APCN x TSN 2025
23rd Asian Pacific Congress of Nephrology
Gene, Immunology, Vast, MEtabolism at its Finest!

Strategies of CKD Prevention in Malaysia: from early risk flags to integrated, data-driven care

⬦

5 to 7th December 2025

Lim Soo Kun, Malaysia

Outline

- Introduction

- CKD Burden in Malaysia: Why Prevention Must Scale

- From Awareness Campaigns to Targeted Prevention
- KFRE auto-reporting
- Cascade screening of relatives at dialysis centres
- AI/ML-based tools (Klinrisk)

- Proposed Integrated CKD Prevention Pathway for Malaysia
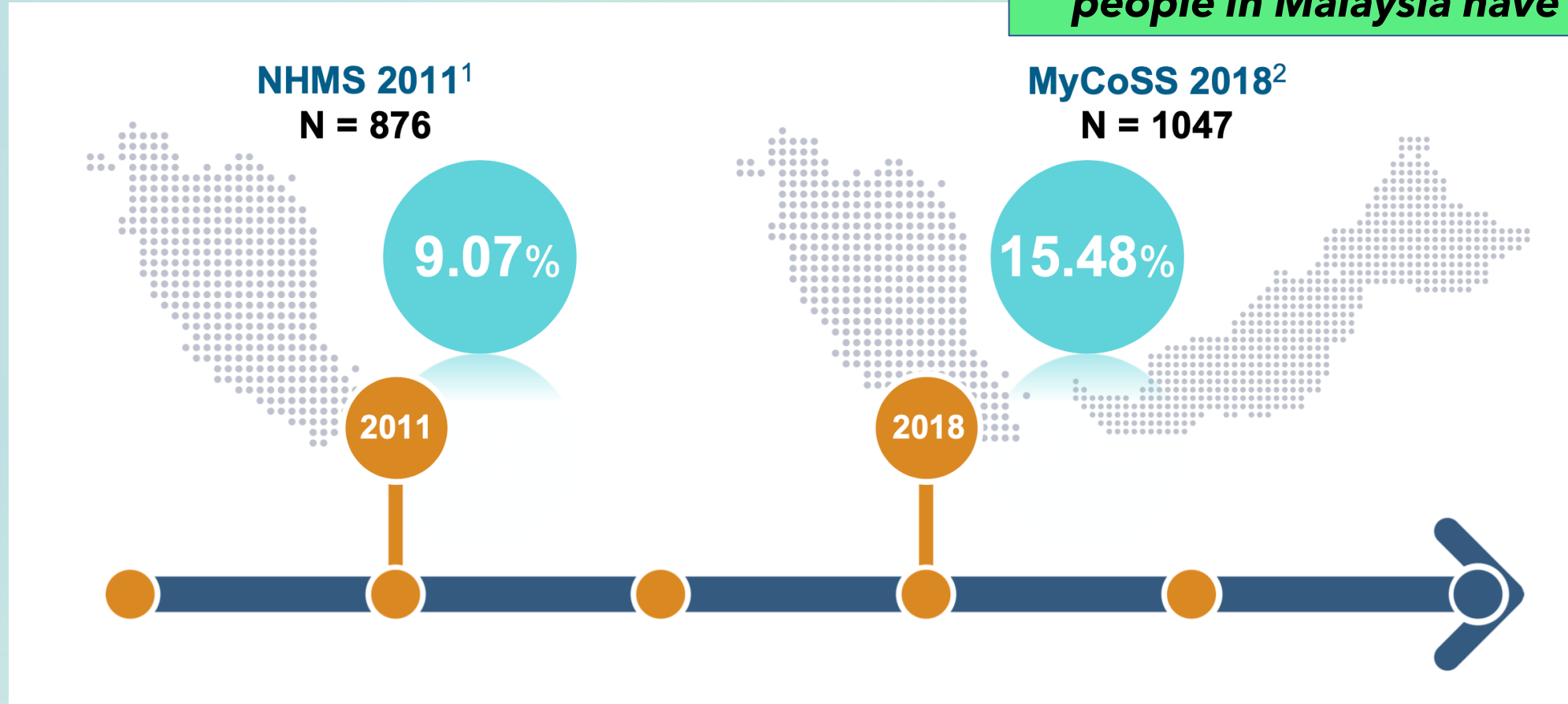
- Take home messages

Disclosure

I have no relevant financial relationship to disclose any COI for this presentation within the period of 36 months.

