STRATEGIES OF CKD PREVENTION IN SINGAPORE

A/Prof Jason Choo MBBS, MMed, FAMS, FRCP, FASN

Senior Consultant, Department of Renal Medicine, Singapore General Hospital
Medical Director, The National Kidney Foundation, Singapore
Clinical Associate Professor, Duke-NUS Medical School
President, Singapore Society of Nephrology

Singapore Society of Nephrology

DISCLOSURE OF CONFLICT OF INTERESTS

- Consultancies & Advisory Boards
  - Boehringer Ingelheim, Novartis, Bayer, AstraZeneca, Pfizer, Nitto Denko ATC, GSK
- Speaker
  - Abbott, Bayer, AstraZeneca, Boehringer Ingelheim
- Steering Committees
  - AstraZeneca, Boehringer Ingelheim, Baxter
- Scientific Grant Fundings
  - NMRC Singapore

AGENDA

- CKD in Singapore: Landscape & Burden
- National CKD Registry
- Prevention Strategies
- Community Screening & Early Detection
- Integrated Clinical Management
- Challenges & Future Directions

AGENDA

- **CKD in Singapore: Landscape & Burden**
- **National CKD Registry**
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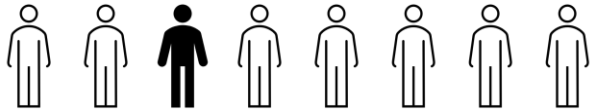
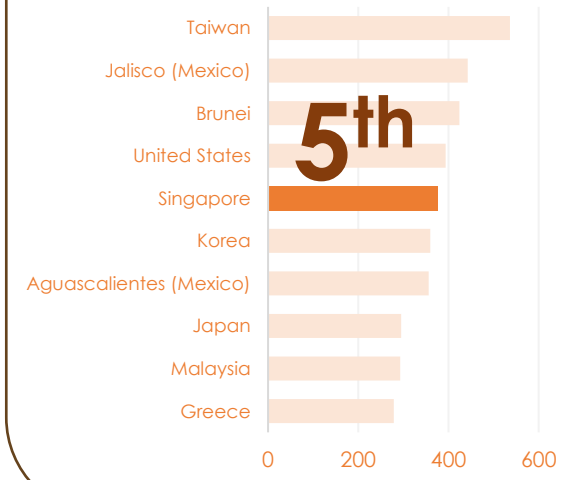
KIDNEY LANDSCAPE



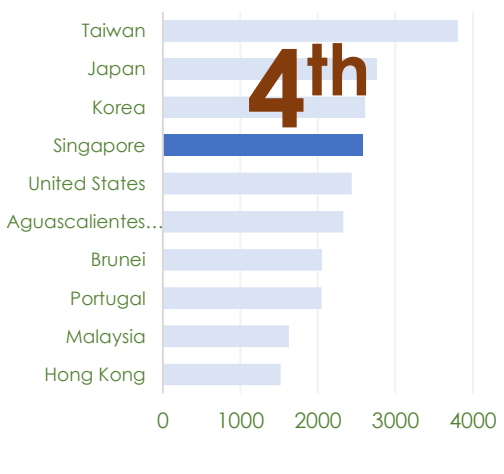
CKD affects 1 in 7 adults in Singapore

Based on National Population Health Survey 2024

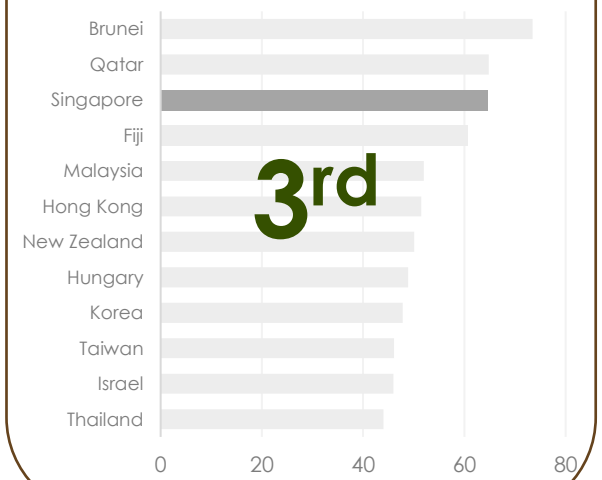
Incidence of treated ESRD (per million population)



Prevalence of treated ESRD (per million population)



% Incident cases of treated ESRD attributed to diabetes



(USRDS Annual Report 2024)

About **6** new kidney failure cases every day

About **2** in **3** are due to diabetes

More than **9,000** patients on dialysis

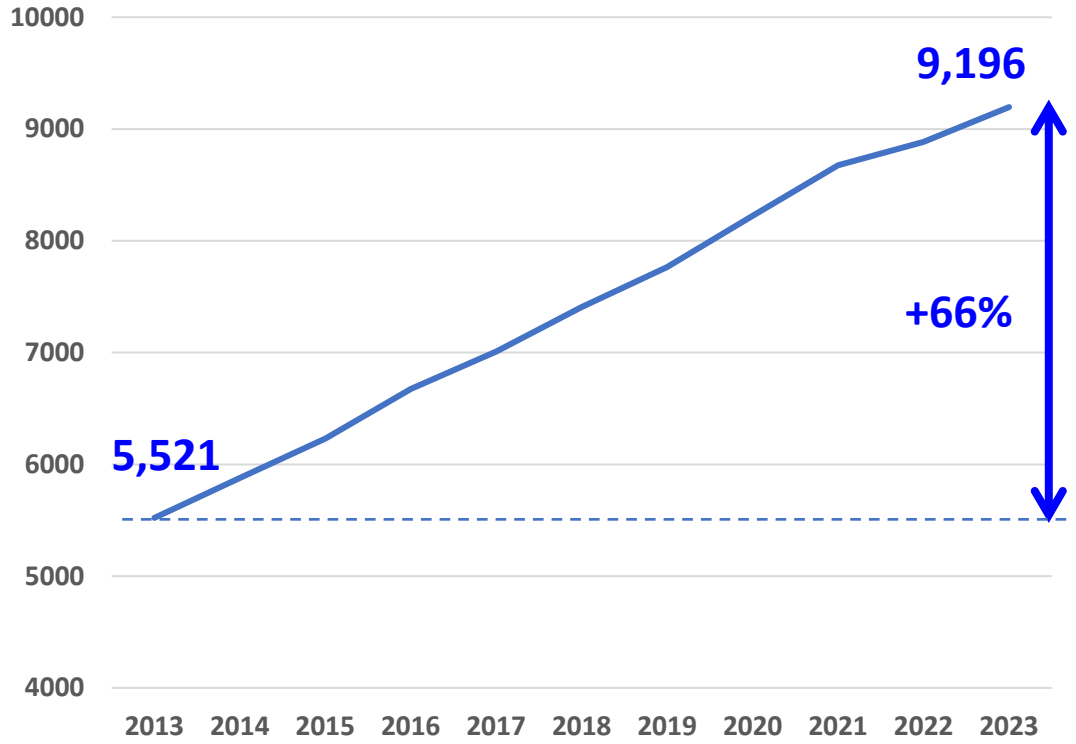
Over **$300mil** spent on dialysis treatment annually

There were 9,196 dialysis patients as of Dec 2023 (Singapore Renal Registry Annual Report 2023)

KEY TRENDS (2013 – 2023)

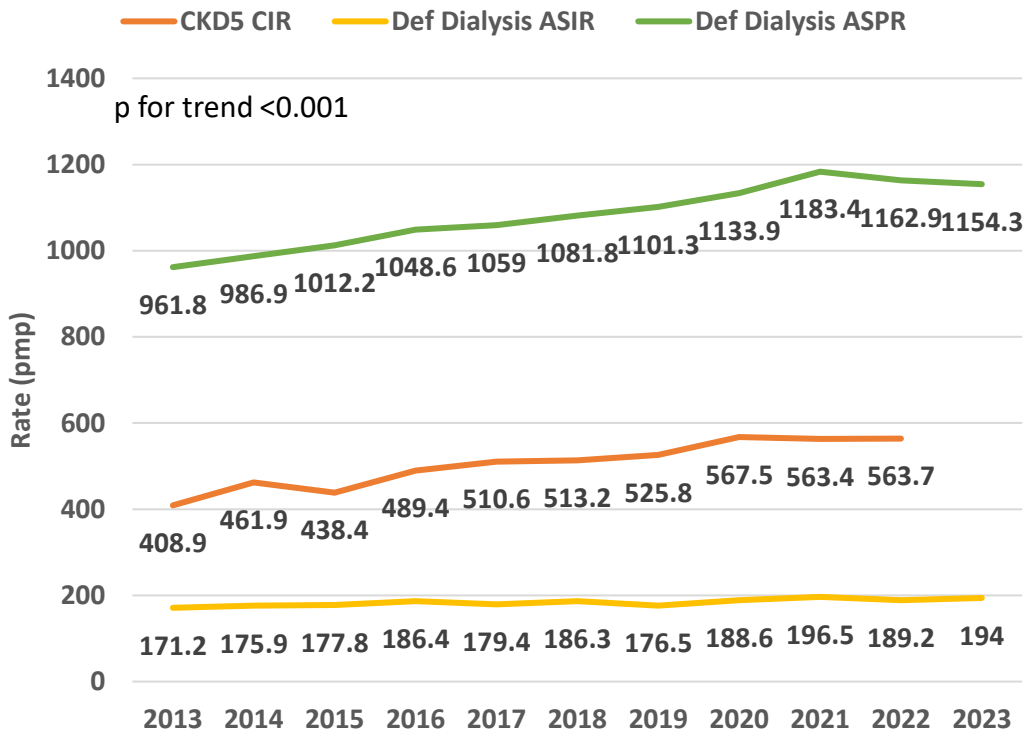
+66% increase in dialysis patients over a decade

