Advancing Cardio-renal-metabolic health in Malaysia: Connected risks, coordinated solutions

About the report

This report presents key insights into cardio-renal-metabolic (CRM) health, with a focus on identifying gaps, measuring progress, and informing policy and practice. Drawing on the latest data, and evidence, it highlights trends in population health, the burden of disease, and the effectiveness of health systems in delivering equitable, high-quality care.

Our goal is to support decision-makers, clinicians, researchers, and advocates in understanding where we are—and where we must go— to improve outcomes for people living with cardio-renal-metabolic (CRM) diseases and to slow disease progression at the national level.

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Table of Contents

Nomenclature and abbreviations **5**
Executive summary **6**
Introduction **8**
The state of cardio-renal-metabolic (CRM) diseases in Malaysia **10**
- Obesity 10
- Type 2 Diabetes (T2D) 10
- Hypertension and Dyslipidemia 11
- Cardiovascular Disease (CVD) 11
- Chronic kidney disease (CKD) 11
- The growing burden of multi-morbidity 12
- Metabolic dysfunction–associated fatty liver disease (MAFLD) and metabolic dysfunction–associated steatohepatitis (MASH) 12
- How has Malaysia fared so far? 13

Closing the gaps: What it's worth **14**
- Direct costs 14
- Indirect costs 14
- Multi-morbidity increases total healthcare costs 14

Gaps and Challenges **16**
- Policy gaps in addressing cardio-renal-metabolic (CRM) diseases 16
- Rising multi-morbidity and siloed care pathways 16
- Fragmented and opportunistic screening landscape 17
- Weak transition from screening to treatment 17
- Gaps in primary care capacity and urban-rural differences 17
- Fragmented digital health infrastructure 18
- Cost barriers and the role of private sector outsourcing 18
- Low awareness and cultural barriers 18
- Challenges in long-term self-management 19
- State-level disparities in disease burden and resources 19

Recommendations **20**
References **26**

Nomenclature and abbreviations

AHA	American Heart Association
BMI	Body Mass Index
BP	Blood Pressure
CHW	Community Health Worker
CKD	Chronic Kidney Disease
CRM	Cardio-Renal-Metabolic
CVD	Cardiovascular Disease
DRG	Diagnosis-Related Group (A Healthcare Provider Payment Classification System)
ECG	Electrocardiogram
eGFR	Estimated Glomerular Filtration Rate
EHR	Electronic Health Records
ESRD	End-Stage Renal Disease
FH	Familial Hypercholesterolemia
HbA1c	Hemoglobin A1C
HCV	Hepatitis C
HDL	High Density Lipoproteins
LDL	Low Density Lipoproteins
M40	Middle 40% Income Group In Malaysia
MAFLD	Metabolic Dysfunction-Associated Fatty Liver Disease
MASH	Metabolic Dysfunction-Associated Steatohepatitis
MySejahtera	Malaysia's National Health Management Mobile App Platform
NCDs	Non-Communicable Diseases
NSP-NCD	National Strategic Plan for Non-Communicable Diseases
ProtectHealth	Malaysian MOH-Linked Agency Coordinating Private Primary Care And Public Health Services
SDG	Sustainable Development Goals
T2D	Type 2 Diabetes
TG	Triglycerides
uACR	Urine Albumin-to-Creatinine Ratio
UHC	Universal Health Care

Executive summary

Non-communicable diseases (NCDs) are the leading cause of death and disability globally. In 2021 alone, more than 43 million people globally died from NCDs.[1] Seven of the top 10 leading causes of death were linked to NCDs, and a staggering 82% of premature NCD deaths occurred in lower-middle income countries.[2] Across the Asia-Pacific, NCDs now account for more than the global average of 74% of all deaths in 15 countries.[3]

Cardio-renal-metabolic (CRM) diseases, including cardiovascular disease (CVD), chronic kidney disease (CKD), type 2 diabetes (T2D), obesity, hypertension, dyslipidemia, and metabolic dysfunction–associated steatohepatitis (MASH), and metabolic dysfunction-associated fatty liver disease (MAFLD), represent a growing clinical and economic crisis in Malaysia. Nearly one in six adults live with diabetes, over 30% have hypertension, and CKD affects more than 15% of the population.[4] These conditions often overlap, leading to higher rates of hospitalization and premature death. In 2023, nearly 2.3 million Malaysians had a combination of three metabolic diseases. Inaction on this front is costly: in 2017 alone, the direct public healthcare cost of treating type 2 diabetes (T2D), CVD, and CKD exceeded RM 9.65 billion (US$ 2.38 billion),[5] equivalent to over 21% of the Ministry of Health's budget.[6] By 2021, indirect productivity losses from cardio-renal-metabolic (CRM) conditions had risen to RM 32 billion,[7] with premature deaths contributing RM 11.8 billion of this burden.[8]

Despite national efforts targeting NCDs, including comprehensive primary prevention efforts, Malaysia faces critical policy and implementation gaps in cardio-renal-metabolic (CRM) care. Present strategies lack comprehensive coverage of key conditions, and disease control targets remain undefined for areas other than diabetes and hypertension. Furthermore, care pathways remain siloed, failing to manage multi-morbidity effectively. Screening programs are fragmented and opportunistic, with limited access to advanced diagnostics and weak referral systems. Digital infrastructure for health systems is disjointed, and the transition from screening to treatment is poorly managed, often resulting in loss to follow-up and care discontinuity.

Structural disparities further worsen outcomes. Primary care capacity, especially in rural regions, remains constrained by shortages of doctors, diagnostics, and allied health staff. Health literacy and awareness are low, compounded by cultural stigma and poor self-management, particularly in lower-income groups. State-level inequalities in disease burden and public health spending further challenge equitable response efforts.
Without immediate and strategic investments in early detection, prevention, and integrated care, these rising costs will continue to strain both the healthcare system and the economy.

This report outlines five key recommendations to build a stronger, more integrated system for cardio-renal-metabolic (CRM) health:

1. **Develop a dedicated cardio-renal-metabolic (CRM) strategy** that strengthens and aligns existing policies (e.g. National Strategic Plan for Non-Communicable Diseases (NSP-NCD)), sets measurable targets for under-addressed conditions (e.g., CKD, T2D, obesity and MASH), and embeds integrated, multi-morbidity care across the health system.
2. **Increase investment in high-burden states.** Prioritize state and national health investments in regions with high cardio-renal-metabolic (CRM) disease burden and low service capacity, particularly rural, East Malaysian, and northern Peninsular states, using needs-based resource allocation.
3. **Establish a comprehensive screening program linked to a National Integrated Referral & Care Coordination Framework (NIRCCF).** Ensure integration of cardio-renal-metabolic (CRM) risk factors according to global guidelines. Implement clear care pathways, referral protocols, and shared digital health records to support early detection and continuity of care.
4. **Leverage public-private partnerships and digital tools** to boost primary care capacity and improve access to diagnostics and chronic disease management through structured outsourcing, shared digital platforms, and value-based financing models to enhance early detection, chronic disease management, and equitable access, especially in overstretched public health settings.
5. **Elevate health literacy and patient self-management** through culturally tailored, digitally enabled, and community-driven approaches to improve cardio-renal-metabolic (CRM) awareness, patient activation, and long-term disease self-management, especially among vulnerable, low-literacy, or rural populations.