CKD Burden in Malaysia: Why Prevention Must Scale ?

CKD is a SERIOUS health concern in Malaysia

~3.8 million
people in Malaysia have CKD[1]

NHMS 2011[1]
N = 876

9.07%

2011

MyCoSS 2018[2]
N = 1047

15.48%

2018

1. Hooi LS, et al. Kidney Int 2013;84:1034–1040;
2. Saminathan TA, et al. BMC Nephrol 2020;21:344

Forecast of ESKD in Malaysia
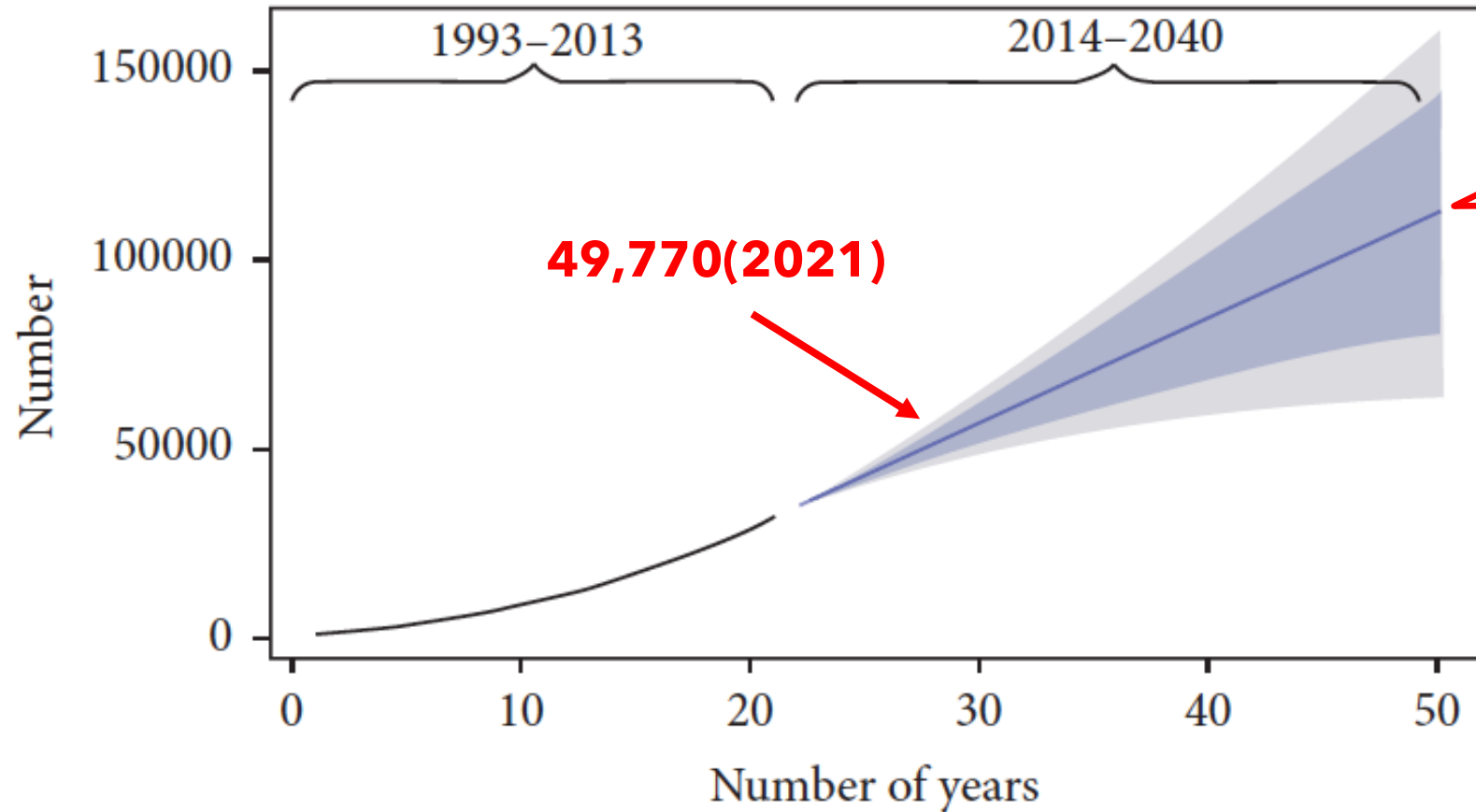
Major drivers:
- *Diabetes*
- *Hypertension*
- *Obesity*
- *Ageing*

