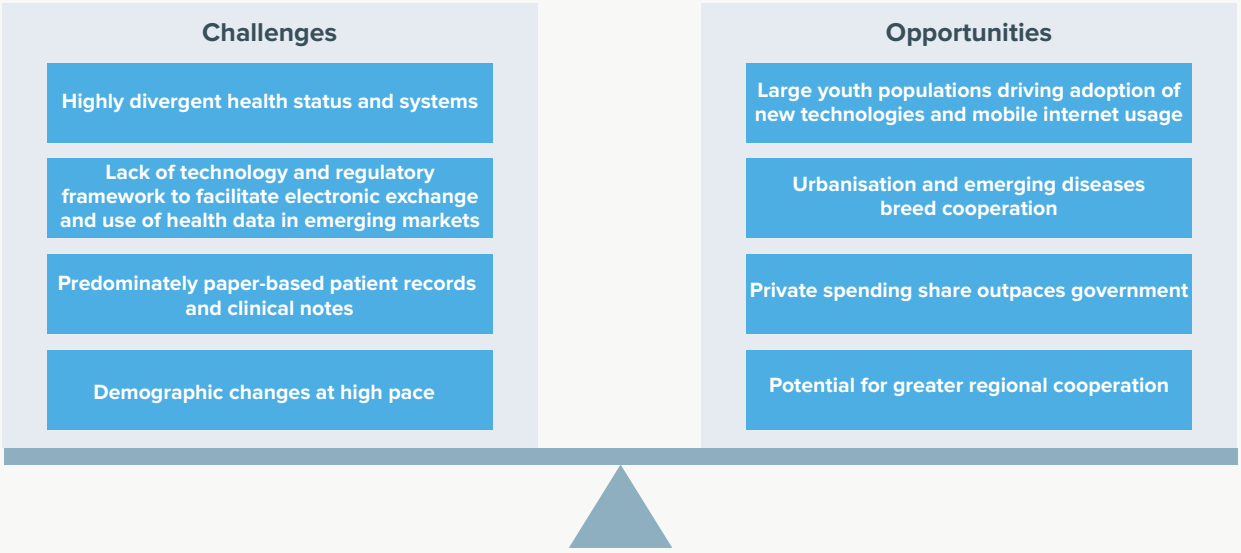
Applying VBH

According to the work of Professor Michael Porter of the Harvard Business School, the key components of a successful value-based healthcare delivery business model include:[6]

- **Organisation of care around patient medical conditions and distinct patient segments by a multidisciplinary care team** who will take responsibility for the complete cycle of direct patient treatment as well as supporting services such as nutrition, psychosocial, and rehabilitation. The aim is to ensure better and optimal patient care with improved continuity of care
- **Measurement and tracking of the health outcomes and the actual cost of care for each patient** to understand what is working, what isn't and at what cost
- **Reimbursement for the full care cycle for medical conditions**, including inpatient, outpatient, rehabilitative and supportive services to motivate and reward providers who deliver the best outcomes at the lowest costs, and penalise those who fail to effectively improve patient health or prevent disease exacerbations. In value-based healthcare delivery, payment covers all treatments and interventions performed for an acute medical condition, creating benefits for all principal players
- **Integration of care across a network of facilities** in conjunction with community resources to add value for patients, providers and the system as a whole. This results in concentration of care volume by medical condition and movement of non-acute care out of heavily resourced hospital facilities to improve outcomes and reduce costs
- **Expansion of the geographic reach of leading providers within their areas of innovation and excellence and integration of their care with community providers** to broaden patient access to the best care, improve protocols and reduce fragmentation and geographic gaps in services while improving outcomes and cost effectiveness
- **An information technology (IT) platform to support the above processes,** and more importantly, data sharing across the entire care episode to provide insights on total cost of care, track quality measures, improve performance, streamline operations and ultimately improve business margins

Given that the Porter's model was developed in the United States, the approach will need to be adapted and contextualised appropriately in other economies of varying maturity. In particular, the diversity across Asia of developed vs. developing countries, and single payer vs. self-pay healthcare reimbursement systems, present a special problem in attempting to apply value-based healthcare concepts, especially in addressing needs of an ageing population. A number of potential challenges and opportunities exist for the application of VBH in Asia (see Exhibit 1).[1]

Exhibit 1: Challenges and Opportunities for VBH in Asia



Source: IMS Institute for Healthcare Informatics in Asia

The predominant use of paper-based patient records in the region, combined with a lack of technology and regulatory frameworks to facilitate electronic exchange limit the use of digital health data to support VBH and its focus on evidence-based decision-making. For this reason, health informatics and decision modelling will likely serve as key tools in Asia to aid understanding of healthcare as a complex, interconnected system, and to allow simulation of the degree to which various sets of policy or clinical choices result in potential desirable and undesirable health and economic outcomes.