Together, these five shifts offer a comprehensive path towards a proactive, integrated, and equitable cardio-renal-metabolic (CRM) response – one that reduces disease burden, enhances quality of care, and delivers better health outcomes for all Malaysians.

Introduction

Non-communicable diseases (NCDs) are the leading cause of death and disability globally. In 2021 alone, more than 43 million people globally died from NCDs, accounting for 75% of non-pandemic-related deaths[9]. Seven of the top 10 leading causes of death were linked to NCDs, and a staggering 82% of premature NCD deaths occurred in lower-middle income countries[10]. Across the Asia-Pacific, NCDs now account for more than the global average of 74% of all deaths in 15 countries[11].

Within this broader NCD crisis lies a particularly urgent and complex cluster: cardio-renal-metabolic (CRM) diseases. These include cardiovascular disease (CVD), chronic kidney disease (CKD), type 2 diabetes mellitus (T2D), hypertension, obesity, dyslipidaemia, and metabolic liver disease. These conditions share common biological, behavioural, and social risk factors, and often occur together converging into a cardio-renal-metabolic (CRM) multi-morbidity syndemic that is outpacing the capacity of most health systems to manage it effectively[12].

Malaysia's cardio-renal-metabolic (CRM) burden reflects these global trends. CVD is the leading cause of death in the country. The country also faces high rates of obesity, CKD, diabetes, and metabolic liver disease – conditions which often coexist, driving multi-morbidity and compounding health risks. While Malaysia has taken considerable steps to address NCDs through preventive policies targeting nutrition and service delivery, progress has been uneven. Gaps in policy coherence, financing and implementation continue to hinder effective cardio-renal-metabolic (CRM) disease control.

The 2015 United Nations Sustainable Development Goal (SDG) 3.4 commits countries to reducing premature NCD mortality by one-third by 2030[13]. However, Malaysia's NCD response, like that of many regional peers, has yet to fully reflect the interconnected nature of cardio-renal-metabolic (CRM) conditions required to effectively meet this goal. Care remains siloed and screening efforts remain fragmented – limiting the effectiveness of early intervention and long-term management.

Despite targeted efforts to manage individual conditions, including comprehensive strategies for primary prevention, the overall burden of cardio-renal-metabolic (CRM) multi-morbidity in Malaysia continues to escalate. One in six adults have diabetes, while hypertension and high cholesterol each affect approximately one-third of the adult population, many of whom remain undiagnosed or poorly controlled. Geographic inequities in access to diagnosis and treatment are creating inequitable health outcomes. Vulnerable groups, including older adults, rural communities, and those in the bottom income quintile, experience disproportionately high rates of preventable complications such as end-stage kidney disease, stroke, and heart failure, further compounding inequities in cardio-renal-metabolic (CRM) health.

At the global level, the World Health Organization's Global Action Plan for the Prevention and Control of Noncommunicable Diseases[14] offers a clear framework. It emphasizes a life-course approach, recognizing that health outcomes are shaped from prenatal stages through to older age. It advocates for evidence-based strategies, a rights-based and equity-driven framework, and emphasizes universal health coverage (UHC) – all of which are critically relevant to Malaysia's cardio-renal-metabolic (CRM) landscape. The plan also calls for the empowerment of people and communities, strong multisectoral action while managing potential conflicts of interest, and national efforts backed by international cooperation – all essential for sustainable progress.

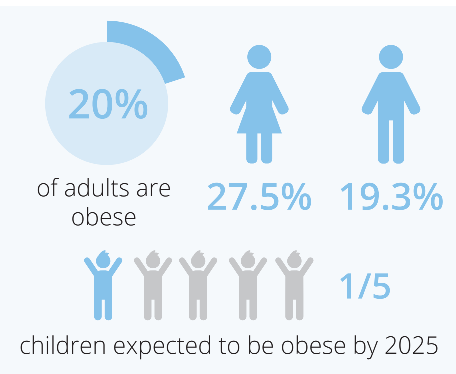
Countries such as Taiwan, Singapore, Spain, Brazil, and Mexico are already integrating these principles through national cardio-renal-metabolic (CRM) strategies that align digital health, financing, and care coordination across the health system. Taiwan's "Healthy Taiwan" policy vision and its 888 Program[15] leverage digital health, multidisciplinary teams, and set explicit targets for cardio-renal-metabolic (CRM) risk factor control. Spain's Clinical Care Pathway Assessment Project (CARPA)[16] is a national initiative that optimizes referral pathways for metabolic liver disease, integrating primary and specialist care. Brazil's Family Health Strategy[17] deploys multidisciplinary primary care teams with community health agents to focus on prevention and chronic disease management, while Mexico's Integrated Care Networks[18] connect primary, secondary, and tertiary services through regional models to support patients with chronic conditions. Taiwan's CHIPS-C program[19] is a shared care model that addresses the close link between Hepatitis C (HCV) and diabetes i*ncreases insulin resistance and the risk of diabetes, while co-infection worsens liver, kidney, and heart outcomes*), by integrating HCV and chronic disease care through multidisciplinary teams, digital tools, and primary care-based pathways – demonstrating how coordinated care can improve outcomes and strengthen health system responses to multi-morbidity. Singapore's Chronic Disease Management Programme (CDMP) supports affordable, long-term management of chronic conditions through subsidized, MediSave payable, team-based care in primary settings, which includes personalized screening for interrelated factors, individualized diet counseling, device instruction, lifestyle modifications such as smoking cessation, and nurse-led follow-up.[20,21]

Malaysia now faces a pivotal opportunity to modernize its health strategies in light of emerging scientific insights into the interconnected nature of cardio-renal-metabolic (CRM) conditions. Traditional disease-specific frameworks, while important in their time, do not fully capture the overlapping pathways that link type 2 diabetes, heart failure, chronic kidney disease, obesity, and metabolic dysfunction–associated steatohepatitis (MASH). Recognizing these connections opens the door for Malaysia to accelerate a transition from siloed approaches to an integrated, patient-centered model of care. Such a shift would enable the country to reduce premature mortality, tackle health inequities, and advance its commitments to universal health care (UHC) and sustainable outcomes in cardio-renal-metabolic (CRM) health. Aligned with the World Health Organization's (WHO) principles for addressing NCDs, this report focuses on strengthening essential enablers—early detection, integrated care models, care coordination, and system readiness—ensuring Malaysia can achieve more comprehensive, measurable, and transformative progress in managing cardio-renal-metabolic (CRM) diseases.