MA Bujang et al. Int J Nephrol. 2017;2017:2735296.

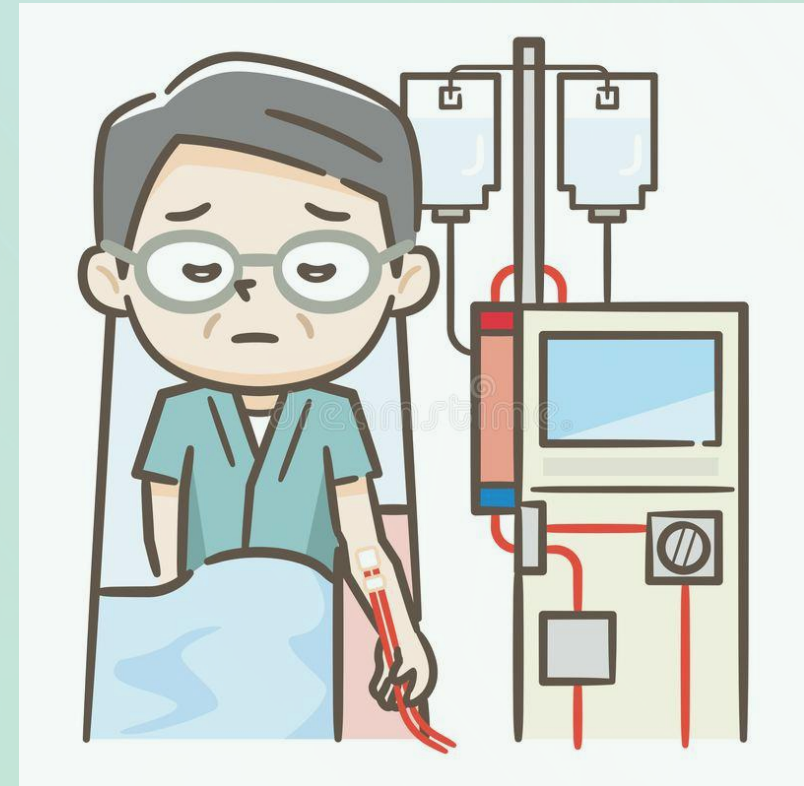# DKD leading to kidney failure has the highest economic burden compared to other comorbidities