Decision modelling to improve patient outcomes

- Timely, accurate data is key to informed decision-making; data must be complemented with compelling analysis which will speak to the needs of decision makers
- Decision modelling can be used to simulate the health outcomes of individual patients or a population under a variety of scenarios; decision modelling represents the core methodology of clinical decision analysis
- Healthcare options that add value to patients can be developed and adjusted as needed, in a simulated modelling environment to support clinical and public policy decision-making in the real world

Decision models

Clinicians and public health policy makers are tasked to develop strategies aimed at improving the quality of healthcare. However, often lacking timely, comprehensive data that is so critical to informed decision-making, they find themselves required to make sound, rational, defensible decisions under uncertainty. Systematic literature reviews, which synthesise current scientific evidence on a particular topic into evidence reports or technology assessments and are intended to help public and private organizations make decisions based on "best evidence", often do not supply enough evidence to fully address questions relevant to decision makers.[7] Decision modelling, in these cases, can complement or utilise existing data to speak to the needs of decision makers, and help them to understand the inherent tradeoffs that are present in complex decisions.[8]

Based on a theory of decision-making under conditions of uncertainty,[9] decision analysis has been used increasingly to evaluate and compare competing public health and medical interventions. A central construct in this work is the decision model—a logical representation of choices, uncertainty, and valued outcomes. Such a model serves as a visual depiction of a complex question; it can also be used to estimate the health as well as cost outcomes for individual patients or a population under a variety of scenarios. Such a "what if" exercise can vary from a very simple "back of the envelope"-type of calculation to an extremely complex computer-based microsimulation model.[10] Outputs of such models can range from single prescriptive metrics, such as "expected utility", to a range of outcomes of relevance to decision makers, such as disability-free survival or out-of-pocket costs to patients.

Decision modelling is fundamentally about improving decision-making. The distinguishing feature of a good decision model is that it supports decision-making without necessarily prescribing the "best decision" or purporting to be the "truth". Decision models reflect our best understanding at the moment we must make a decision. A good decision model is no more complex than needed to address the decision at hand (at which point it is termed a "requisite" model), and is constructed in a way that builds confidence in the outputs. Confidence comes from a clear structure that can be understood by all stakeholders, and grounding in the best available data. In this sense, a decision model complements both expert opinion and empirical data from clinical trials, epidemiological studies, and electronic repositories.

An important feature of a decision model is that it provides a controlled environment in which healthcare options can be examined safely, and various modifications can be examined and compared. A modelling exercise can identify crucial data that should be collected before a confident decision can be taken. In short, decision modelling is an attractive alternative to heuristic approaches, providing insight into highly complex and dynamic processes, and can inform policy choices before committing real health resources.

Building a better model through data

A limited number of studies in the United States and Europe have demonstrated varying success with disease models and offered changes and additions to make them better predictors of cost-effective outcomes of diseases in general.[11] However, these studies rarely consider all aspects of the system of care from diagnosis through to policy decisions about the level of care provided, for how long, and who bears the cost. Ideally, modelling must be able to take into account the context of co-morbidities, care patterns and costs across the continuum of care for a particular disease management. The adaptation of country- and disease-specific models by various healthcare systems is a challenge not only in developed, but also developing countries. Timely, accurate data is key to informed decision-making, and data must be complemented with compelling analysis that speaks to the needs of decision-makers.

Types of decision models

Health-related decision-making applications employ various types of decision models. Exhibit 2 presents a simplification of the taxonomy of model types: decision trees, Markov (cohort) models, discrete event simulation models, dynamic models (e.g., system dynamics), and microsimulation (individual) models.[12] The choice of what type of model to develop is typically related to the particular question at hand.

The most commonly used model types are decision trees and Markov models, which are usually used to represent a cohort of similar individuals and their various possible life trajectories made more or less likely by choices. Discrete event simulation modelling is particularly useful in the design of a delivery system at the local level to improve production efficiency and patient outcomes, such as by evaluating flow in the emergency department or operating theatre. As an illustration, discrete event simulation has been used to compare current laparoscopic surgical practice with a new model system in which patient care is handed off between two anesthesiologists in order to balance patient volume and safety.[13]

Relatively new to health policy analysis, system dynamics (SD) modelling focuses on problems with complex dynamics, including interrelationships between sectors, time delays, and accumulations. It is especially useful for representing problems in which there are conflicting objectives and vested interests of many stakeholders.[14] Moreover, SD models can incorporate the increasingly available real-time electronic data allowing for the evaluation of policies that are responsive to change. Microsimulations extend the potential detail that can be captured in a dynamic model, and is limited only by available data.

No matter the modelling type, the value of the modelling exercise for care planning and allocation of resources to achieve the best patient outcomes depends on the quality and credibility of data.[15]

Exhibit 2: Types of Decision Models

Model type	General description	Type of decision best suited for
Decision tree	Diagrams the risk of events and states of nature over a fixed time horizon	Interventions for which the relevant time horizon is short and fixed
Markov (cohort) model	Simulates a hypothetical cohort of individuals through a set of health states over time	Modelling interventions for chronic diseases or conditions that involve risk over a long time horizon and/or recurrent events
Microsimulation (individual) model	Simulates one individual at a time; tracks the past health states of individuals and models risk of future events stochastically	Modelling complex disease processes, when Markov models are too limiting
Systems Dynamic model (population)	Simulates the interactions between individuals and the spread of disease	Modelling interventions for communicable diseases or such as vaccinations
Discrete event simulation model	Simulates one individual at a time as well as interactions among individuals or within a healthcare system	Evaluating alternative healthcare systems (e.g. workflow, staffing)

Source: Kuntz K, et al. Decision and Simulation Modeling in Systematic Reviews. Agency for Healthcare Research and Quality, U.S. Department of Health and Human Services. Rockville MD. 2013 Feb.