The state of cardio-renal-metabolic (CRM) diseases in Malaysia

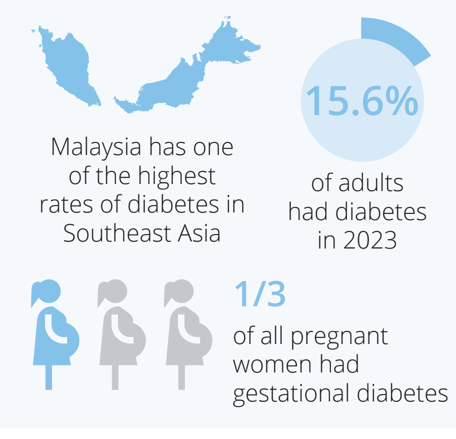
Cardio-renal-metabolic (CRM) diseases form a spectrum of interconnected chronic diseases encompassing cardiovascular disease (CVD), chronic kidney disease (CKD), type 2 diabetes (T2D), hypertension, obesity, dyslipidemia, and, more recently, metabolic dysfunction–associated steatohepatitis (MASH) and metabolic dysfunction-associated fatty liver disease (MAFLD). These conditions are driven by overlapping risk factors such as metabolic syndrome, insulin resistance, obesity, sedentary lifestyles, and unhealthy diets. In Malaysia, the burden of cardio-renal-metabolic (CRM) has reached alarming levels and poses a significant public health challenge due to rising prevalence, early onset, high rates of multi-morbidity and a growing aging population.

Obesity



Obesity is a significant and growing health concern in Malaysia, with about 20% of adults classified as obese and an additional 30% considered overweight, making Malaysia the country with the highest adult obesity rate in Southeast Asia.[22] According to 2024 Global Obesity Observatory data, the prevalence of obesity is substantially higher among women than men, at 27.5% vs. 19.3%.[23] Worryingly, obesity rates are projected to rise sharply, with estimates suggesting that up to 41% of adults could be obese by 2035[24] if current trends continue. Childhood obesity is also on the rise. The national prevalence of childhood and adolescent obesity nearly tripled from 5.4% in 2006 to 14.8% in 2019.[25,26] These statistics highlight the urgent need for effective public health interventions to address obesity in Malaysia.

Type 2 Diabetes (T2D)

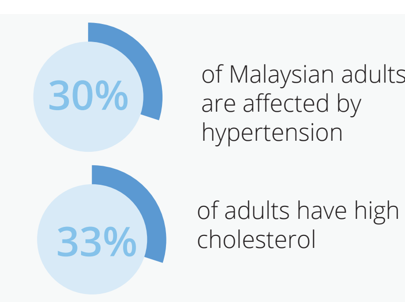


[a] Type of diabetes not specified

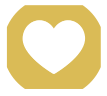
Malaysia has one of the highest rates of diabetes in Southeast Asia. According to the National Health and Morbidity Survey (NHMS) 2023, the prevalence of diabetes[a] among adults aged 18 and above was 15.6% in 2023,[27] a significant increase from 11.2% in 2011. Key findings from the National Health and Morbidity 2023 survey indicate that diabetes prevalence among Malaysian adults is 15.6%, of which 2 in 5 cases are undiagnosed.[28] Women with a history of gestational diabetes have a three to four times higher risk of developing metabolic syndrome

and are at significantly increased risk of type 2 diabetes, especially in the six to 15 years following pregnancy.[29,30] Their children are up to eight times more likely to develop prediabetes or T2D by the age of 19 to 27.[31] Children born from gestational diabetes pregnancies are also at increased risk of later metabolic syndrome, cardiovascular disease, and cognitive impairment.[32,33] In 2022, nearly one-third of all pregnant women had gestational diabetes in Malaysia, more than double the prevalence six years prior.[34] This growing burden highlights the urgent need for stronger prevention, early detection, and lifelong management strategies that include targeted intervention.

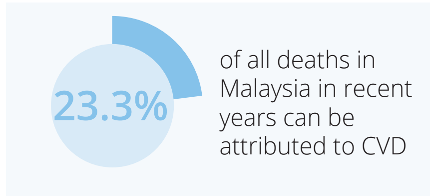
Hypertension and Dyslipidemia



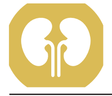
Hypertension affects nearly 30% of Malaysian adults, with nearly 12% being undiagnosed.[35] Dyslipidemia is characterized by elevated low-density lipoproteins (LDL; 'bad cholesterol'), low high-density lipoproteins (HDL; 'good cholesterol'), and high triglycerides (TG). In Malaysia, 33% of adults have high cholesterol, and half of them are unaware of the disease, as there are often no symptoms. 44% of the population's dyslipidemia is driven by high LDLs. Most Malaysians have sufficient 'good cholesterol' and only 23% have high TG levels.[36] These conditions often coexist with T2D, significantly increasing the risk of both cardiovascular and renal complications.



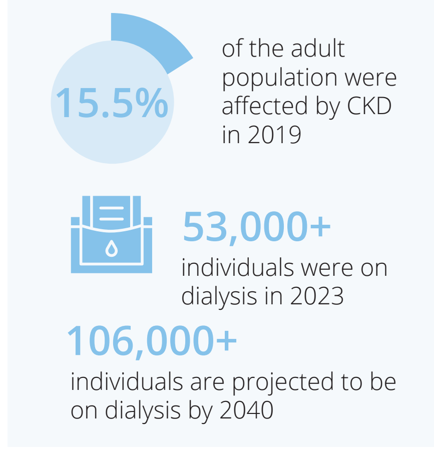
Cardiovascular Disease (CVD)



CVD remains the leading cause of death in Malaysia, accounting for approximately 23.3% of all deaths in recent years.[37] In 2022, ischemic heart disease alone caused 20,322 deaths, making up 16.1% of all medically confirmed deaths in the country.[38] Alarmingly, CVD is affecting younger populations, with over a third (35.2%) of heart attack-related deaths occurring in individuals under 60, and nearly one-third of fatalities among those aged 40 to 59.[39,40] The burden of CVD is projected to rise further due to an aging population and increasing prevalence of risk factors.



Chronic kidney disease (CKD)



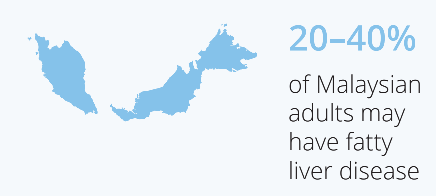
CKD is one of the most pressing and costly public health challenges in Malaysia today. In 2019, its prevalence was estimated at 15.5%[41] of the adult population—a steep rise from 9.07%[42] in 2011—indicating that nearly one in six Malaysians may be living with CKD. Alarmingly, most cases remain undiagnosed until the disease is already advanced, missing the critical window for early intervention.

This delay has serious consequences. Each year, around 10,000 Malaysians

progress to kidney failure requiring dialysis[43]. As of 2023, over 53,000 individuals were on dialysis[44], and this number is projected to double to more than 106,000 by 2040[45]. This not only strains the public health system—with dialysis consuming a significant share of the national healthcare budget—but also affects patients' quality of life, workforce participation, and long-term outcomes.