Shafie, et al. Malaysian Journal of Pharmaceutical Sciences 18.2 (2020): 15-32.
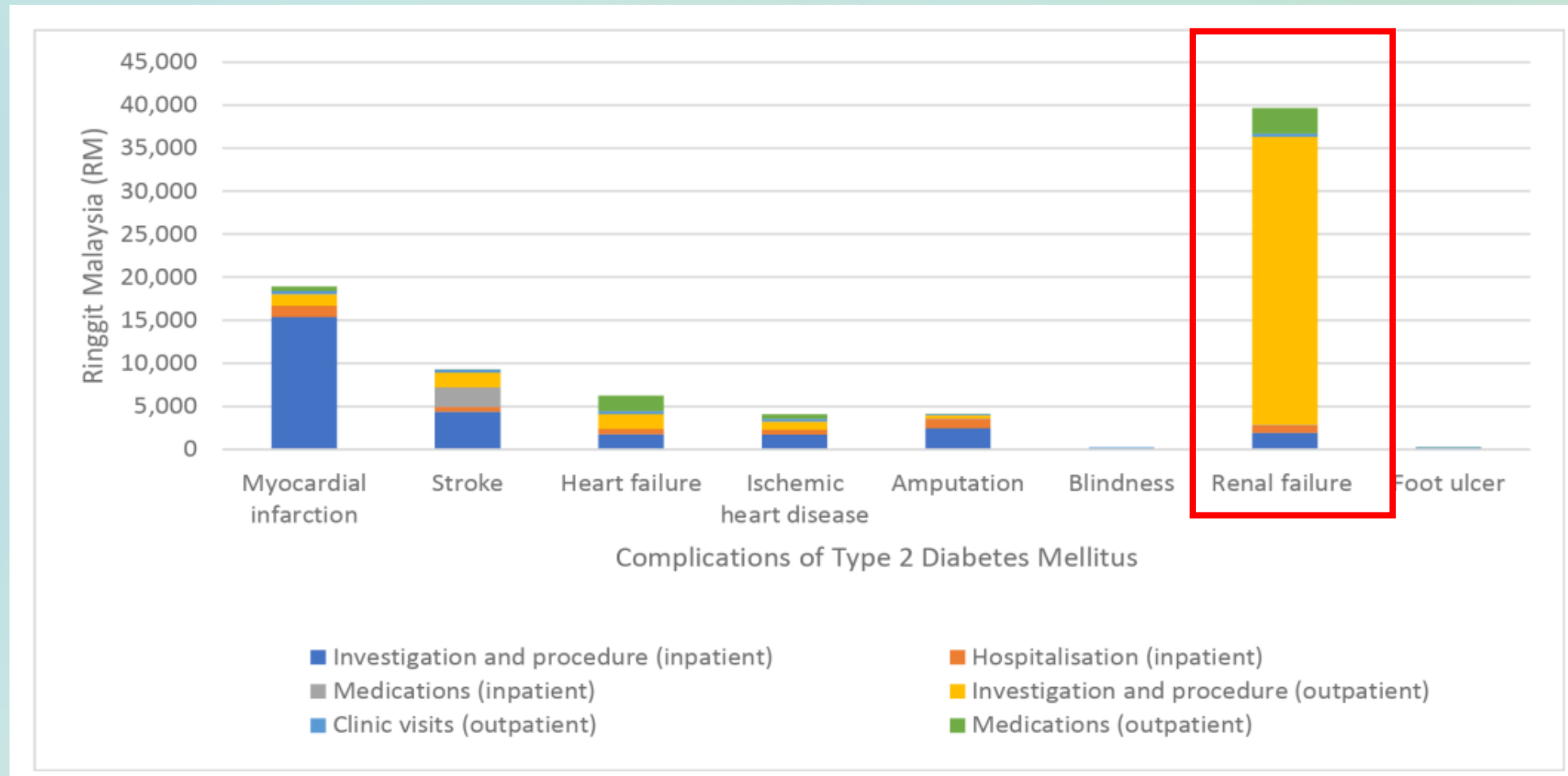
Kidney failure cost an average of **RM42,000**, with almost similar cost each subsequent year

T2DM complications	Event year	Subsequent year
MI	RM19,381.43 (USD4,528.37)	RM1,802.40 (USD421.12)
Stroke	RM8,740.60 (USD2,042.20)	RM1,388.40 (USD312.71)
HF	RM5,032.71 (USD1,175.87)	RM2,246.10 (USD524.79)
IHD	RM3,788.31 (USD885.12)	RM1,802.40 (USD421.12)
Amputation	RM5,959.93 (USD1,392.51)	–
Blindness	RM2,387.00 (USD557.71)	–
RF with haemodialysis	RM42,394.97 (USD9,905.37)	RM39,521.52 (USD9,233.89)
Diabetic foot ulcer	RM316.12 (USD73.86)	–

Shafie, et al. Malaysian Journal of Pharmaceutical Sciences 18.2 (2020): 15-32.

CKD – predicted to be TOP 10 leading cause of death by 2040 !