In the following chapters, two real world examples will be presented demonstrating how decision models have been used to inform decision-making to improve patient outcomes and management in diabetes mellitus and stroke—two of the world's five leading diseases. Such models are a critical step toward value-based health, where care is organised more fully around patient medical conditions and distinct patient segments. The objective of these examples is to demonstrate that healthcare options that add value to patients can be developed and adjusted as needed, in a simulated environment, to support clinical and public policy decision-making.

Decision modelling to improve outcomes in diabetes care

- Given the significant economic impact of diabetes mellitus, there is an ongoing need to prioritise competing interventions through the analysis of costs and benefits via complex disease modelling
- Decision modelling provides a framework for synthesizing data from a variety of sources and allows simulation to optimise patient outcomes due to prevention, treatment choices and self-care
- The IMS CORE Diabetes Model combines costs and health consequences associated with therapy choice and disease progression to provide robust estimates of cost-effectiveness

The burden of diabetes in Asia

Diabetes Mellitus (DM), a group of metabolic diseases tied to defects in insulin secretion and/or action,[16] afflicts an estimated 75 million people in South East Asia with the number expected to rise to 123 million by 2035.[17] Patients with DM are at risk for vascular complications—from which more than 2 million die annually—that affect the extremities and multiple organs including the eyes and kidneys.[18] They are also at increased risk of tuberculosis.[37]

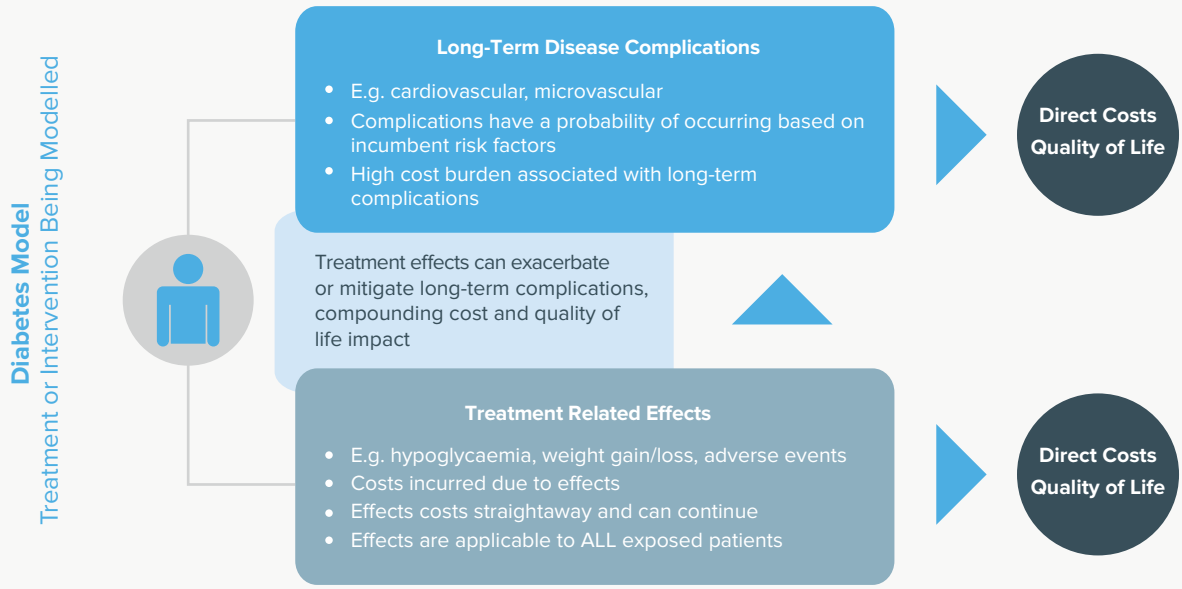
The direct global costs of the disease are significant, estimated at US$825 billion in 2014, and are borne heavily in South and Eastern Asia and among low- and middle-income countries, which bear nearly 60 percent of total costs. China alone accounts for 24.4 percent of global cases of DM and US$170 billion in costs, while India sees 15.3 percent of global cases and US$73 billion in costs. Japan, Indonesia and Pakistan each account for 2.6-2.8 percent of global costs.[18] Additional indirect costs of lost productivity result in a substantial financial cost to patients, the health sector and national economies. For instance, in Singapore, only 42 percent of total economic costs were attributable to direct medical costs of diabetes, while indirect costs of lost productivity amounted to 58 percent of the overall cost.[19]

Such high burden of the disease, plus the added threat that these costs are likely to increase in Asia, is driving the need for successful value-based health models to clarify the value for money conferred by competing interventions. Per patient costs of the disease in Singapore, for example, are projected to rise 38% between 2010 and 2050 from US$5,646 per working-age patient to US$7,791, while costs are estimated to rise 2.4-fold for the entire working-age population, due to increased prevalence, from US$787 million in 2010 to US$1,867 million in 2050.[19]