Despite its scale, CKD remains under-recognized in national strategies, and early-stage interventions—such as risk-based screening, better glycaemic and blood pressure control, and use of reno-protective therapies—are still inconsistently implemented. Strengthening CKD prevention and care, particularly at the primary care level, is vital to averting a full-blown kidney disease crisis.

Metabolic dysfunction–associated fatty liver disease (MAFLD) and metabolic dysfunction–associated steatohepatitis (MASH)



20–40%

of Malaysian adults may have fatty liver disease

MAFLD refers to the build-up of fat in the liver due to metabolic dysfunction, while MASH is its more severe form, marked by inflammation and liver cell damage that can progress to fibrosis, cirrhosis, and liver cancer[46].

While CKD poses a clear and growing threat, MAFLD and MASH are rapidly emerging as underappreciated drivers of the cardio-reno-metabolic disease burden in Malaysia. Fuelled by the rise in obesity, type 2 diabetes (T2D), dyslipidaemia, and hypertension, MAFLD is now the most common cause of chronic liver disease in the country[47].

An estimated 20–40% of Malaysian adults[48,49]—and over 60% of people with T2D[50]— may have fatty liver disease, though often undiagnosed. MASH, the more advanced inflammatory and fibrotic form, is associated with increased risk of liver cirrhosis and liver cancer. Already, MAFLD accounts for 15.4% of cirrhosis cases[51] and 35.7% of hepatocellular carcinoma cases[52] in Malaysia—figures that are expected to rise as metabolic conditions continue to surge.

Critically, MAFLD and MASH are not liver diseases in isolation. They significantly increase cardiovascular and kidney disease risks, and in fact, many patients are more likely to die of heart or kidney failure than of liver-related complications.

The growing burden of multi-morbidity

500,000+

adults in Malaysia live with all four major risk factors: type 2 diabetes (T2D), hypertension, high cholesterol, and obesity

Many patients present with overlapping conditions, reflecting the interconnected pathophysiology of cardio-renal-metabolic (CRM) diseases. Over half a million adults in Malaysia live with all four major risk factors: type 2 diabetes (T2D), hypertension, high cholesterol, and obesity, and an estimated 2.5 million people are affected by any combination of the three.[53] The National Diabetes Registry (2013–2019) found that among adults with T2D, 80.4% had hypertension, 74.3% had dyslipidemia, 14.6% had developed kidney damage, and 5.9% developed ischemic heart disease.[54] Among MAFLD patients, 25% had diabetes[a], 76% had high cholesterol, and 48% had hypertension.[55] Among CVD patients, 40% had high cholesterol, 30% had hypertension, and 20% had diabetes , yet few had been assessed for these.[56]

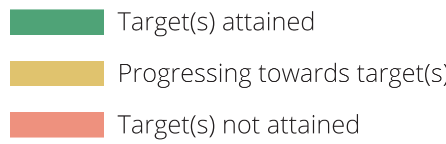
[a] Refers to diabetes inclusive of type 1, type 2 and gestational diabetes

How has Malaysia fared so far?

Malaysia has taken considerable strides in addressing the rising burden of non-communicable diseases (NCDs), including metabolic diseases, through its main overarching NCD policy, supported by preventative strategies and policies that target nutrition and obesity and improvements in health service delivery. However, despite this, targets have not been achieved across all policies. A key driving factor for this is gaps in policies, guidelines, financing, and actual implementation of interventions across the patient pathway from prevention, detection, and treatment, particularly in addressing multi-morbidity and the interconnectedness of cardio-renal-metabolic (CRM) diseases.

Table 1: Policies and progress on targets

Progress	Policy/Strategy	Timeline	Target Progress
	National Strategic Plan for Non-Communicable Diseases (NSP-NCD)[57]	2016–2025	The probability of dying from any cardiovascular disease, cancer, diabetes and chronic respiratory disease for Malaysians between 30-70 years old increased from 19.6% in 2016 to 19.9% in 2021.[58]
	National Action Plan for Healthy Kidneys (ACT-KID)[59]	2018–2025	New dialysis patients increased by 24.6% from 2017 to 2023.[60]
	Salt Reduction Strategy to Prevent and Control Non-Communicable Diseases (NCDs) in Malaysia[61]	2021–2025	79% of Malaysians consume 2.9g more sodium than the recommended daily salt intake.[62]
	Policy Options to Combat Obesity in Malaysia[63,64]	2016–2025	Combined adult obesity and overweight rates increased from 44.5% in 2011 to 54.4% in 2023.[65]
	National Plan of Action for Nutrition of Malaysia (NPANM) III[66]	2016–2025	On average, adults consume only 2 servings of fruit and/or vegetables per day instead of the recommended 5 servings per day.[67]
	National Strategic Plan for Cancer Control Program (NSPCCP)[68]	2021–2025	Cancer mortality increased from 12.6% in 2022 to 13.8% in 2023, with liver cancer coming in 5th among Malaysia's top 5 cancers.[69]



Closing the gaps: What it's worth

Addressing the gaps in cardio-renal-metabolic (CRM) care is not just a clinical imperative – it's an economic one. The financial toll of type 2 diabetes (T2D), cardiovascular disease (CVD), and chronic kidney disease (CKD) on Malaysia's health system is staggering. These conditions not only drive some of the highest direct medical costs in the public sector but also impose a massive productivity burden on the nation.

RM 9.65 billion in 2017
the combined direct annual cost of treating T2D, CVD, and CKD in the public health sector

RM 32 billion in 2021
indirect costs from CVD and diabetes

RM 11.8 billion in 2021
premature death cost from CVD and diabetes alone

Direct costs

A 2022 World Health Organization and Ministry of Health Malaysia report found that the direct health care costs from diabetes, cardiovascular disease, and cancer in Malaysia exceeded RM9.65 billion yearly. The estimated total health-care cost for diabetes was RM 4.38 billion (45.38% of total costs), followed by CVD with RM 3.93 billion (40.73%), and cancer with RM 1.34 billion (13.89%).[70] In 2016, end-stage renal disease (ESRD) alone accounted for approximately RM 1.12 billion (around US$785 million, PPP 2016), 4.2% of total public-sector health expenditure.[71]

Hospitalization costs[72]

In 2017, hospitalization costs for CVD reached RM 1.01 billion, while diabetes-related admissions cost RM 128.6 million. Within these, dialysis-related hospitalizations alone amounted to RM 13.63 million for CVD and RM 44.54 million for diabetes[b].

Outpatient costs[73]

In 2017, of the RM 3.13 billion spent on primary care and outpatient services for diabetes[b], an overwhelming 98.74% (RM 3.09 billion) was attributed to renal dialysis, a direct consequence of diabetes-related kidney failure.
Similarly, for CVD, 92.23% (RM 951.4 million) of outpatient and primary care expenditure was spent on dialysis, largely driven by kidney damage caused by uncontrolled hypertension.