- **Prevalent Numbers** HD dominant (~86.9% prevalence)



Median age 62 years → 66.5 years

- **Incidence and Prevalence**



NATIONAL EPIDEMIOLOGY, PROGNOSTICATION AND HEALTH RELATED IMPACT OF CKD

NEPHRIC

NUHS National University Health System

National Healthcare Group — Adding years of healthy life

SingHealth — Defining Tomorrow's Medicine

Scope

- Retrospective registry
  - CKD stage G1-5 patients
  - 2014-2022
- Prospective collection thereafter with annual generation of data

Build a centralised CKD analytics platform with harmonised and unified cross-cluster data for analysis and scalable for data-sharing

Main Aims

1. **Map out the journey of CKD patients within Singapore (prevalence/incidence data)**
2. **Determine the prevalence/incidence of complications associated with CKD across the continuum of stage 1-5, or ESKD**
   - Death (all causes), MACE
   - Hyperkalemia, hyperphosphatemia, anaemia, admissions for volume overload
3. **Ultimately determine management gaps which can be filled with ongoing tracking of clinical outcomes**
   - Quality Improvement initiatives
   - Data Science analytics

Compared to NEPHRIC Vs CURE-CKD

Adult cohort – pending more data

NEPHRIC

CKD Stage	Avg eGFR	Patient Count	%
G1-2	≥60	62,588	53.0
G3a	45-59	28,819	24.4
G3b	30-44	17,950	15.2
G4	15-29	6,726	5.7
G5	<15	1,975	1.7
Total		118,058	100

Adults >21 years
Total patients with at least 1 Creatinine: 556,774

CURE-CKD

CKD Stage	Avg eGFR	Patient Count	%
G1-2	≥60	137,784	22.7
G3a	45-59	226,693	37.4
G3b	30-44	100,239	16.5
G4	15-29	39,125	6.5
G5	<15	20,328	3.4
Not categorised		81,895	13.5
Total		606,064	100

Unpublished

Tuttle KR et al. JAMA Netw Open. 2019;2(12)

Work in progress

Unpublished

Prognosis of CKD by GFR and albuminuria categories				Albuminuria (UACR) Categories: A1 Normal-mildly increased <3mg/mmol	A2 Moderately increased 3-30mg/mmol	A3 Severely increased >30 mg/mmol	No UACR value/Abnormal N.A	Total
GFR categories (mL/min/1.73 m²)	G1	Normal to high	≥90	655 (0.6%)	19,572 (16.6%)	1,808 (1.5%)	3,211 (2.7%)	25,246 (21.4%)
	G2	Mildly decreased	60-90	799 (0.7%)	28,879 (24.5%)	3,934 (3.3%)	3,730 (3.2%)	37,342 (31.6%)
	G3a	Mildly to moderately decreased	45-59	4071 (3.4%)	9,626 (8.2%)	2,500 (2.1%)	12,622 (10.7%)	28,819 (24.4%)
	G3b	Moderately to severely decreased	30-44	1540 (1.3%)	4,671 (4.0%)	2,096 (1.8%)	9,643 (8.2%)	17,950 (15.2%)
	G4	Severely decreased	15-29	167 (0.1%)	1,040 (0.9%)	864 (0.7%)	4,655 (3.9%)	6,726 (5.7%)
	G5	Kidney failure	<15	86 (0.07%)	63 (0.05%)	17 (0.01%)	1,821 (1.5%)	1,975 (1.67%)
			Total	7,318 (6.2%)	63,846 (54.1%)	11,212 (9.5%)	35,682 (30.2%)	118,058 (100%)

17,968 (15.2%)

Unpublished

AGENDA

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- **Prevention Strategies**
- Community Screening & Early Detection
- Integrated Clinical Management
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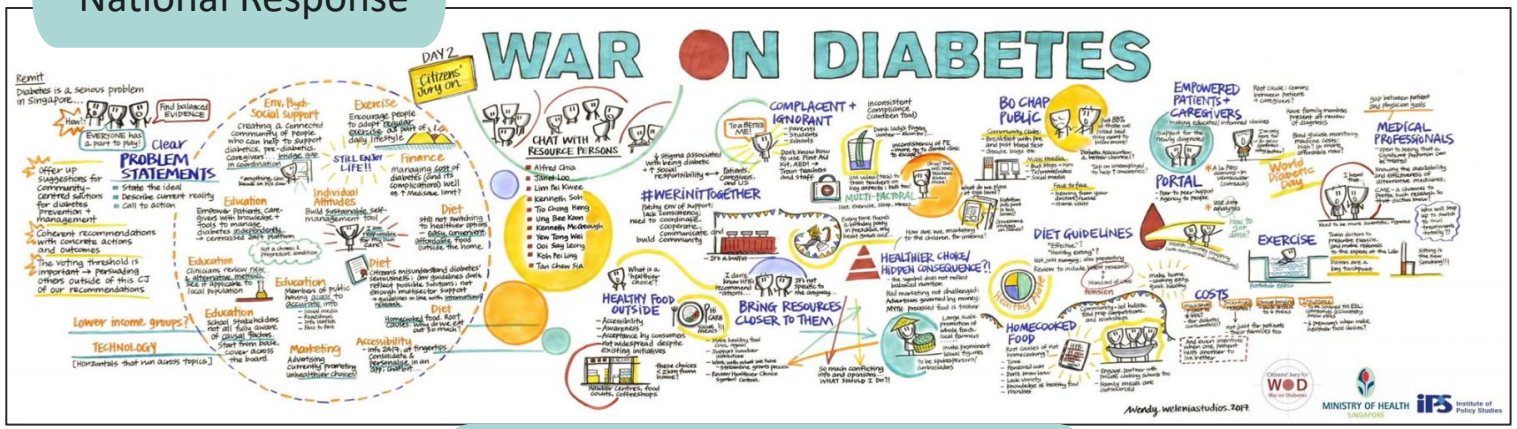
TACKLING ROOT CAUSES: PRIMORDIAL & PRIMARY PREVENTION

Risk Factors

- Diabetes in adults: 14.9% (2021)
- Obesity in adults: 10.5% (2020)
- Obesity in children: 16% (2022)

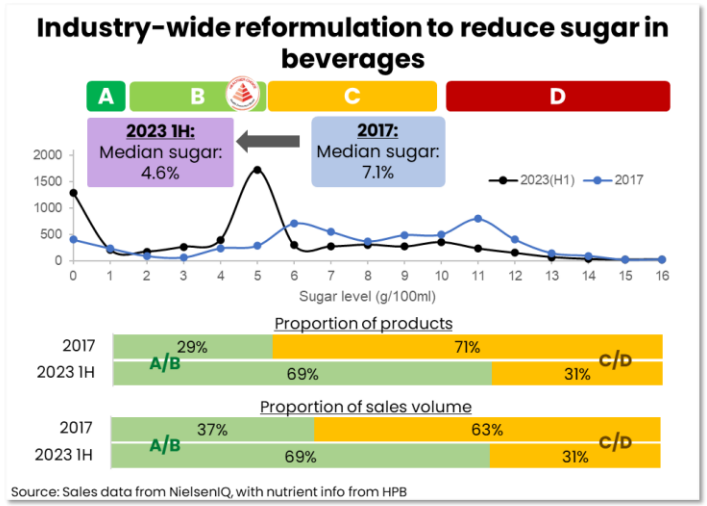
National Response

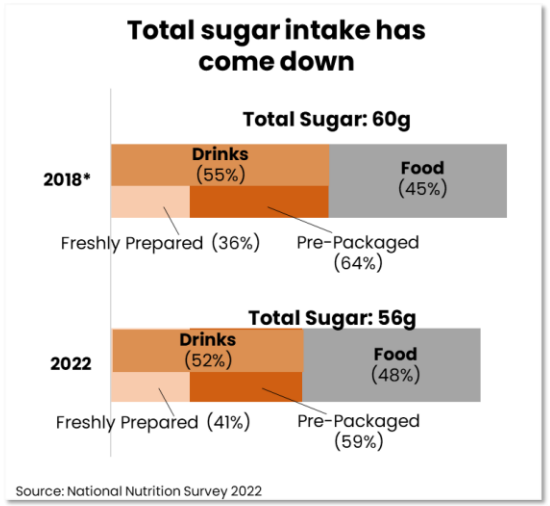


Beverage Product Reformulation

NUTRI-GRADE A B C D 8% sugar

Nutri-Grade labelling and advertising measures for beverages were announced in 2020, and implemented for prepacked beverages in 2022 and freshly prepared beverages in 2023.



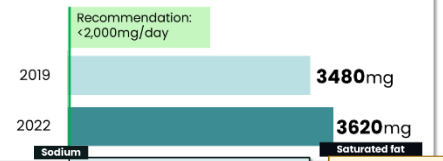


Nutritional Health Survey 2022

SODIUM

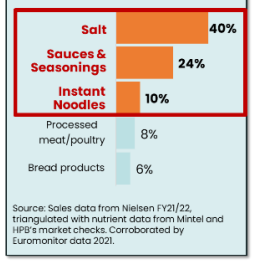
Singaporeans consume almost 2X the recommended sodium limit.