Prioritising competing interventions in diabetes

Given the significant economic impact of diabetes, there is an ongoing need to prioritise competing interventions through the analysis of their costs and benefits via complex disease modelling. Such a model that assesses 'value for money' in diabetes should take into consideration an intervention's impact on key factors that affect a patient's direct costs and quality of life. These outcomes of cost and quality of life can be influenced by two overarching factors—long-term disease complications, often linked to incumbent patient risk factors, and treatment-related effects such as adverse events or hypoglycaemia. However, treatment-related effects may further exacerbate or mitigate long-term complications that in turn can compound the impact on patient costs and quality of life (see Exhibit 3).

Exhibit 3: Drivers of Value for Money in a Diabetes Model



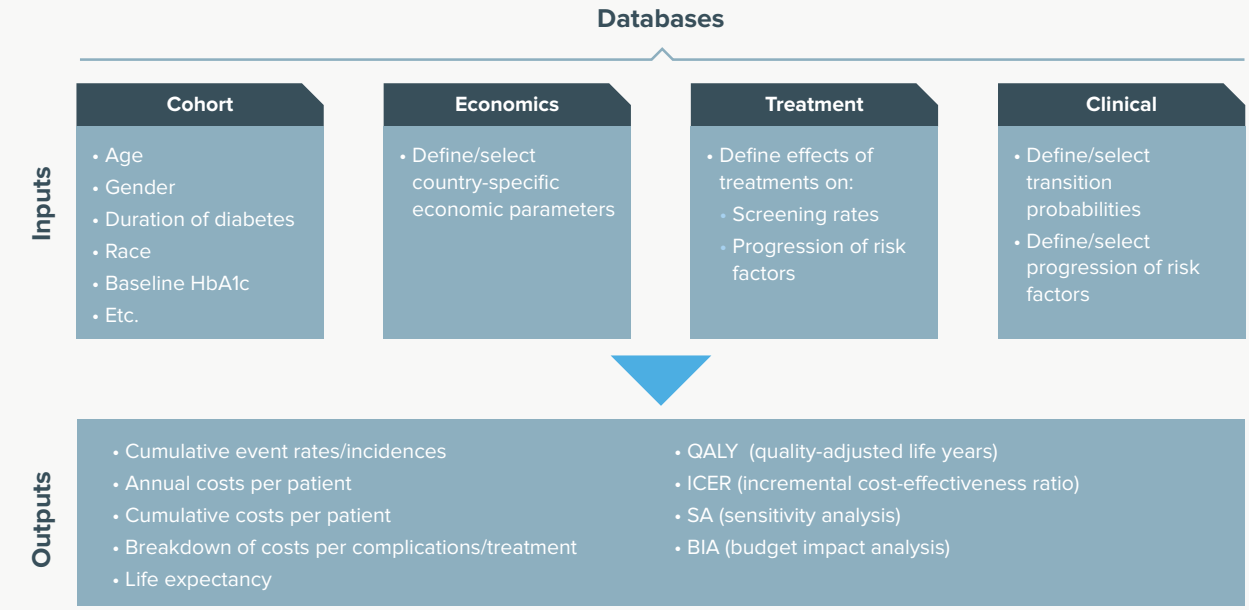
Source: IMS Real World Evidence Solutions

To create a successful model, all of this information must be gathered from payers, providers, and patients in a cohesive way, placed into a common form and synthesised to the point that researchers can create a model demonstrating the short-term costs of intervention and impact on productivity loss and, more importantly, the long-term outcomes of different treatments and other factors involved with diabetes, the cost of each, and the overall impact on society as well as the patient. The model can then potentially serve as a roadmap for payers and/or providers to select preventive and treatment interventions that can be effective in reducing costs or improving patient outcomes in the long term.

IMS CORE Diabetes Model

One such model that has been widely applied in diabetes is the IMS CORE Diabetes Model (CDM)—a microsimulation model that consists of several Markov sub-models, that predicts the long-term health outcomes and costs associated with the management of Type I DM and Type II DM (see Exhibit 4).[20] The CDM has been used extensively to evaluate the cost-effectiveness of new therapies for the treatment of diabetes[21,22] to inform reimbursement decisions, resource planning and clinical trial design, clarify public health issues and identify optimal patient management strategies.[23,24] Importantly, model validation has been a key part of the CDM's development process. A major validation exercise published in 2014 examined the operational predictive validity of the model against 121 clinical endpoints from 11 epidemiological and clinical studies,[25] and found it to be a credible tool for predicting the absolute number of clinical events tested including macrovascular and microvascular complications and all-cause mortality.

Exhibit 4: IMS CORE Diabetes Model



Source: IMS Real World Evidence Solutions

The IMS CDM has provided insights into the relative cost-effectiveness of interventions, compared them with alternative management programs, and has reduced the need for many costly, long-term clinical studies to evaluate outcomes in terms of quality and cost-efficiency.