Indirect costs

Indirect costs from CVD and diabetes[b] amounted to RM 32 billion[74] in 2021 due to absenteeism and reduced work productivity. Premature death cost Malaysia RM 11.8 billion in 2021 from CVD and diabetes[b] alone.[75] Poorly managed conditions cost more in terms of productivity loss. The presence of diabetes[b] complications, often a proxy for poor disease control, was associated with an additional 3.2 work-loss days within a two-week period compared to those without complications.[76]

Multi-morbidity increases total healthcare costs

The presence of two or more comorbidities can increase total healthcare costs by two to four times. Patients with multiple cardio-renal-metabolic (CRM)

[c] chronic kidney disease (CKD) estimates were based on the definition in the source report 'dialysis from diabetic complications'
[b] Refers to diabetes inclusive of type 1, type 2 and gestational diabetes

The presence of two or more comorbidities can increase total healthcare costs by two to four times.

conditions – such as T2D, CVD, and CKD – incur significantly higher healthcare costs compared to those with a single condition. Patients with both CKD and T2D, for instance, had annual healthcare costs more than double those with only one of these conditions.[77] In Malaysia, the total treatment cost for CVD events was RM 4.8 million (US$ 1.13 million) for T2D patients compared to RM 3.7 million (US$ 0.871 million) for those without T2D[78]. The cost escalation is driven by increased hospitalizations, medication use, specialist visits, and complications. This pattern holds across various healthcare systems and is especially pronounced as the number and severity of comorbidities rise, underscoring the substantial economic burden of multi-morbidity and the importance of integrated care strategies.

These figures underscore a crucial message: the cost of inaction is high, making it urgent for policymakers to prioritize early intervention, integrated care, and

RM 4.8 million

the total treatment cost for CVD events for T2D patients

RM 3.7 million

the total treatment cost for CVD events for patients without T2D

Gaps and Challenges

While the country has a broad national strategy for non-communicable diseases (NCDs) and has targeted shared risk factors in the growing burden of cardio-renal-metabolic (CRM) diseases (which include cardiovascular disease (CVD), chronic kidney disease (CKD), diabetes, obesity, and metabolic-associated steatotic liver disease through primary prevention strategies, several critical gaps remain in how interconnected conditions are addressed, both at the policy and implementation levels.

There is an absence of specific policy targets for key cardio-renal-metabolic (CRM) conditions such as hypercholesterolemia, CKD, CVD, and metabolic dysfunction–associated steatohepatitis (MASH).

Policy gaps in addressing cardio-renal-metabolic (CRM) diseases

Malaysia's main NCD policy, the National Strategic Plan for Non-Communicable Diseases (NSP-NCD),[79] focuses on diabetes[b], obesity, and hypertension. However, there is an absence of specific policy targets for other key cardio-renal-metabolic (CRM) conditions such as hypercholesterolemia, CKD, CVD (especially heart failure), and metabolic dysfunction–associated steatohepatitis (MASH). MASH, in particular, is not included in clinical guidelines or the national policy framework despite its increasing relevance. While the 2023 Malaysian Clinical Practice Guidelines (CPG) for Obesity management[80] explicitly categorize obesity as a chronic disease requiring long-term, multidisciplinary care, public health initiatives often frame it as a preventable risk factor to emphasize lifestyle interventions, which limit the scope of preventive and treatment initiatives.

Rising multi-morbidity and siloed care pathways

This fragmented approach is especially problematic given the rising incidence of multi-morbidity in Malaysia. Many adults are now living with combinations of diabetes, hypertension, high cholesterol, and obesity. Despite this, clinical pathways remain siloed, with little integration across disease areas. For instance, ACT-KID, the national policy on kidney health, does not include heart failure detection in CKD patients, even though the prevalence of heart failure is significant among dialysis patients and less than half of adults with CVD risk factors such as T2D, hypertension, and cholesterol are diagnosed, highlighting significant gaps in screening and disease awareness.[81]

[b] Refers to diabetes inclusive of type 1, type 2 and gestational diabetes

Fragmented and opportunistic screening landscape

Another critical area of concern is the approach to screening and early detection. Current efforts are opportunistic and have the potential to systematically detect cardio-renal-metabolic (CRM) diseases early. Programs such as *Jom Saring* under the Agenda Nasional Malaysia Sihat (ANMS)[82] encourage citizens to screen for NCDs, but they remain fragmented and difficult for many to navigate. While basic screenings for body mass index (BMI), blood pressure (BP), glucose, and cholesterol are available, the scope is limited. More advanced and relevant tests, such as urine dipstick tests, urine albumin-to-creatinine ratio (uACR), liver function tests, NT-proBNP for heart failure, or assessments for metabolically obese normal-weight individuals, are not included in standard offerings.[83] Compounding the issue is the lack of a recall system to remind individuals of periodic screening, minimal involvement of insurance providers or employers in promoting preventive screenings, and substantial differences in health screening rates across states.

Weak transition from screening to treatment

The transition from screening to treatment in Malaysia is affected by a combination of health system constraints and patient-level factors, which can weaken referral completion and timely follow-up. Furthermore, primary care clinics face challenges such as limited coordination with higher-level facilities and variable use of tools to track referrals and follow-up, increasing the risk of an incomplete care journey.[84,85]

In Sarawak, **45%** of rural clinics do not have doctors, and **39%** of the state's public health clinics do not have pharmacists. **70.7%** of the clinics do not have laboratory services, and **88.9%** do not have x-ray services.[89,90]

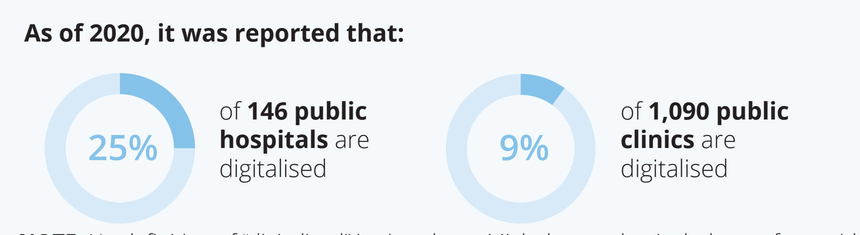
Gaps in primary care capacity and urban-rural differences

Primary care, while well-positioned to serve as the first line of defense, also faces several barriers. Many general practitioners are not equipped to manage patients with multiple chronic conditions, as they often deal with complex medication regimens and lack access to adequate training, comprehensive diagnostic tools, and integrated patient records. The lack of structured chronic disease management models, combined with resource limitations in many rural areas, further hampers early detection and ongoing care. In some regions, particularly in East Malaysia, clinics lack essential services such as laboratory testing, x-ray facilities, and even doctors or pharmacists.[86,87] Long distances to healthcare facilities in rural communities, such as in Sungai Pelek,[88] add further strain and often lead to delayed diagnoses and treatment.

Fragmented digital health infrastructure

Strengthening digital health infrastructure is a national priority for Malaysia, with plans to establish an integrated healthcare ecosystem anchored on nationwide use of electronic medical records by 2030. However, despite the deployment of multiple digital systems across public hospitals over the years, data sharing between facilities remains limited. Uneven uptake of electronic systems reflects several persistent challenges, including fragmented system architectures that hinder interoperability, the absence of comprehensive legal and regulatory frameworks governing health data and patient rights, and insufficient user training to support confident adoption. Thus, levels of digitalization across public hospitals and clinics remain relatively low.[91]

As of 2020, it was reported that:



NOTE: No definition of "digitalised" is given here. Might be good to include one for avoidance of doubt and improved understanding of what it entails.