Mean sodium intake of Singaporean residents (mg)



Majority of our sodium intake comes from salt, sauces, seasonings, & instant noodles.

Key contributors of sodium in the food supply

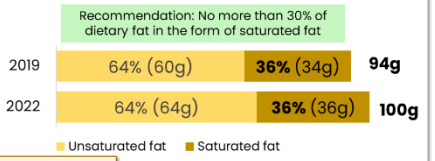


Source: Sales data from Nielsen FY21/22, triangulated with nutrient data from Mintel and HPB's market checks. Corroborated by Euromonitor data 2021.

SATURATED FAT

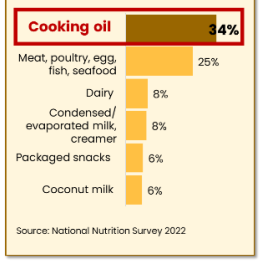
36% of dietary fat comes from saturated fat, exceeding recommendations

Total dietary fat intake among Singapore residents



Majority of our saturated fat intake comes from cooking oil

Key contributors of sat fat intake (among food categories that make up >80% of sat fat intake)



Source: National Nutrition Survey 2022

Extend Nutri-Grade labelling and advertising measures to prepacked....

Policy objectives

1. Help consumers identify products that are higher in sodium and/or saturated fat, and make more informed, healthier choices
2. Encourage manufacturers to reformulate and offer more healthier products for consumers and F&B operators to choose from
3. Reduce influence of advertising on consumer choices

POLICY, INDUSTRY AND COMMUNITY ENGAGEMENT

Health Promotion Board

Policy Measures

1

- Ramp up voluntary front-of-store labelling to highlight stalls offering healthier dishes (lower-sodium ingredients, healthier oils).
- Serves as a nudge to influence consumer behaviour

Community & Consumer Engagement

2

- Step up public education for consumers and F&B operators on the need to reduce sodium and saturated fat, and to promote the 'Less Salt, More Taste' message

3 Industry Partnerships

- "Healthier Ingredient Promotion Programme" to educate hawkers on the need to reduce sodium, provide samples and encourage switching to lower-sodium ingredients
- Increase engagements with distributors to increase supply of healthier ingredients from manufacturers to F&B operators

Policy objectives

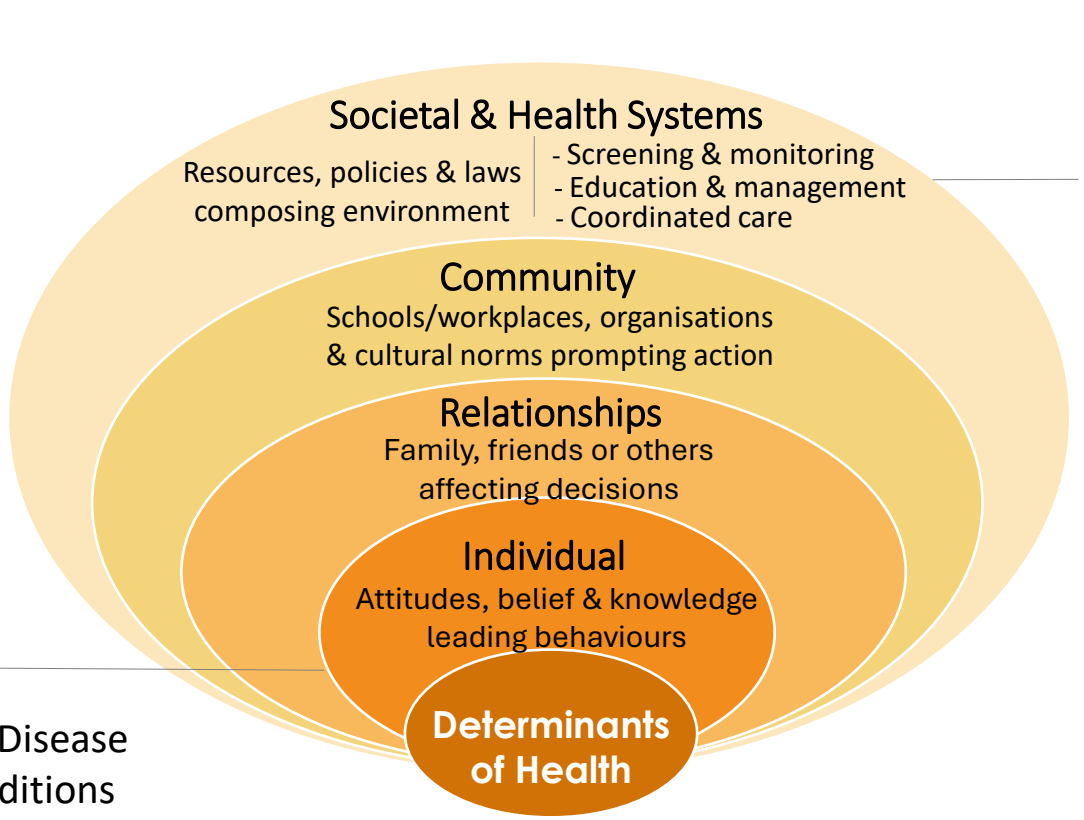
- **Help consumers make informed choices**
- **Encourage industry reformulation**
- **Reduce advertising influence on unhealthy products**

PROMOTE KIDNEY HEALTH THROUGH AN INTEGRATED, COMMUNITY-BASED, SOCIALLY-DRIVEN APPROACH

CONNECT

Current Situation:

Public awareness of Chronic Kidney Disease (CKD) remains low compared to conditions like diabetes

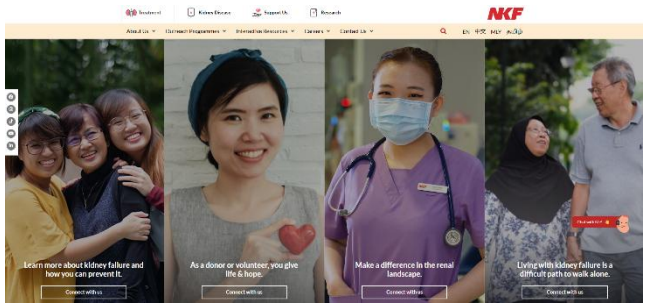


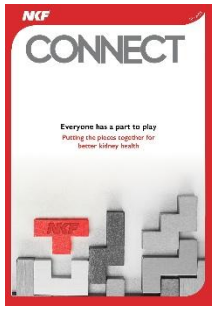
CONVERT

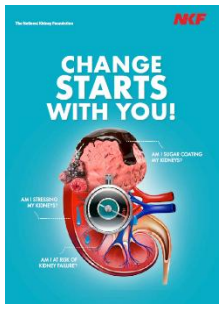
Current Situation:

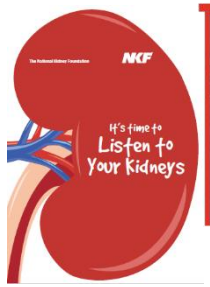
CKD management often starts late, with many cases diagnosed at advanced stages

TRANSFORM KIDNEY HEALTH THROUGH SUSTAINED EDUCATION & ENGAGEMENT









Digital Media

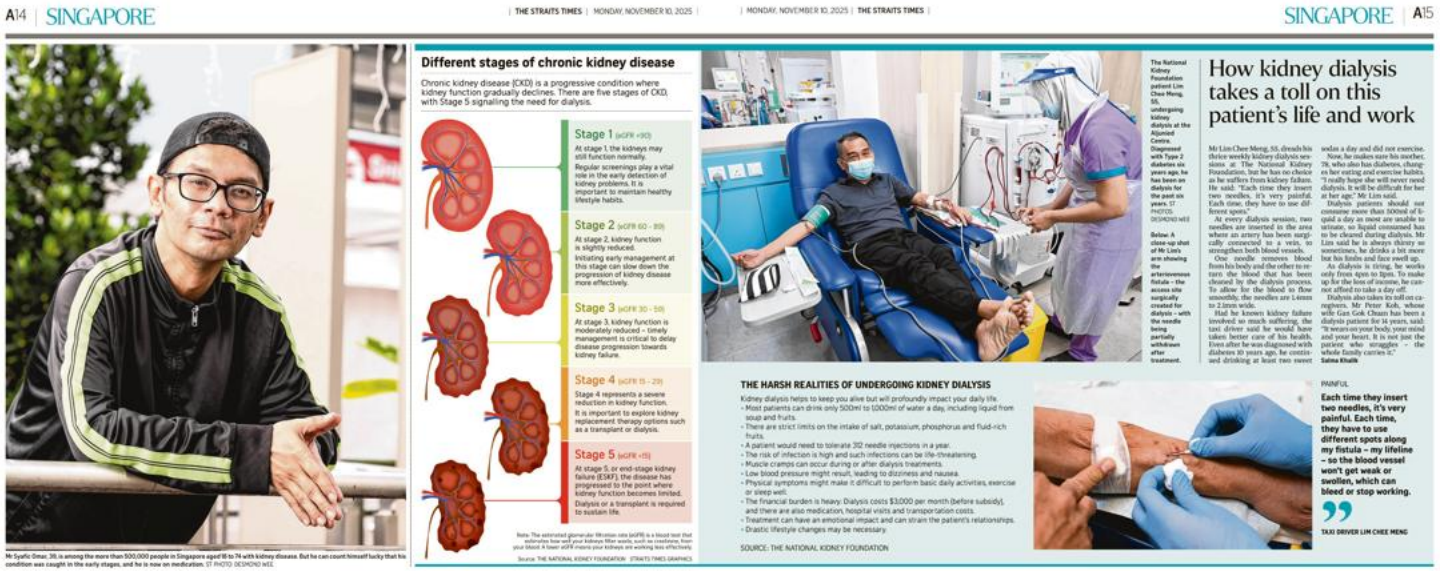
- Website
- Social Media
- News Channels
- eDM
- ePosters
- ePublications

Traditional / Offline Media

- Brochures
- Posters
- Banners
- Vehicle Decals
- Publications
- Swags

HARNESSING THE POWER OF MEDIA

	Measurable Outcomes
1	Blurb on front page
2	5-fold increase in kidney screening interest
3	> 900 QR codes scanned
4	Strong online traction – 157 likes, 81 shares, 25 comments


A14 | SINGAPORE

THE STRAITS TIMES | MONDAY, NOVEMBER 10, 2025

SINGAPORE | A15

Different stages of chronic kidney disease

Chronic kidney disease (CKD) is a progressive condition where kidney function gradually declines. There are five stages of CKD, with Stage 5 signaling the need for dialysis.