In nearly eighty studies reported in 2007 and 2008 alone, the IMS CDM has demonstrated the long-term cost-effectiveness of several interventions for diabetes, including the comparative effectiveness of various insulins and some in combination. The insulin comparisons and other studies applied the model to government and third-party payers in at least sixteen countries. It has even been used to examine the cost-effectiveness of case management in low-income populations. Some studies restricted the value only to the payer, and others to the patient or the system as a whole.

Some of the findings of the CDM include demonstrating that better value for money was achieved by using one specific treatment over another with measurement over a patient's lifetime, that the increased costs of complications would be greater than the cost of treating the underlying diabetes and that some interventions were partially offset by a reduction in complication-costs that might have occurred. In short, the stakeholders had a better understanding of the diabetes care that they were about to face, particularly of the ability to achieve maximum value for money and potentially improved patient outcomes, through model simulation.

Applying the CDM to diabetes in Asia

The flexibility of such models to simulate the impact of various interventions will be critical in Asia, where the problem is large and will likely need to be tackled by multiple approaches. The case study here illustrates an application of the CDM in South Korea to help measure the impact of an implemented diabetes initiative and is a clear example of the ways decision modelling can not only simulate potential clinical impact over time but also compare the economic impact on investing in a specific intervention versus standard of care. This approach is valuable as on many occasions there may not be enough evidence to substantiate a value-for-money argument or return on investment of a new innovation prior to making a business decision to introducing it more widely.

Application of the CDM: Proving the value of an information-technology based diabetes management system to reduce complications in T2D patients[26]

What was the problem?

A new information technology-based glucose control system, called the Internet-Based Glucose Monitoring System (IBGMS) was implemented in South Korea at a diabetes centre. The system, through which patients and physicians could communicate interactively to enable close monitoring, also included a data-based management system including glucose monitoring charts, the ability to provide advice, education, feedback, and motivation to patients to attain glucose control, and also enabled drug modification. Although positive effects on HbA1c reduction and glucose stability had already been shown with the system,[27] further evidence was needed showing reductions in long-term complications before the system could be considered for broader application in the general population.

What was the approach to address the problem?

The IMS CORE Diabetes Model (CDM) was used to project long-term clinical outcomes of Type 2 Diabetes patients supported by IBGMS in addition to existing treatment. The objective of the study was to assess the complication reducing effect of IBGMS over a period of time. This was done by using the CDM to simulate the prevalence of diabetic complications over a 35-year period and comparing the results of the use of IBGMS with those of a conventional outpatient management system. The study demonstrated the positive effect of IBGMS, when added to existing treatment, in reducing diabetic complications (mainly microangiopathic complications, including diabetic retinopathy, diabetic neuropathy, diabetic nephropathy, and diabetic foot ulcer). This equated to additional quality of life and cost-savings. Albeit the data represented patients in a well-managed diabetes centre, it demonstrated that IBGMS and similar approaches held great promise for application in the general population.

Key takeaways:

- In this simulation test, researchers demonstrated the beneficial effect of the Internet-based glucose monitoring system on reducing diabetic complications
- Researchers were able to calculate not only the cost-saving effect resulting from the reduction of complications, but also the labour cost for maintaining the system for a long-term period
- In addition to simulating potential clinical impact, modelling was also used to calculate the return on investment in new IT technology to maximise patient outcomes (value-based health concept)

Decision modelling to improve outcomes in stroke care

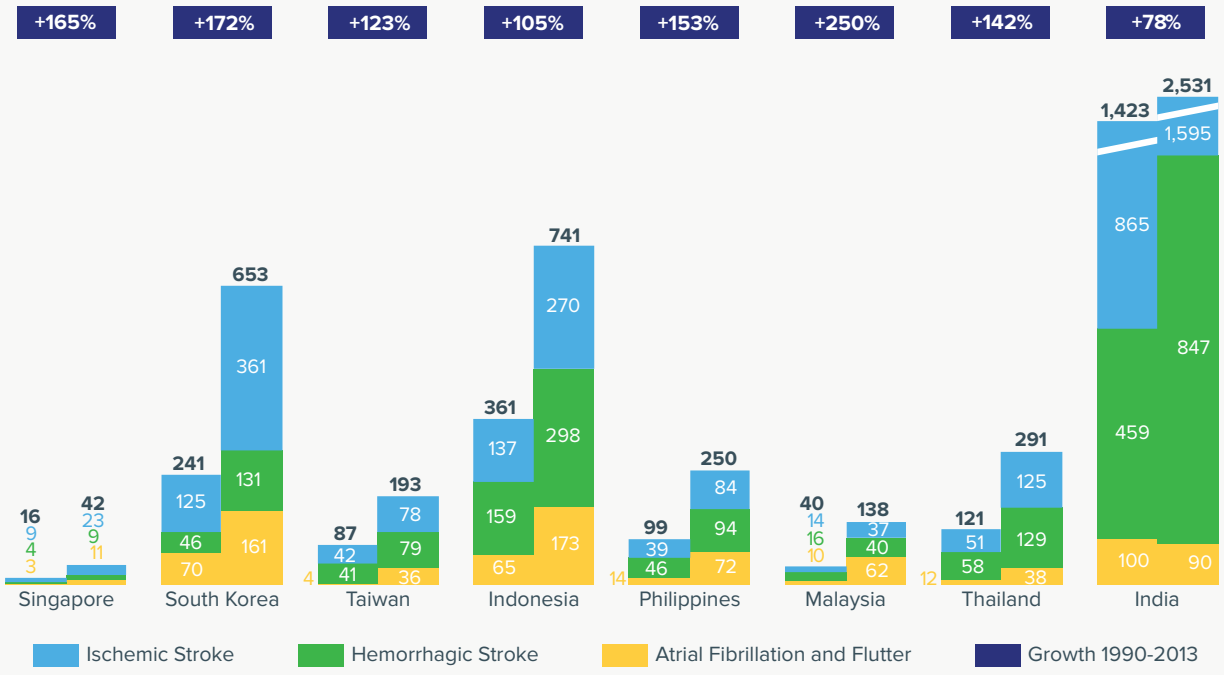
- Two-thirds of the world's deaths due to stroke are recorded in Asia where stroke cases are increasing and occurring at an earlier age than in the West
- Decision models provide an attractive vehicle for estimating the impact of the range of policies aimed at improving stroke care before committing real health resources
- The Duke-NUS Singapore Stroke Model is a dynamic population model to evaluate system-wide health and economic effect of improving the current level of stroke care considering a variety of interventions ranging from a public campaign to encourage people with symptoms to seek care promptly, to more aggressive use of therapies such as thrombolytics, endovascular therapy, rehabilitation, and medications for secondary stroke prevention