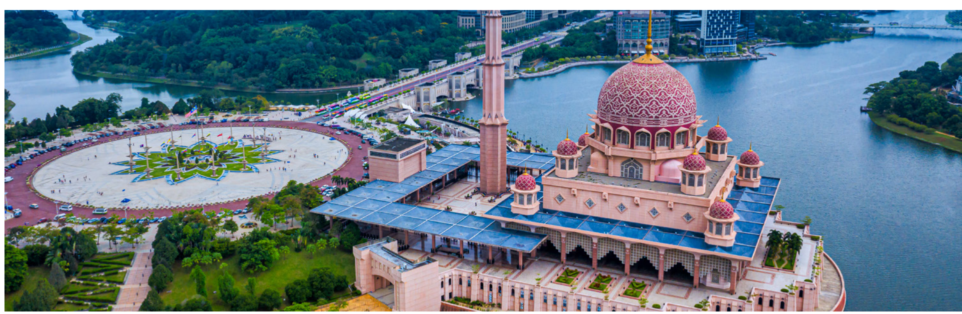
Figure 1 *Low digitalization of public hospitals and clinics[92] (https://www.krinstitute.org/publications/digital-health-records-in-malaysia-the-journey-and-the-way-forward)*

Cost barriers and the role of private sector outsourcing

Affordability is another barrier to care. Public hospitals often struggle with high patient volumes and long waiting times.[93] While private healthcare providers can bridge some of these gaps, the costs are often prohibitive for lower-income groups. The Hospital Services Outsourcing Programme (HSOP) launched in 2024,[94] has improved access to diagnostic and surgical services by outsourcing patients from public to private facilities. However, enabling seamless data sharing between facilities continues to be key priority for Malaysia.[95,96]

Low awareness and cultural barriers

Compounding these structural issues is a widespread lack of awareness and health literacy among the population. Many Malaysians, particularly those in rural areas or with lower education levels, have a limited understanding of preventive health screenings and the importance of early detection.[97] Cultural beliefs and fear of diagnosis also play a role, with many individuals avoiding health checks due to perceived stigma or fatalism about chronic illness.[98] As of 2023, nearly half of adults had not undergone screening for diabetes, hypertension, or high cholesterol in the past year. Despite government efforts to provide free screenings for the bottom 40% income group, uptake has been low, with only 22% participation.[99]



Challenges in long-term self-management

Finally, even among patients already diagnosed with cardio-renal-metabolic (CRM) conditions, self-management remains a significant challenge. Only 48% of patients with hypertension have their blood pressure under control, and just 44% own a home blood pressure monitor.[100] Among people with diabetes, more than half do not have adequate glycemic control, and only two in five have access to a glucometer.[101] This reflects broader systemic issues in patient education, access to tools for self-monitoring, and support for long-term disease management.

State-level disparities in disease burden and resources

There are also substantial disparities between states in terms of cardio-renal-metabolic (CRM) burden and the capacity to respond. States such as Kedah, Negeri Sembilan, Perlis, and Terengganu have type 2 diabetes (T2D) rates 1.5–2 times the national average. Others, including WP Labuan (12.5%), Pahang (11.4%), and Johor (9.4%), report the highest rates of undiagnosed T2D.[102] These same states often have lower per capita health spending (less than RM2,000 per person), which limits the capacity of state health departments to roll out locally tailored cardio-renal-metabolic (CRM) programs.[103]

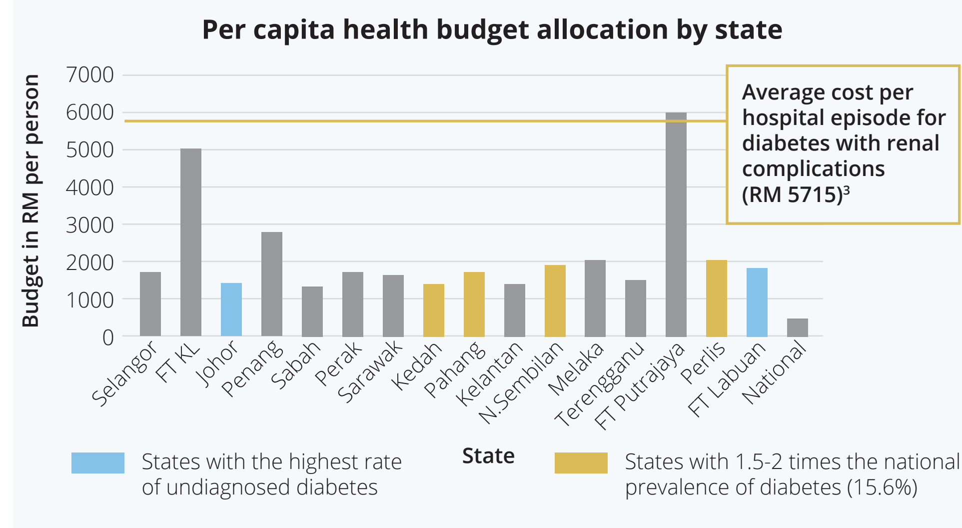


Figure 2* *State spending is low across all states and is of greater consequence in those with a higher burden of disease. Kedah, N. Sembilan, and Perlis *have very high diabetes prevalence rates that are 1.5-2 times that of the 2023 national rate of 15.6%.[104]* ***WP Labuan*** *(12.5%), followed by* ***Pahang*** *(11.4%) and* ***Johor*** *(9.4%), have the highest rates of undiagnosed diabetes.[105] These states also have low spending on health, with an overall state health budget of about 2000RM or less per person.[106] The national health budget was recorded at RM2,521 per person in 2023. Despite a 4% increase from 2022, this may not be adequate to meet patient needs, as the average cost of a single diabetes-related hospitalization was found to be RM5,444 in 2017[107]*

In summary, while Malaysia has made commendable strides in recognizing and responding to the burden of NCDs, significant gaps remain in addressing the interconnected spectrum of cardio-renal-metabolic diseases. These include missing targets for critical conditions, fragmented care pathways, inequitable access to services, low public awareness, and a lack of integration across sectors and systems. A more cohesive national cardio-renal-metabolic (CRM) strategy is urgently needed, one that reflects the realities of multi-morbidity, integrates prevention and treatment and bridges the divides between public and private healthcare providers.

Recommendations

Malaysia must adopt a whole-of-system approach that builds on existing policies while filling critical gaps across the care continuum.

Malaysia is at a pivotal moment in addressing cardio-renal-metabolic (CRM) diseases. The rising burden of type 2 diabetes (T2D), cardiovascular disease (CVD), chronic kidney disease (CKD), obesity, and metabolic conditions is outpacing the health system's current capacity, both in prevention and in care. The evidence is clear: poor awareness, fragmented care, late diagnoses, under-resourced regions, and clinical inertia are accelerating disease progression and compounding costs.