Stage 1 (eGFR >90)
At stage 1, the kidneys may still function normally.
Regular screenings play a vital role in the early detection of kidney problems. It is important to maintain healthy lifestyle habits.

Stage 2 (eGFR 60 - 89)
At stage 2, kidney function is slightly reduced.
Initiating early management at this stage can slow down the progression of kidney disease more effectively.

Stage 3 (eGFR 30 - 59)
At stage 3, kidney function is moderately reduced - timely management is critical to delay disease progression towards kidney failure.

Stage 4 (eGFR 15 - 29)
Stage 4 represents a severe reduction in kidney function. It is important to explore kidney replacement therapy options such as a transplant or dialysis.

Stage 5 (eGFR <15)
At stage 5, or end-stage kidney failure (ESKF), the disease has progressed to the point where kidney function becomes limited. Dialysis or a transplant is required to sustain life.

How kidney dialysis takes a toll on this patient's life and work

THE HARSH REALITIES OF UNDERGOING KIDNEY DIALYSIS

Kidney dialysis helps to keep you alive but will profoundly impact your daily life.
- Most patients can drink only 500ml to 1,000ml of water a day, including liquid from soup and fruits.
- There are strict limits on the intake of salt, potassium, phosphorus and fluid-rich fruits.
- A patient would need to tolerate 312 needle injections in a year.
- The risk of infection is high and such infections can be life-threatening.
- Muscle cramps can occur during or after dialysis treatments.
- Low blood pressure might result, leading to dizziness and nausea.
- Physical symptoms might make it difficult to perform basic daily activities, exercise or sleep well.
- The financial burden is heavy. Dialysis costs $3,000 per month (before subsidy), and there are also medication, hospital visits and transportation costs.
- Treatment can have an emotional impact and can strain the patient's relationships.
- Drastic lifestyle changes may be necessary.

SOURCE: THE NATIONAL KIDNEY FOUNDATION

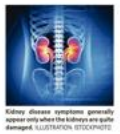
PAINFUL

Each time they insert two needles, it's very painful. Each time, they have to use different spots along my fistula – my lifeline – so the blood vessel won't get weak or swollen, which can bleed or stop working.

TAXI DRIVER LIM CHEE MENG

A silent killer

Half of kidney failure cases in S'pore could have been prevented, says doc


Kidney disease symptoms generally appear only when the kidneys are quite damaged. ILLUSTRATION: ISTOCKPHOTO


NKF medical director Jason Choo said new medications can significantly delay the deterioration of kidney function if the problem is discovered early. PHOTO: THE NATIONAL KIDNEY FOUNDATION


NKF chairman Ang Hao Yao said NKF wants to "ditch the needle", and help Singaporeans stay healthy for as long as possible, not just to treat them when they have kidney failure. PHOTO: THE NATIONAL KIDNEY FOUNDATION

Salma Khalik

In March 2025, Mr Syafic Omar felt a tingly feeling in his feet. The feeling continued for two months before he consulted a doctor.

Dr Arjunan Kumaran, a family physician at Immedical clinic, suspected Mr Syafic might have neuropathy, or problems with his peripheral nerves, and suggested a thorough screening.

Then came the bad news. Not only did the 39-year-old data centre facilities engineer have high blood pressure, high cholesterol levels and diabetes, his kidneys were also starting to fail. Fortunately, his kidney disease was in the early stages.

Mr Syafic is among the more than 500,000 people in Singapore aged 18 to 74 with kidney disease – or more than one in seven people in that age group. Among those aged 70 and older, more than one in three have impaired kidneys.

Kidneys are our body's waste disposal unit, removing toxins and other wastes, salt and excess water from about half a cup of blood every minute. When this cleaning is hampered, the body suffers from a host of problems such as tiredness, swelling, nausea, shortness of breath and confusion.

There are five stages in chronic kidney disease (CKD), often called a silent killer, as most people feel fine in the early stages. Symptoms generally appear only when the kidneys are quite damaged.

A person needs close monitoring and preparation for a kidney transplant or dialysis when the kidneys are struggling at less than 15 per cent of their normal function. That's CKD5, or kidney failure.

Dr Jason Choo, medical director of The National Kidney Foundation (NKF), estimates that about half the kidney disease cases in Singapore could have been prevented if chronic conditions such as diabetes, high blood pressure and high cholesterol were diagnosed and controlled early.

While there is no way to reverse kidney damage, he said new medications can significantly delay the deterioration of kidney function if the problem is discovered early.

For those with CKD, kidney function deteriorates by 10 per cent a year (in healthy people, it's 0.5 per cent to 1 per cent a year from the age of 30 to 40).

Patients on older medication alone, such as Losartan, can slow the deterioration to 4 per cent, while adding a newer drug, such as the SGLT2 inhibitors, can cut it to almost 2 per cent a year.

For those with kidney function deterioration by 10 per cent a year, it's 0.5 per cent to 1 per cent a year from the age of 30 to 40.

Patients on older medication alone, such as Losartan, can slow the deterioration to 4 per cent, while adding a newer drug, such as the SGLT2 inhibitors, can cut it to almost 2 per cent a year.


Dr Arjunan Kumaran (right), 34, a family physician at Immedical clinic, had suggested that Mr Syafic undergo a thorough screening, where Mr Syafic was found to have high blood pressure, high cholesterol levels and diabetes, apart from kidney disease. ST PHOTO: DESMOND WEE

It is also important for patients to reduce their salt intake to less than 2g a day to help control blood pressure and reduce fluid retention. This, in turn, cuts the workload on already damaged kidneys.

People with CKD3 or CKD4 should also cut their protein intake. The rule of thumb is to consume no more than 0.8g of protein for every 1kg of body weight – or 56g of protein a day for someone who weighs 60kg.

Said Dr Choo: "Plant-based proteins reduce the formation of harmful substances that stress the kidneys. They are also easier to process and promote better gut health compared with animal-based proteins such as red meat."

The amount of protein does not equate to the weight of the food. About 25 per cent of red meat or poultry is protein. So if you eat a 200g steak, that contains 50g of protein, you may have hit your daily limit. In comparison, a 50g egg has only 6g of protein.

MOVING UPSTREAM

What both Dr Choo and The NKF, which provides care to 60 per cent of kidney failure patients, want to see is greater prevention upstream.

Said NKF chairman Ang Hao Yao: "Kidney failure is not inevitable. For many people, it is the result of chronic conditions like diabetes and high blood pressure that developed silently over time. The real opportunity lies upstream.

"This is where NKF wants to shift the needle. Beyond providing high-quality dialysis care, we are strengthening our efforts in early screening, community education and supporting healthier living.

"Our goal is to help Singaporeans stay healthy for as long as possible – not just to treat them when they have kidney failure. When we act early, we give ourselves the best chance at preserving quality of life."

Two in three cases of kidney disease here are linked to diabetes – compared with fewer than one in five in countries such as Norway, the Netherlands and Italy. Dr Choo said reducing the number of diabetics here could cut the number of people with CKD.

This is why The NKF launched its free kidney screening programme in March 2024 for people who are at risk, said its chief executive Yeo Tan. Of the 5,700 people screened to date, 18 per cent had abnormal results.

She said: "This initiative supports the broader Healthier SG vision. The NKF is now working towards sharing its data with healthcare clusters to strengthen population health management, while ensuring the Foundation's focus remains on improving overall patient care."

The Health Ministry's war on diabetes, launched in 2016, has already resulted in a drop in cases of diabetes-related kidney failure, from 646 per cent in 2009, to 63 per cent in 2024.

The National Population Health Survey 2024 showed that one in ten people who have both diabetes and high blood pressure will likely get kidney disease.

The risk falls to 1 per cent for those who have only diabetes, and 2.4 per cent for patients with only high blood pressure. For people with neither diabetes nor high blood pressure, the risk is 0.3 per cent.

The survey does not distinguish between people whose chronic conditions are well controlled and those who are not, but Dr Choo said controlling these conditions can significantly delay damage to the kidneys.