The burden of stroke in Asia

Nearly two-thirds of the world's deaths due to stroke are recorded in Asia where stroke cases are increasing and occurring at an earlier age than in the West.[28] A comparison of representative nations of South and Eastern Asia illustrates diversity in the pattern of stroke and significant growth in prevalence between 1990 and 2013 (see Exhibit 5), which is exacting a huge cost for Asian nations. On average, Asia Pacific (APAC) countries average prevalence of stroke increased from 298K in 1990 to 605K in 2013, an average growth rate of 148%.[28] Asia's incidence of stroke is mainly driven by rises in cholesterol, ageing and ethnic predisposition. There is a strong, independent, positive, and continuous association between cholesterol levels and the risk of coronary heart disease among populations from the Asia Pacific region. Genetic factors appear to contribute to the ethnic differences in the prevalence of coronary heart disease.[29] This genetic predisposition can be exaggerated by nutritional and environmental factors.[30]

The average costs per patient is also quite high. For instance, in Singapore, where stroke is the fourth leading cause of death and a top cause of hospitalisation, the average bill in 2015 for intervention without complications is US$8,000, with an acute-care hospital stay that averaged 3.9 days—double what it was in 1990.[31] Taking into account indirect costs, South Korea saw a 13.2 percent increase in spending for stroke in the past decade, to about US$3,300 per event.[32] The Taiwan cost in the first year of treatment was US$5,149 in direct costs, and half the patients were either readmitted or died within the first year.[33]

Exhibit 5: Prevalence and Growth of Stroke in the Asia Pacific Region by Stroke Type and Country, 1990 and 2013, in thousands



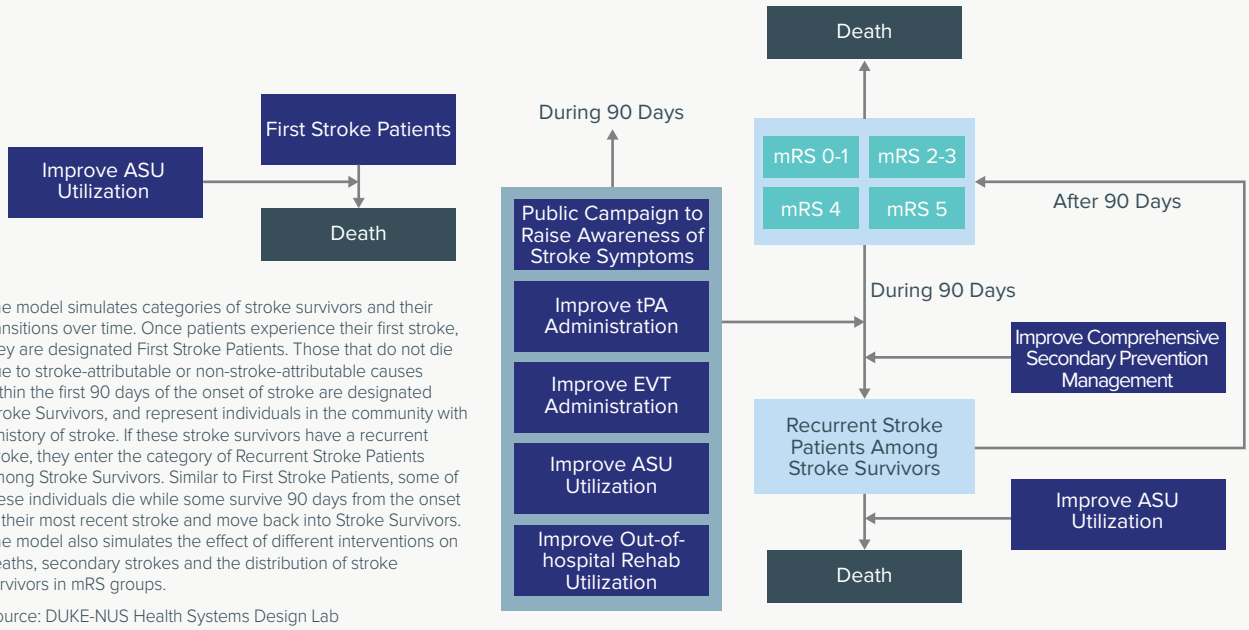
Source: IMS Real World Evidence Solutions; Derived from data in Mehndiratta MM et al. Stroke in Asia: geographical variations and temporal trends. J Neurol Neurosurg Psychiatry. 2014;85(12):1308-12
Note: Numbers may not sum to total due to rounding