To reverse these trends, Malaysia must adopt a whole-of-system approach that builds on existing policies while filling critical gaps across the care continuum. The following five recommendations provide a roadmap for action. They focus on aligning strategy and resources to where the needs are greatest, improving detection and care coordination, strengthening primary care capacity through innovative public-private models, and elevating health literacy and self-management among patients and the public.

These are not isolated interventions; they are interconnected levers that, together, can shift Malaysia's cardio-renal-metabolic (CRM) response from reactive to proactive, integrated, and patient centered. Taking timely action is important, as delays may lead to increased health-related costs, reduced productivity, and greater strain on the healthcare system.

Recommendation 1:
Develop a cardio-renal-metabolic (CRM) strategy that strengthens existing policies to address cardio-renal-metabolic (CRM) gaps across the care continuum.

Recommendation 2:
Increase state and national investment in priority geographies for early detection of cardio-renal-metabolic (CRM) diseases.

Recommendation 3:
Establish a comprehensive screening program linked to a National Integrated Referral & Care Coordination Framework (NIRCCF).

Recommendation 4:
Introduce comprehensive public-private strategies, leveraging digital strategies and financing models to strengthen Malaysia's primary care resourcing for early detection, chronic disease management, and equitable access.

Recommendation 5:
Strengthen public health literacy, patient awareness, and self-management through culturally tailored, digitally enabled, and community-driven approaches.

Recommendation 1: Develop a cardio-renal-metabolic (CRM) strategy that strengthens existing policies to address cardio-renal-metabolic (CRM) gaps across the care continuum.

1. Expand the cardio-renal-metabolic (CRM) definition

Recognize chronic kidney disease (CKD) as an area of critical concern, include metabolic dysfunction–associated steatohepatitis (MASH) as an area of future importance and recognize obesity as a disease, not just a risk factor, and include them in the cardio-reno-metabolic (CRM) strategy and National Strategic Plan for Non-Communicable Diseases (NSP-NCD) to ensure policy and intervention alignment.

2. Set national targets and KPIs

Establish clear targets for detection, management, and prevention of cardio-renal-metabolic (CRM) conditions - CKD, cardiovascular disease (CVD), MASH, obesity, hypercholesterolemia, with regular review cycles. Align with future NCD-NSP updates. For CKD, ensure critical catch-up targets are included, particularly early screening and detection and awareness.

3. Implement a comprehensive screening plan

Target high-risk groups and regions (e.g., postpartum women with gestational diabetes history, adolescents with family risk, and states with high undiagnosed diabetes).

Leverage technology and public-private partnerships (e.g., community pharmacies and use MySejahtera to monitor test results, referrals, medication) to expand reach, especially in underserved areas.

4. Strengthen treatment and early intervention

Address gaps in reimbursement, access, adherence, and clinical inertia to prevent the progression and onset of related cardio-renal-metabolic (CRM) conditions.

5. Update clinical guidelines and train providers

Develop national guidelines for MASH management, covering lifestyle, pharmacotherapy, and referral.

Train providers to implement both MASH and the new obesity guidelines as disease management protocols.

6. Increase public and patient awareness on the interconnectedness of cardio-renal-metabolic (CRM) disease

Make MASH and obesity focal points of public health campaigns on metabolic health, diet, and physical activity. Ensure that health awareness efforts emphasize the interconnection between diseases — how one poorly managed condition can drive the onset or worsening of another. Additionally, communication should highlight critical opportunities to delay disease progression and the benefits of early intervention. For example, the distinctions between early-stage and late-stage CKD, or between metabolic dysfunction–associated fatty liver disease (MAFLD) and MASH, should be clearly conveyed.

7. Build data and research infrastructure

Establish an integrated cardio-renal-metabolic (CRM) registry, capturing obesity as a primary condition, and develop a dedicated MASH registry to inform future policies.

8. Enable multistakeholder leadership

Engage specialists, primary care, and patient organizations in designing and implementing the strategy.

Adapt global resources (e.g., ISN Cardio-Kidney-Metabolic Roadmap) to Malaysia’s context.

Recommendation 2: Increase state and national investment in priority geographies for early detection of cardio-renal-metabolic (CRM) diseases.

For key existing and emerging cardio-renal-metabolic (CRM) diseases, including type 2 diabetes (T2D), dyslipidemia, chronic kidney disease (CKD), cardiovascular disease (CVD), and metabolic dysfunction–associated steatohepatitis (MASH):

1. Financing for non-communicable diseases (NCDs) should be increased in Kedah, N. Sembilan, Perlis, and Terengganu, where diabetes rates are soaring at 1.5-2 times the national prevalence rates (15.6%)[107] to fund initiatives to control and better manage T2D diabetes rates to prevent the rise of more complex cardio-renal-metabolic (CRM) diseases such as CKD, MASH, and CVD, which are costlier to treat.
2. States such as WP Labuan, Pahang, and Johor should allocate funding for comprehensive cardio-renal-metabolic (CRM) screening, as there is a high rate of undiagnosed diabetes at 12.5%, 11.4%, and 9.4%, respectively, and it is likely that they may also be at risk for CKD, MASH, and CVD[108].
3. The government should increase the national health budget expenditure to improve implementation gaps: invest in rural physician retention and multidisciplinary care training models; build a paid, well-trained community screening workforce and better awareness initiatives for screening in rural areas.

Recommendation 3: Establish a comprehensive screening program linked to a National Integrated Referral & Care Coordination Framework (NIRCCF).

1. Implement a nationwide, integrated screening program

Address fragmented, opportunistic screening, especially in rural and underserved areas, through multisite delivery, standardized protocols, and sustainable financing.

- **Diverse Delivery Channels and ensure adequate follow up:**
  Expand screening beyond Klinik Kesihatan through:
  - Panel private GPs and clinics (diagnosis-related group (DRG)/capitation reimbursement)
  - Mobile units for rural/Orang Asli communities
  - Community pharmacies and NGOs with point-of-care tools
- **Standardized Screening Package:**
  Include evidence-based, cost-effective tests: blood pressure, body mass index (BMI), waist circumference, fasting glucose/ hemoglobin A1C (HbA1c), lipid profile, urine albumin-to-creatinine ratio (uACR), serum creatinine (estimated glomerular filtration rate (eGFR), liver function tests and electrocardiogram (ECG) for high-risk cardiovascular disease (CVD) patients.
- **Adapt Global Best Practices:**
  - Apply AHA Presidential Advisory recommendations on life-course cardio-renal-metabolic (CRM) risk screening
  - Include social determinants of health (SDOH) in both risk assessment and care planning
- **Financing and Incentives:**
  - Introduce partial co-payments for M40
  - Incentivize providers to achieve detection and treatment initiation targets defined in national policies
- **Public Awareness and Engagement:**
  - Run mass media and community-based campaigns using influencers, religious leaders, and workplace or campus-based outreach

2. Establish a National Integrated Referral & Care Coordination Framework (NIRCCF)

Ensure a smooth transition from screening to diagnosis and care through digital integration, standardized pathways, and strong coordination.