The survey found that 36.5 per cent of diabetic adults here do not know they have the disease. Of those diagnosed, only one in three has the problem under control. The largest group with poorly controlled diabetes (40.5 per cent) are people aged 30 to 39.

salma@sph.com.sg

This special report is supported by The National Kidney Foundation to raise public awareness about protecting kidneys ahead of World Diabetes Day on Nov 14.

SCAN THIS QR CODE for a list of GP clinics you can go to for a kidney screening


MONDAY NOVEMBER 10, 2025

Singapore• How to stop kidney disease from becoming a killer |A4&B5

The Big Story• More space for youth to chase dreams at new-look 'Scape |A2

The Big Story• S. Korea's nuclear ambition set to rattle regional nerves |A6

SINCE 1845 THE STRAITS TIMES 180

THE STRAITS TIMES

Beyond policy, PAP must also set the tone for politics in S'pore: PM Wong

It must call out harmful moves before they become normalised, he says

COST OF KEEPING QUIET

Each time we call out bad behaviour, there will be naysayers who accuse the PAP of being overbearing or accuse us of bullying. So speaking up does carry some political cost to us. But keeping quiet carries a greater cost to our country – to our values, to our standards, and to Singapore's future.

PRIME MINISTER LAWRENCE WONG

6 out of 7 insurers raised premiums for Integrated Shield Plans, riders in 2025


The Straits Times
10 November at 09:30 ·

New medications can significantly delay the deterioration of kidney function if the problem is discovered early, said NKF medical director Dr Jason Choo.

STRAITSTIMES.COM

A silent killer: Half of kidney failure cases in S'pore could have been prevented, says doc

157 25 comments 81 shares

Like Comment Share


The Straits Times
1d ·

Mt Rowdeen · 1d
In my opinion , some diseases are preventable and some cannot be prevented.I have known people who are careful with diet, no drinking of alcohol , no smoking & still get chronic illness .I think type of life style, over stress ,.over work , over worry, over eating , over thinking , inadequate sleep & rest can also contribute to poor health of human.
Reply

Pika Choo · 1d
The question is most patients have to wait soooo long to be seen by referrals doctors from polyclinic, by then could it already increased the failure? Or like initial detection if will rich enough go private can be seen n treated so can survive or can save on more cost to treat ? Or take up hospital bed? Is a question government hospital need to look at it. Can conduct survey as data is the best proof
Reply 1

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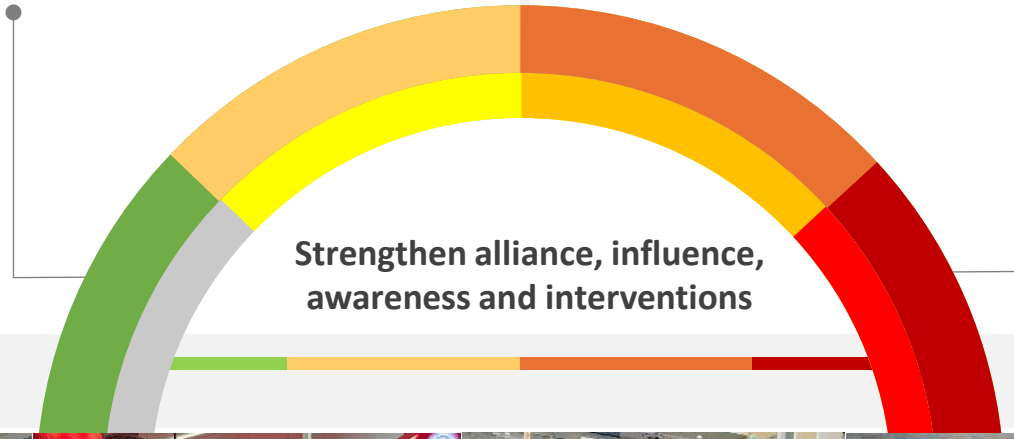
STRENGTHEN ADVOCACY AND INTERVENTION TO IMPROVE LONG-TERM HEALTH OUTCOMES

CONNECT

Approach:

1. **Early education fosters healthier, more aware generations, creating a ripple effect of knowledge within families**
2. **Build advocacy through partnerships with community and corporates**
3. **Work with MMO leaders to deliver culturally tailored messaging for greater impact**



CONVERT

Approach:

1. **Garner GPs and healthcare clusters support to ramp up CKD screenings to enable accessible screening**
2. **Support GPs on early detection and management**
3. **Enhance kidney health literacy and reduce follow-up barriers, including cost and navigation of care pathways**

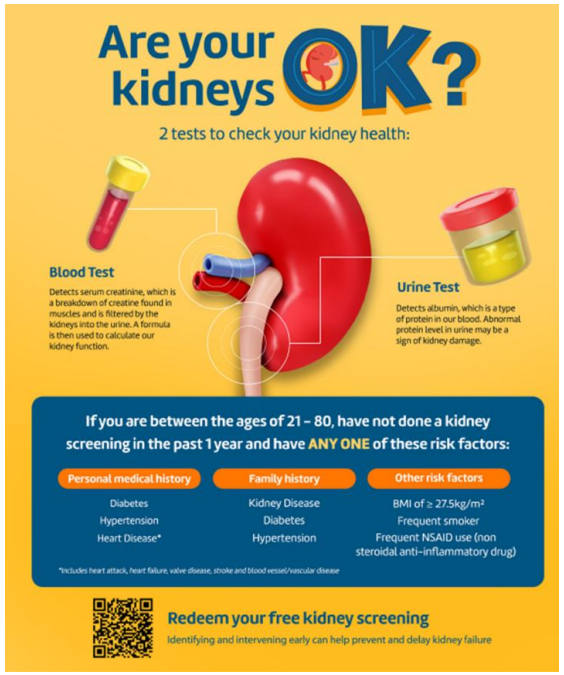





SCREENING RESULTS & RISK STRATIFICATION

NKF Kidney Screening Programme
Launched in March 2024 at 237 GP clinics

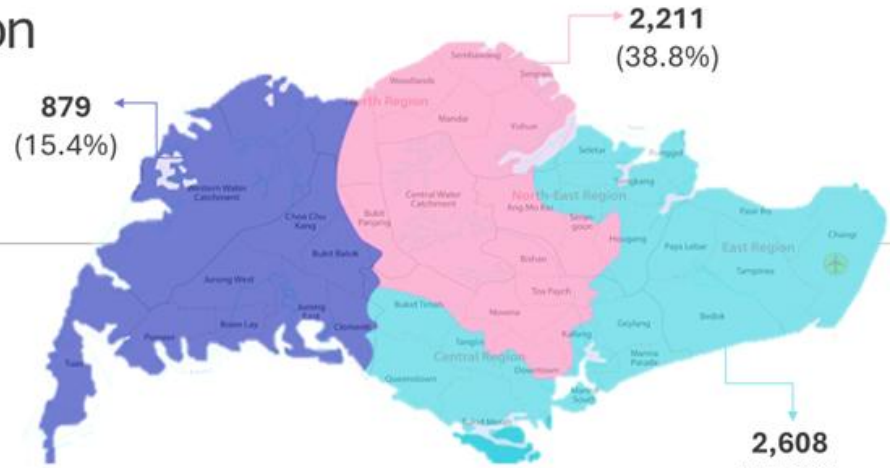
Aim: Raise kidney health awareness and integrate kidney function checks into routine care



Kidney Screening Distribution

(March 2024 – June 2025)

5,698 at-risk individuals



Average Age	54	
Gender	2,710 (47.6%)	2,988 (52.4%)

Race Distribution

Chinese	4,294 (75.4%)	Malay	744 (13.1%)
Indian	363 (6.4%)	Others	297 (5.2%)

Unpublished

SCREENING RESULTS & RISK STRATIFICATION

NKF Kidney Screening Programme
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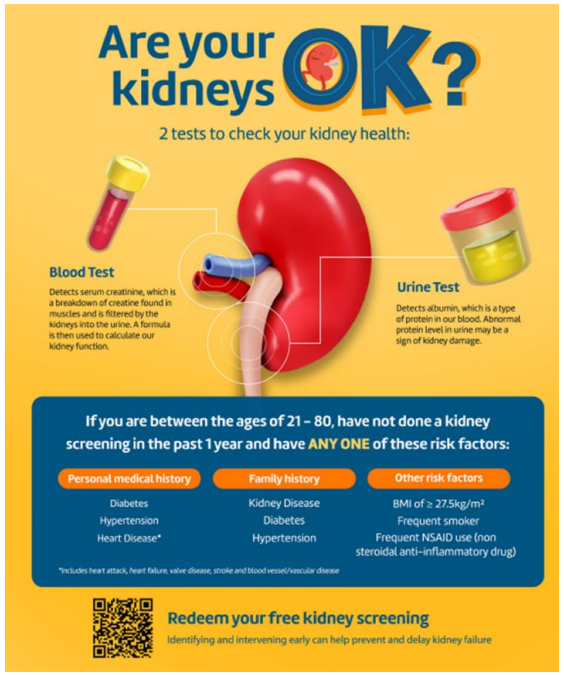
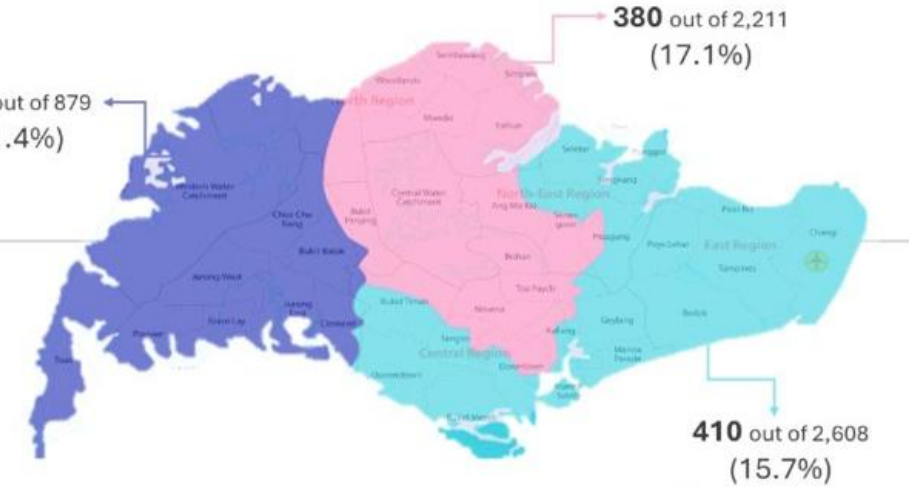
Aim: Raise kidney health awareness and integrate kidney function checks into routine care