Duke-NUS Singapore Stroke Model

The Health Systems Design Lab of the Duke-National University of Singapore Medical School built a system dynamics (SD) model of the stroke population in Singapore – the Singapore Stroke Model – to evaluate the population-level impact of improving the current level of stroke care on a variety of outcomes including health (e.g., survival, stroke recurrence, disability level, quality of life) and cost (intervention costs, cost savings, and net economic benefit) over a 15-year time frame.[34,35]

The model used data from the Singapore Stroke Registry—a local longitudinal survey of stroke patients—to define first and recurrent stroke incidence and current level of acute stroke management including use of tissue plasminogen activator (tPA), endovascular therapy (EVT), and the acute stroke unit (ASU); data from the Singapore Stroke Study to estimate current utilisation of out-of-hospital stroke rehabilitation; and existing international and local literature and expert opinion to estimate effectiveness and costs of stroke interventions.[34] Fifteen combinations of six different unique interventions were tested to determine their expected system-wide impact in Singapore by 2030, including acute stroke management options, a public information campaign, out-of-hospital rehabilitation and comprehensive secondary prevention interventions. Exhibit 6 shows how the model simulates categories of stroke survivors, their transitions between categories over time, and outcomes such as death or survival.

Exhibit 6: Singapore Stroke SD Model



The model simulates categories of stroke survivors and their transitions over time. Once patients experience their first stroke, they are designated First Stroke Patients. Those that do not die due to stroke-attributable or non-stroke-attributable causes within the first 90 days of the onset of stroke are designated Stroke Survivors, and represent individuals in the community with a history of stroke. If these stroke survivors have a recurrent stroke, they enter the category of Recurrent Stroke Patients among Stroke Survivors. Similar to First Stroke Patients, some of these individuals die while some survive 90 days from the onset of their most recent stroke and move back into Stroke Survivors. The model also simulates the effect of different interventions on deaths, secondary strokes and the distribution of stroke survivors in mRS groups.

Source: DUKE-NUS Health Systems Design Lab
Notes: tPA (tissue plasminogen activator); EVT (endovascular therapy); ASU (Acute Stroke Unit); mRS (modified Rankin Scale)

The process of building this simulation model allowed various stakeholders to share their understanding of the current stroke management and exchange ideas for how to do better in stroke care. The study findings are beginning to be used by the Stroke Services Improvement Initiative (SSI) and the Ministry of Health (MOH) in Singapore to inform the priorities for improving stroke care in Singapore.[34]

The holistic approach examined various strategies for improving stroke care, individually and in combination, ranging from increasing public awareness of stroke to encourage immediate care-seeking for symptoms, to use of thrombolysis or endovascular therapy (EVT), to improved secondary prevention and rehabilitation. Major insights of this exercise were:

- **Improving the standards of stroke care is, in general, cost-effective.** Crucial to this conclusion is the reduction in down line costs of acute and long-term care individuals who would otherwise be severely disabled, alongside quality of life improvements
- **Intervention strategies are often synergistic.** For example, public awareness campaigns are only effective when linked to one or more other interventions, such as a targeted effort to increase use of thrombolysis or EVT. Incorporating all stroke practice improvement strategies led to a gain of 14,330 quality-adjusted life years (QALYs) versus only 166 QALYs gained by implementing only a public-awareness campaign for the full Singapore population
- **Through the coordination of the range of effective interventions at modest extra cost, implementing an acute stroke unit could be cost saving**

The value of this modelling exercise depended on the participation of stakeholders in its development and interpretation, the inclusion of the best local data, and the generation of estimates of various policies that were of practical importance to decision makers. As a result, the Singapore Stroke Model has proven to be a useful tool for supporting informed clinical and public health policy for stroke.