- **Digital e-Referral System:**
  - Link via MySejahtera public-private electronic health records (EHRs) for bi-directional referrals
  - Integrate reminders for follow-up and treatment initiation

- **Standardized cardio-renal-metabolic (CRM) Care Pathways:**
  - Define clear referral triggers, adapted to rural and urban contexts and between types of clinics (for instance, between antenatal clinics and primary care clinics for following up diabetes screening in gestational diabetes women postpartum throughout life)
  - Include clinical care bundles and response timelines
- **Care Coordination at the Primary Level:**
  - Assign coordinators/nurses to manage newly diagnosed patients, support referrals, educate patients, and track follow-up
- **Public-Private Task Sharing:**
  - Enable seamless access to diagnostics and treatment through reimbursed private sector involvement
  - Use DRG or capitation models to enable financial access to care for multiple conditions across the patient's life course
- **Enhanced Use of Digital Tools for Continuity of Care:**
  - Leverage MySejahtera to monitor test results, referrals, medication, and personal clinical targets (e.g., hemoglobin A1C (HbA1C), blood pressure (BP), low-density lipoproteins (LDL), eGFR)
  - Include alerts for missed follow-ups and provider updates
  - Include flags for early risk on patient profiles (for instance, link family history with young children for early follow-up in these subgroups in adolescence or early adulthood).

Recommendation 4: Introduce comprehensive public-private strategies, leveraging digital strategies and financing models to strengthen Malaysia's primary care resourcing for early detection, chronic disease management, and equitable access.

1. Boost primary care funding for early detection and diagnostics

- Expand MOH funding to Klinik Kesihatan and private GPs for point-of-care tests (e.g., hemoglobin A1C (HbA1C), NT-proBNP, lipid panels, urine albumin-to-creatinine ratio (uACR) testing, liver function tests)
- Subsidize portable diagnostic tools (e.g., handheld electrocardiogram (ECG) and uACR for rural clinics and mobile teams
- Launch public-private diagnostic partnerships with private labs offering subsidized tests under a diagnosis-related group (DRG) based model

2. Expand public-private screening and treatment access and improve follow-up protocols

- Enable subsidized cardio-renal-metabolic (CRM) and chronic kidney disease (CKD) screenings at private clinics
- Contract private hospitals to reduce overload in public hospitals
- Establish follow-up contact with patients as part of the screening process to encourage patients to attend further appointments and get treatment as necessary

3. Strengthen rural chronic care delivery

- Scale up mobile health teams and community health workers (CHWs) for home monitoring, education, and adherence support
- Use telehealth to connect rural patients with urban specialists

4. Adopt DRG-based and co-payment models

- Standardize DRG payments to private providers for public patients
- Introduce affordable co-payment schemes for vulnerable populations

5. Introduce outcome-based incentives for providers

- Reward primary care providers for meeting disease management targets (e.g. hemoglobin A1C (HbA1C), blood pressure, CKD screening)

6. Build regional chronic disease networks

- Link rural clinics, district hospitals, and tertiary centers to ensure coordinated referrals and care

7. Enhance digital integration and data sharing

- Expand MySejahtera as a national EHR and chronic disease-tracking tool
- Mandate EHR interoperability across public and private sectors
- Enable patients to monitor screenings, medication, and appointments via MySejahtera

Case example: Hospital Services Outsourcing Programme (HSOP) - MOH & Private Sector Collaboration[109]

- The Hospital Services Outsourcing Programme (HSOP) is an initiative by Malaysia's Ministry of Health (MOH) aimed at enhancing healthcare accessibility and quality by outsourcing patients from MOH hospitals to private healthcare facilities. Launched on July 18, 2024, the program focuses on reducing patient congestion, shortening waiting times, and improving service quality. As of November 30, 2024, a total of 24,734 patients had been referred to 91 private hospitals under HSOP, leading to significant reductions in waiting times for various procedures.

- The MOH has outsourced diagnostic tests, surgeries, and outpatient care to private hospitals to reduce waiting times in public hospitals. In Sabah, private hospitals provide MRI, CT scans, and cardiology services for public patients under an MOH agreement. However, private hospitals are reporting financial losses, as MOH reimbursement does not fully cover actual costs.

- This model could be expanded at the primary care level to include private GPs to enhance early screening and strengthen treatment continuity at the community level. Challenges to financing and patient information sharing will need to be considered.

Recommendation 5: Strengthen public health literacy, patient awareness, and self-management through culturally tailored, digitally enabled, and community-driven approaches.

1. Tailor culturally sensitive public campaigns

- Design multi-language (Malay, English, Tamil, Mandarin) educational content tailored by age, risk group, and urban/rural context
- Use mass media, social media influencers, community leaders, and religious institutions to reach diverse audiences
- Focus messages on:
  - "Know Your Numbers" (blood pressure (BP), glucose, lipids, estimated glomerular filtration rate (eGFR))
  - Benefits of early screening and treatment
  - Addressing myths about medications and "silent diseases"

2. Embed health literacy in MySejahtera

- Add interactive risk assessment tools and personalized nudges/reminders for screening and follow-up
- Provide visual, simplified info about test results and "next steps" after diagnosis
- Link to tele-counseling or live chat with nurses or pharmacists
- Gamify health literacy through quizzes and personalized scoreboards for health screening and treatment goals, with incentives such as free vouchers with retail partners

3. Train frontline providers in health coaching

- Upskill primary care providers, nurses, and pharmacists in health coaching techniques (e.g., motivational interviewing, visual tools)
- Use structured "teach-back" methods to ensure patient understanding at the point of diagnosis or medication initiation

4. Leverage community health ambassadors

- Recruit and train community health workers or volunteers to conduct small-group or home-based education in underserved communities
- Focus on peer-driven education among the elderly, women, and rural dwellers

5. Workplace & school-based programs

- Integrate education on non-communicable diseases (NCDs) into employee wellness programs, especially for civil servants and large companies
- Include early screening education in secondary schools and universities

6. Peer-led education & support networks

- Organize patient-to-patient education programs to share real-life experiences on screening, treatment, and self-management
- Conduct support groups to address medication fears, lifestyle modifications, and mental health challenges associated with chronic diseases
- Ensure that support network information is available at primary care clinics that healthcare workers can provide to help support treatment initiation
- Example: Diabetes Malaysia runs patient-led workshops on insulin use and diet management

7. Design self-management plans that enhance patients' roles in self-care and enhance family awareness of patients' contextual needs[1 2]

- Self-management plans should be co-designed by physicians, patients, and families, considering social determinants of health to enhance adherence and accessibility:
  - Flexible Follow-Ups: Offer teleconsultations (video or audio) for patients with mobility or transportation challenges, with reduced in-person visits where feasible
  - Financial Support: Provide affordable monitoring devices or a subsidized consumables allowance for glucose strips and blood pressure (BP) monitors
  - Home Support: Extend family counseling to improve home-based care routines and adherence strategies

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