Abnormalities Distribution

(March 2024 – June 2025)

891 out of 5,698 screened



Average Age	60		
Gender	466 (52%)	425 (48%)	
Race Distribution	Chinese	635 (71.2%)	Malay	163 (18.3%)
	Indian	47 (5.3%)	Others	46 (5.2%)

Risk factors among moderate to very high-risk: male gender, Malay ethnicity, obesity, history of cardiovascular disease, diabetes, hypertension, hereditary kidney disease, and gout.

INTERVENTION THROUGH PRIMARY CARE

Phase 2: Allied Health Support for Holistic Management

Phase 1

Healthier SG

Connect at-risk with GPs

Kidney Screening

Access to Care

Early Detection

Phase 2

Added Support to GPs for CKD Education and Lifestyle Modifications

CKD Intervention
For lifestyle management and support:

Q4 2025
✓ **Exercise**

Q2 2026
✓ **Medical Nutrition Theory**

Personalised plan tailored to the patient's needs

Allied health recommendations are communicated to the GP for continuity of the care plan

AGENDA

- CKD in Singapore: Landscape & Burden
- National CKD Registry
- Prevention Strategies
- Community Screening & Early Detection
- **Integrated Clinical Management**
- Challenges & Future Directions

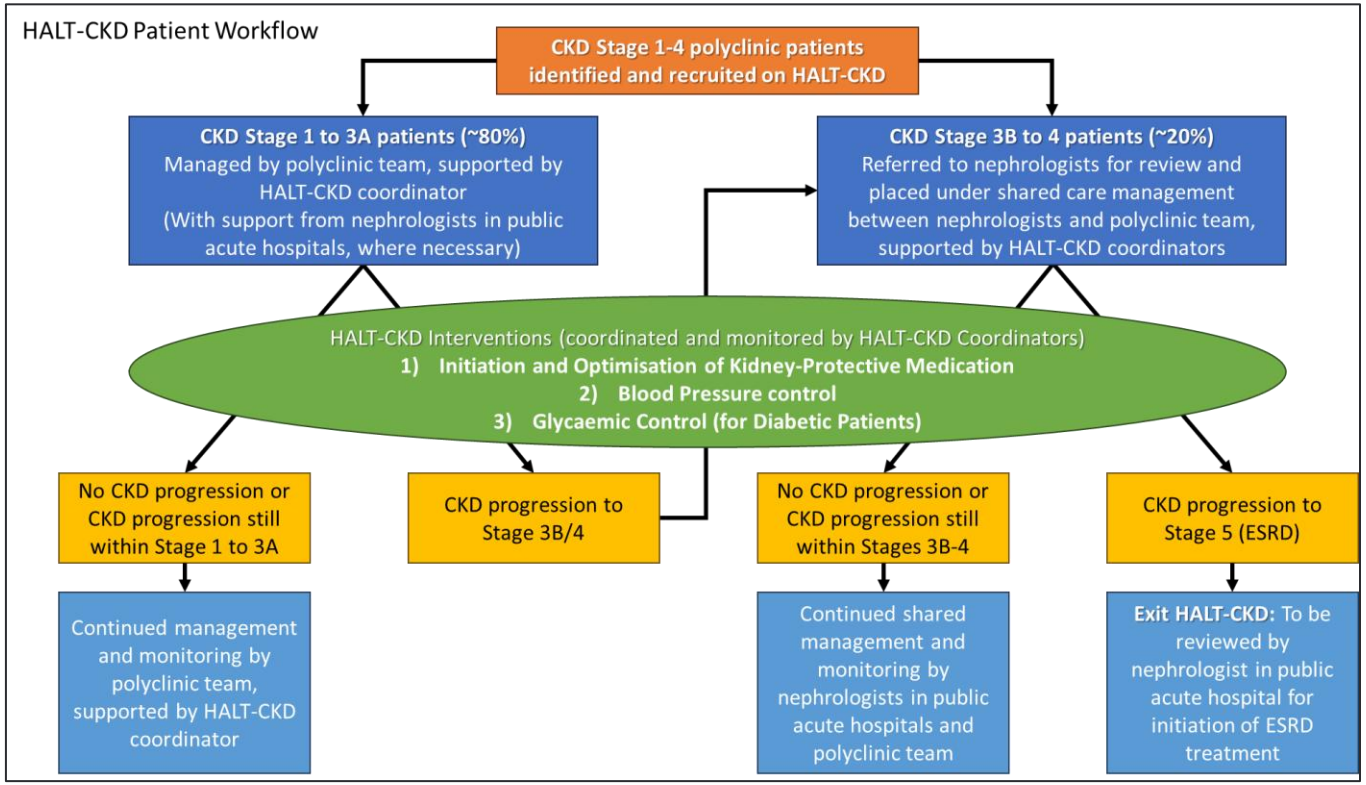
HOLISTIC APPROACH IN LOWERING & TRACKING CKD (HALT-CKD) PROGRAMME

National CKD Prevention Programme implemented in 2017

Aim: Prevent and delay the progression of CKD to kidney failure

Progress & Focus:

- **Phase I (from 2019):** **Medical interventions** (medication optimisation, BP/sugar control) across all hospitals and polyclinics
- **Phase II (from 2020/2021):** **Lifestyle interventions** (exercise, diet, salt reduction, smoking cessation) rolled out in polyclinics
- **Data & Tools:** CKD risk prediction models developed and embedded in national health records
- **Current focus:** Align with Healthier SG, update KPIs (including SGLT2i use), integrate new clinical guidelines



HALT-CKD

Eligibility	All patients with CKD G1–G3A <80 years old • CKD G1 & G2: Requires 2 abnormal UACR/UPCR ≥12 weeks apart • Add "chronic renal failure" as visit diagnosis and problem list
Lifestyle modification	• Refer all patients aged <80 years for HALT-CKD counselling • Stop smoking, refer smoking cessation clinic by pharmacist • Encourage weight loss, consider dietician review if BMI >23 kg/m^2, weight management clinic if BMI >27.5 kg/m^2 • Counsel on low salt (<2 g/day) diet • Counsel on low protein diet (<0.8 g/kg/day) and refer dietician for CKD G3B patients • Advice on 150 mins/week of moderate intensity exercise
Maximise ACEi/ARB	Optimise dosages until one of these endpoints below: a) Maximal recommended or tolerated dose b) Normoalbuminuria + achieve BP target c) When starting or increasing ACEi/ARB, order ACEi/ARB panel in 2–4 weeks with CM review
Optimise BP	a) <130/80 mmHg for ALL patients b) <140/90 mmHg for older patients, high fall risk, multiple comorbidities
Optimise HbA1c	a) ≤7%: Age ≤75 years b) ≤8%: Age 76–80 years
Optimise LDL-C	a) <1.8 mmol/L for DM patients b) <2.6 mmol/L for non-DM patients c) More stringent targets for patients with ASCVD or additional risk factors
Start SGLT2 inhibitor	a) Can be started if patient is on ACE-I/ARB; check renal panel in the elderly, advanced CKD or on diuretic b) Multiple benefits such as weight loss, BP and DM control, reducing albuminuria, retarding progression, reducing mortality
Shared care with renal	Refer CKD G3B, G4 and G5 or persistent significant albuminuria to nephrology

CKD stage	eGFR (ml/min/1.73 m^2)
G1	≥90
G2	60–89
G3A	45–59
G3B	30–44
G4	15–29
G5	<15

ACEi/ARB	Initial dose	Max daily dose (mg/day)	Renal dose (mg/day)
Lisinopril	5 mg OM Elderly: 2.5 mg	40 OD	CrCl <30 Initial 2.5–5 OD
Enalapril	5 mg OM Elderly: 2.5 mg OM	20 BD	CrCl <30 max 20/day
Captopril	25 mg BD/TDS	50 TDS	CrCl <50 75% dose BD
Perindopril	4 mg OM Elderly: 2 mg OM	8 OD	CrCl <30 Do not use
Losartan*	50 mg OM	100 OD	No change
Valsartan	80 mg OM	320 OD	No change
Irbesartan	150 mg OM Elderly: 75 mg OM	300 OD	No change
Candesartan	8 mg OM	32 OD	Initial 4 OD
Telmisartan*	40 mg OM	80 OD	No change