Working together to implement value-based health in Asia

- Value-based approaches can optimise healthcare for the population and patients in a cost-effective manner
- All stakeholders should encourage collaboration to share meaningful real-world data and apply analytics to derive new actionable insights
- All stakeholders should consider adopting the use of decision models to simulate potential strategies, compare interventions and patient outcomes before committing real resources

For healthcare systems in Asia to fully realise the benefits of VBH, all stakeholders must join in the project of maximising the role of health informatics and modelling in guiding practice. There has been growing recognition that value-based approaches can optimise healthcare for the population and patients in a cost-effective manner. There has also been growing recognition of the importance of real-world health data and analytics to improving healthcare, as all stakeholders witness the progress made to identify best treatments, improve patient outcomes, and optimise resource allocation. However, to maximise the benefits from value-based health models can provide in Asia, all stakeholders, including hospitals, government institutions, academia, clinicians, insurance agencies, payers and manufacturers should:

- Identify as a core principle that the goal of their business is to maximise value for patients
- Revise their focus from the volume and profitability of services provided—physician visits, hospitalisations, procedures, and tests—to tailored services (including health-related social services) that optimise patient outcomes
- Encourage collaboration amongst themselves and non-health actors to build analytics competency to derive new actionable insights from their real-world data
- Consider adopting the use of decision models to simulate potential strategies, compare interventions and patient outcomes before committing real resources

The IMS Health Asia and National Cancer Centre Singapore Partnership: An Asia-specific model of collaboration aiming to improve patient outcomes[36]

Hepatocellular carcinoma (HCC) poses a huge burden across Asia, however opportunities exist to reduce this burden. Early detection and management of the disease would undoubtedly lead to better prognosis for patients. With this aim, IMS Health Asia along with Singapore Clinical Research Institute (SCRI) & National Cancer Centre Singapore (NCCS) have partnered to develop a first of its kind Hepatocellular Carcinoma Registry in Asia through the Asian HCC Physician Network. This patient registry will help in early detection, thus improving overall diagnosis and, ultimately, treatment and survival of patients suffering from this disease. The IMS Institute Asia will then develop a HCC Disease Model that will allow simulation of long-term health and economic outcomes, validated by non-identified data from this registry.

What is new about this approach?
The HCC registry includes multiple data types to create a complete longitudinal picture of the disease at individual patient-level. It also includes retrospectively collected non-identified patient data, prospectively collected clinical data to define treatment patterns, Patient Reported Outcomes (PRO) data—a questionnaire designed to collect cancer patients' quality of life information for all consented patients—and comprehensive data on direct and indirect costs of HCC patients in Asia to provide a healthcare stakeholders a specific view of the cost-effectiveness of treatment.

How can analytics be applied to improve patient outcomes?
The HCC Disease Model will provide an attractive tool both for simulating highly complex and dynamic processes (such as deriving HCC standard of care, comparing patient outcomes of various interventions) and for supporting heuristic strategic planning before committing real health resources.

This partnership will also serve a useful example to guide future collaborations between public and private healthcare actors including hospitals, government institutions, academics, practitioners and manufacturers.

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About the IMS Institute in Asia

The IMS Institute in Asia is the first collaborative platform in Asia for technology-enabled, analytics-driven approaches to improve health outcomes in Asia, bringing together relevant stakeholders to shape clinical and public policy decision-making.

Fulfilling an essential need within healthcare, the Institute in Asia delivers objective, relevant insights and research that accelerate understanding and innovation critical to sound decision-making and patient care. The Institute works in tandem with a broad set of healthcare stakeholders, including government agencies, academic institutions, the life sciences industry and payers to address today's healthcare challenges, measure outcomes and costs, develop innovations that provide value to all stakeholders, and create a healthcare system based on reimbursement for value delivered.

The IMS Institute in Asia seeks partnerships in the area of health services and systems research, decision analytic modelling, patient-centric care, and value-based healthcare. With those partners, it works to create real-world evidence-based solutions, innovative value-based healthcare and business models, technology and applications, advanced predictive analytics, and thought leadership in life science, medical technology and consumer health. The IMS Institute in Asia invites industry leaders in private and public healthcare sectors to serve on its external advisory boards to provide their expertise and input.

By collaborating on research of common interest, the IMS Institute in Asia builds on a long-standing and extensive tradition of using IMS information and expertise to support the advancement of evidence-based healthcare around the world.

Research Agenda

The research agenda for the Institute centres on five areas considered vital to the advancement of healthcare globally:

The effective use of information by healthcare stakeholders globally to improve health outcomes, reduce costs and increase access to available treatments.

Optimizing the performance of medical care through better understanding of disease causes, treatment consequences and measures to improve quality and cost of healthcare delivered to patients.

Understanding the future global role for biopharmaceuticals, the dynamics that shape the market and implications for manufacturers, public and private payers, providers, patients, pharmacists and distributors.

Researching the role of innovation in health system products, processes and delivery systems, and the business and policy systems that drive innovation.

Informing and advancing the healthcare agendas in developing nations through information and analysis.

Guiding Principles

The Institute operates from a set of Guiding Principles:

The advancement of healthcare globally is a vital, continuous process.

Timely, high-quality and relevant information is critical to sound healthcare decision-making.

Insights gained from information and analysis should be made widely available to healthcare stakeholders.

Effective use of information is often complex, requiring unique knowledge and expertise.

The ongoing innovation and reform in all aspects of healthcare require a dynamic approach to understanding the entire healthcare system.

Personal health information is confidential and patient privacy must be protected.

The private sector has a valuable role to play in collaborating with the public sector related to the use of healthcare data.

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