*Recommended option

Updated October 2024

ASCVD: atherosclerotic cardiovascular disease; ACEi: angiotensin-converting enzyme inhibitor; ARB: angiotensin receptor blocker; BMI: body mass index; BP: blood pressure; CKD: chronic kidney disease; CM: care manager; DM: diabetes mellitus; eGFR: estimated glomerular filtration rate; HALT-CKD: Holistic Approach to Lowering and Tracking Chronic Kidney Disease; Hb1Ac: haemoglobin 1Ac; LDL-C: low-density lipoprotein cholesterol; SGLT2i: sodium-glucose cotransporter-2 inhibitor; UACR: urine albumin-creatinine ratio; UPCR: urine protein-creatinine ratio

Koh SWC et al . Ann Acad Med Singap. 2024 Oct 15;53(10):597-607

HALT-CKD: 5-YEAR OUTCOMES (2017-2023)

- **Design:** Retrospective cohort of 3,800 primary-care patients with CKD G1–G3A from 5 polyclinics; median follow-up 4.7 years
- **Key result:**

Progression to CKD stages G3B–G5 occurred in 12.6% over 5 years

  - Statistically significant improvements in HbA1c, SBP/DBP, and albuminuria at 5 years, yet progression persisted
- **Independent predictors of faster progression:**
  - Age, female sex, higher baseline creatinine, higher HbA1c, higher DBP, macro-albuminuria (A3)
- **Medication finding:**
  - Reduction or stopping of ACEi/ARB associated with earlier progression (HR 1.92); maintaining therapy recommended

ACE CLINICAL GUIDANCE

Published: 7 October 2022
www.ace-hta.gov.sg

Chronic kidney disease

Early detection

Objective	Scope	Target audience
To enhance timely detection of chronic kidney disease (CKD)	Identification of patients at increased risk of CKD, as well as diagnosis and staging of CKD	This clinical guidance is relevant to all healthcare professionals caring for patients at risk of CKD, especially those in primary care

Chronic kidney disease (CKD) is defined as abnormalities of kidney function or structure persisting for at least three months, with implications for health.[1] In 2017, the estimated global prevalence of CKD was 9.1%.[2] In Singapore, the prevalence of CKD among residents aged 18 to 74 years was 8.8% in 2019–2020,[3] and CKD has remained in the top ten causes of death from 2009 to 2019 with CKD-related deaths rising by 76% within that decade.[4]

Timely CKD detection and management play a major part in slowing down or preventing progression to kidney failure or other complications. Early detection is particularly significant given that patients are asymptomatic in the early stages of CKD. Primary healthcare professionals play an essential role in identifying patients at increased risk of CKD to detect it early.

Statement of Intent

This ACE Clinical Guidance (ACG) provides concise, evidence-based recommendations and serves as a common starting point nationally for clinical decision-making. It is underpinned by a wide array of considerations contextualised to Singapore, based on best available evidence at the time of development. The ACG is not exhaustive of the subject matter and does not replace clinical judgement. The recommendations in the ACG are not mandatory, and the responsibility for making decisions appropriate to the circumstances of the individual patient remains at all times with the healthcare professional.

https://www.ace-hta.gov.sg/healthcare-professionals/ace-clinical-guidances/chronic-kidney-disease-early-detection

ACE agency for care effectiveness

MINISTRY OF HEALTH SINGAPORE

Academy of Medicine, Singapore
Chapter of Cardiologists, CPS
Chapter of Endocrinologists, CPS
Chapter of Family Medicine Physicians
Chapter of General Physicians, CPS
Chapter of Geriatricians, CPS
Chapter of Renal Physicians, CPS

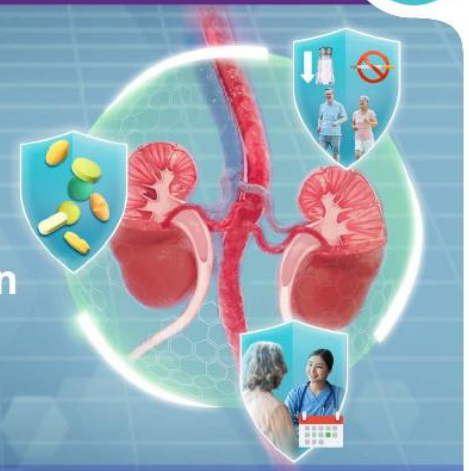
COLLEGE OF FAMILY PHYSICIANS SINGAPORE

ACE CLINICAL GUIDANCE

Published: 27 October 2023
www.ace-hta.gov.sg

Chronic kidney disease

Delaying progression and reducing cardiovascular complications



Objective	Scope	Target audience
To enhance management of chronic kidney disease (CKD)	Management of early-stage CKD[a] through pharmacotherapy and lifestyle intervention	This clinical guidance is relevant to all healthcare professionals caring for patients with CKD, such as those in primary care

Chronic kidney disease (CKD) is a major public health problem worldwide.[1,2] Patients with CKD have increased risk of cardiovascular (CV) complications such as coronary artery disease, heart failure, arrhythmia, or sudden cardiac death.[3] Furthermore, patients with commonly associated comorbidities such as hypertension, dyslipidaemia, or diabetes mellitus carry an even higher CV risk – underscoring the importance of optimised management of comorbidities and overall CV risk for all patients.[4]

In Singapore, CKD prevalence among residents aged 18–74 years was 8.8% in 2019-2020.[5] This is estimated to triple by 2035, with CKD stages G1-2 accounting for most cases.[1] Locally, the number of people detected with CKD stages G1-2 had increased significantly during the last decade and their annual rate of decline in kidney function was also found to be higher compared to those in the later stages – highlighting the need for timely and effective management early. This ACG focuses on management of early-stage CKD to slow down disease progression and to reduce risk of renal and CV complications.

*For the purpose of this ACG, "early-stage" denotes patients with CKD G1-3a and A1-A3.

Statement of Intent

This ACE Clinical Guidance (ACG) provides concise, evidence-based recommendations and serves as a common starting point nationally for clinical decision-making. It is underpinned by a wide array of considerations contextualised to Singapore, based on best available evidence at the time of development. The ACG is not exhaustive of the subject matter and does not replace clinical judgement. The recommendations in the ACG are not mandatory, and the responsibility for making decisions appropriate to the circumstances of the individual patient remains at all times with the healthcare professional.

https://www.ace-hta.gov.sg/healthcare-professionals/ace-clinical-guidances/chronic-kidney-disease-delaying-progression-and-reducing-cardiovascular-complications

ACE agency for care effectiveness

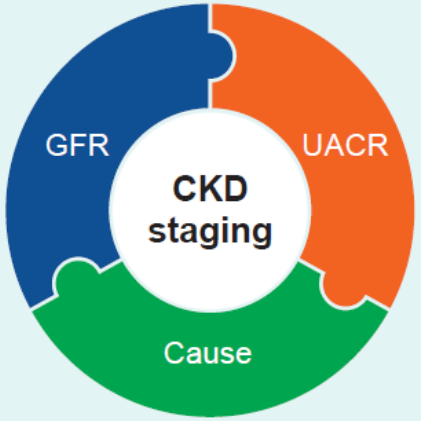
MINISTRY OF HEALTH SINGAPORE

Academy of Medicine, Singapore
Chapter of Cardiologists, CPS
Chapter of Endocrinologists, CPS
Chapter of Family Medicine Physicians
Chapter of General Physicians, CPS
Chapter of Geriatricians, CPS
Chapter of Renal Physicians, CPS
College of Public Health & Occupational Physicians

COLLEGE OF FAMILY PHYSICIANS SINGAPORE

Overall approach to management of early-stage CKD

Management of CKD may vary between two patients with similar GFR and UACR levels, if their underlying causes of CKD are different.



CKD staging includes:

i. GFR
ii. UACR, and
iii. Cause(s) (see *"CKD – early detection" ACG*)

Personalise CKD management plan based on CKD stage (see ***Recommendation 1***), with the aim of:

- Delaying CKD progression, and
- Reducing CV complications

Pharmacological treatment

Lifestyle intervention

Follow-up and monitoring

Shared or multi-disciplinary care

Consider shared or multidisciplinary care depending on CKD progression and other clinical needs (see ***Recommendation 7***)

Pharmacological treatment

Optimise management of blood pressure and albuminuria in patients with early-stage CKD:

i. ACE inhibitor or ARB should be used to treat patients with CKD and albuminuria and titrated to maximum tolerated dose (see ***Recommendation 2***)

ii. Add SGLT2 inhibitor if albuminuria persists (see ***Recommendation 3***)

Treatment considerations depending on comorbidities

Optimise management of CKD-related comorbidities such as:

- Hypertension
- Dyslipidaemia
- T2DM

(see ***Recommendation 4***)

Lifestyle intervention

Encourage and provide education on lifestyle intervention through shared decision-making, which includes guidance on:

Healthy diet

Physical activity, and

Smoking cessation

(see ***Recommendation 5***)

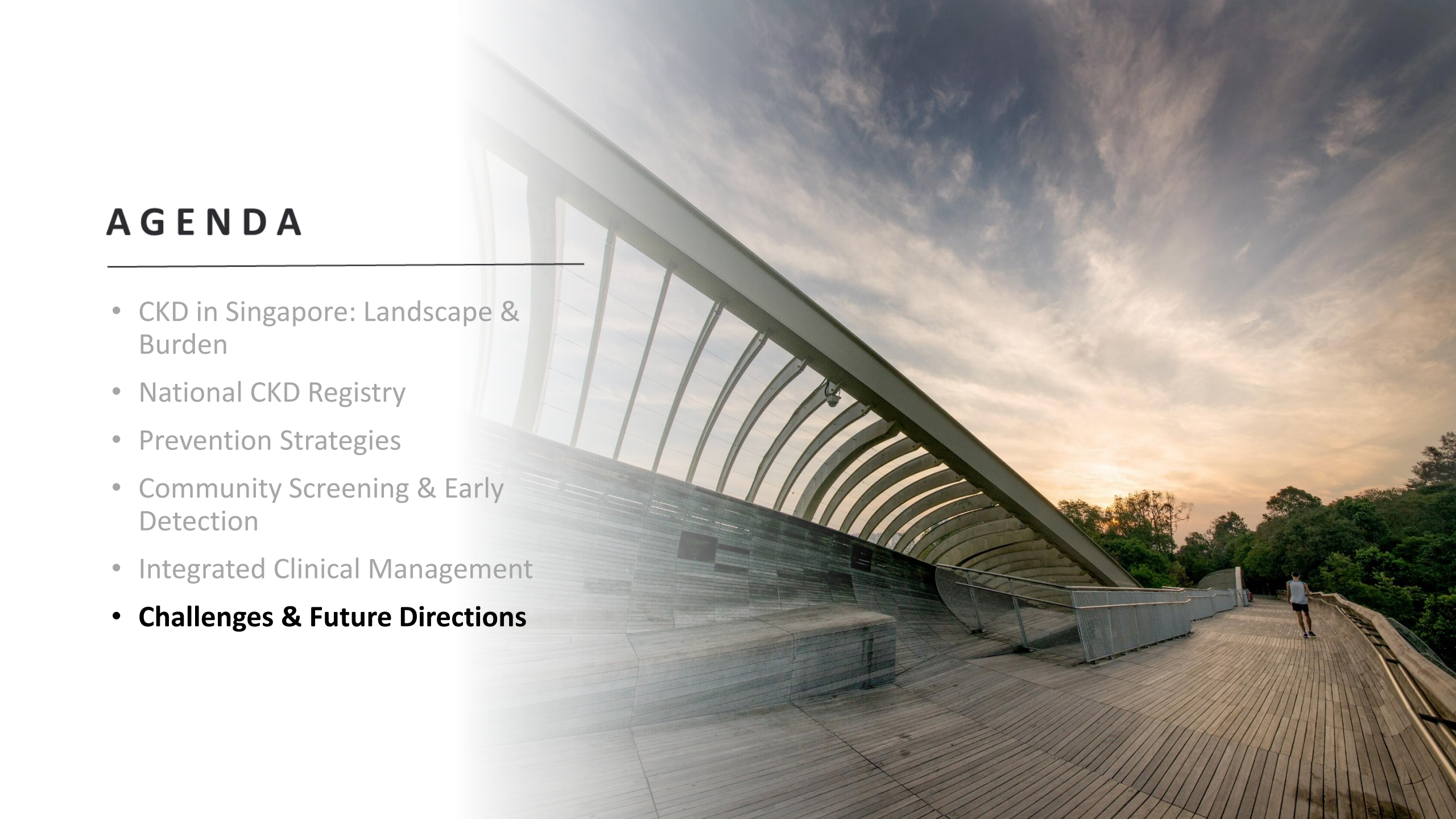
Follow-up and monitoring

Follow-up all patients with CKD regularly, with more frequent reviews for patients at risk of CKD progression (see ***Recommendation 6***)

Review and adjust the management plan, as needed

AGENDA

- CKD in Singapore: Landscape & Burden
- National CKD Registry
- Prevention Strategies
- Community Screening & Early Detection
- Integrated Clinical Management
- **Challenges & Future Directions**



BARRIERS, OUTCOMES AND FUTURE DIRECTION

SGH

Theme	Innovations & Future Directions	Integrated Strategy Highlights
Patient Engagement	Community health programmes expanding to improve awareness and early intervention	Multi-level approach: integrates patient, provider, and system-level interventions
Resource Constraints	Harnessing new medical technologies for early detection and monitoring (e.g., predictive analytics, AI)	Collaboration across public, private, and community sectors
Coordination Complexities	Personalised medicine: tailored treatments for better outcomes. Community-based integrated care models	Focus on seamless care pathways, shared data, and coordinated follow-up
Measuring Outcomes	Robust metrics guide ongoing strategy refinement and programme effectiveness	Continuous monitoring and iterative improvement of CKD prevention and management strategies

INTEGRATED STRATEGY

SGH

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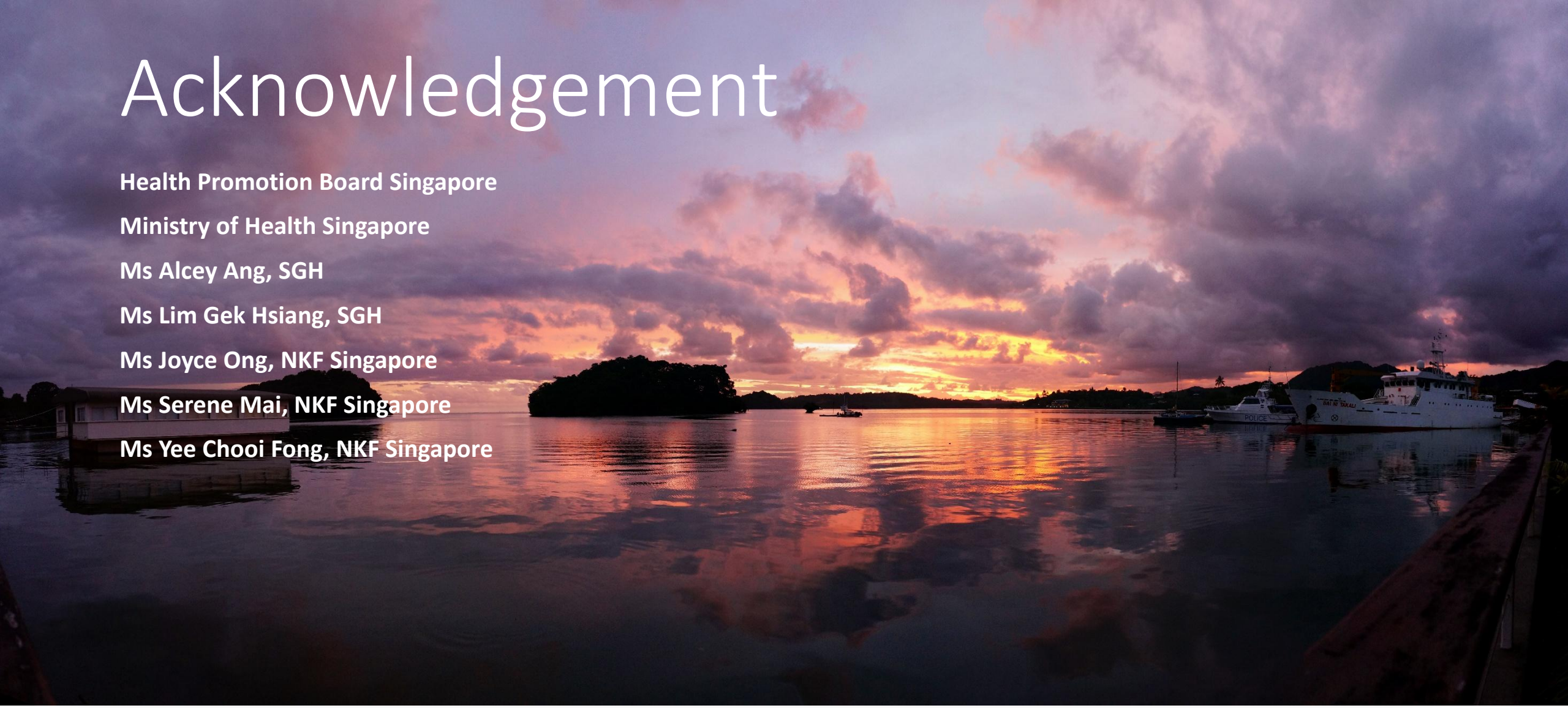
Ms Serene Mai, NKF Singapore

Ms Yee Chooi Fong, NKF Singapore



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Physicians

- Dr Timothy Koh
- Dr Sky Koh
- Dr Charles Ng
- Dr Mabel Tan
- Renal HODs from all the institutions

Senior Management

- Prof Chan Choong Meng
- A/Prof Yeo Khung Keong
- A/Prof Tan Chieh Suai
- A/Prof Lina Choong
- GCEOs, CEOs, CIOs, CMIOs, GDPOs, DXOs, DPOs from all institutions
- NUHS Senior management
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- SingHealth Senior Management

AstraZeneca Team

Legal Office

- Serene Lim

IHIS/SYNAPXE

- Jeffrey Fong
- Andy Ta
- Susan Lee

Finance

- Ayulestari Bte Harsono
- Lee Kwai Sim
- Anna Goh

Public Health Advisor

- Prof Eric Finkelstein
- A/Prof Lim Yee Wei

Renal Coordinator

- Chan Kai Wen

Secretariat

- Alcey Ang
- Chue Xiu Ping

Quality

- Ratna Binte Abdul Rahman

Research Officers

- Tan Lay Lian
- Ong Siok Luan
- Lim Chew Gin
- Heiny
- Wong Mee Kim
- Edwin Liu

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- Xin Xiaohui
- Lim Gek Hsiang