Leading causes 2016

1. Ischaemic heart disease
2. Stroke
3. Lower respiratory infections
4. Diarrhoeal diseases
5. Road injuries
6. Malaria
7. Neonatal preterm birth
8. HIV/AIDS
9. COPD
10. Neonatal encephalopathy
11. Tuberculosis
12. Congenital defects
13. Lung cancer
14. Self-harm
15. Diabetes
16. Chronic kidney disease
17. Other neonatal
18. Alzheimer's disease
19. Neonatal sepsis
20. Liver cancer

Leading causes 2040

1. Ischaemic heart disease
2. Stroke
3. Lower respiratory infections
4. COPD
5. Chronic kidney disease
6. Alzheimer's disease
7. Diabetes
8. Road injuries
9. Lung cancer
10. Diarrhoeal diseases
11. Self-harm
12. HIV/AIDS
13. Liver cancer
14. Hypertensive heart disease
15. Colorectal cancer
16. Tuberculosis
17. Congenital defects
18. Neonatal preterm birth
19. Breast cancer
20. Falls

Foreman KJ et al. Lancet. 2018 Nov 10;392(10159):2052-2090.

From Awareness Campaigns to Targeted Prevention

- Past decade: health talks, screening days, World Kidney Day events
- Awareness surveys: CKD knowledge still low in general population
- Opportunistic, one-off screening → limited follow-up
- Need shift: **from mass, one-time screening → targeted, repeated, risk-based prevention**
1. KFRE auto-reporting
2. Cascade screening of relatives at dialysis centres
3. AI/ML-based tools (Klinrisk)

Gaps in clinical practise
(Reflection on Malaysia scenario)

Many examples of missed opportunities

AKI treat as CKD

64-yr-old lady
- Presented with elevated creatinine 500μmol/l
- Advised for dialysis
- Further investigations showed AKI sec to AIN

High risk CKD not referred

55-yr-old man
- First referred to nephrology
- Creatinine 225μmol/L
- In retrospect, uACR >200mg/mmol for few years. eGFR dropped >5ml/min/1.73m^2 per year for few years

Non-DKD treated as DKD

48-yr-old man
- T2DM x 10yrs
- Noticed to have severe albuminuria (uACR 800mg/mmol)
- Treated as DKD
- Renal biopsied showed membranous nephropathy

Underutilisation of urine test

45-yr-old lady
- Follow-up at GP for T2DM
- eGFR 80ml/min/1.73m^2
- No urine test for 2 yrs
- First uACR 60mg/mmol

ACR screening – room for improvement

States	Clinical Investigations											
	Urine Protein						Urine Microalbumin					
	No. of patients audited	2022		No. of patients audited	2023		No. of patients audited	2022		No. of patients audited	2023	
		n	%		n	%		n	%		n	%
MALAYSIA	106,742	79,202	74.20	113,903	87,655	76.96	106,742	57,731	54.08	113,903	62,604	54.96
Johor	7,570	5,407	71.43	7,350	5,773	76.67	7,570	3,246	42.88	7,350	3,419	45.41
Kedah	7,718	5,444	70.54	7,791	6,205	79.64	7,718	3,697	47.90	7,791	3,997	51.30
Kelantan	8,657	7,124	82.29	9,995	8,184	81.88	8,657	6,082	70.26	9,995	6,622	66.25
Melaka	13,522	8,426	62.31	13,378	8,629	64.50	13,522	5,117	37.84	13,378	5,834	43.61
N. Sembilan	5,863	4,637	79.09	5,564	4,367	78.49	5,863	2,785	47.50	5,564	2,142	38.50
Pahang	7,229	6,064	83.88	7,057	6,189	87.70	7,229	4,629	64.03	7,057	4,978	70.54
Perak	8,348	5,965	71.45	9,207	6,506	70.66	8,348	4,384	52.52	9,207	4,724	51.31
Perlis	789	630	79.85	800	749	93.63	789	545	69.07	800	698	87.25
P. Pinang	4,316	2,776	64.32	4,668	3,235	69.30	4,316	2,158	50.00	4,668	2,565	54.95
Sabah	10,819	7,900	73.02	14,099	10,866	77.07	10,819	4,829	44.63	14,099	6,624	46.98
Sarawak	5,440	3,518	64.67	6,911	4,636	67.08	5,440	2,656	48.82	6,911	3,289	47.59
Selangor	6,721	4,457	66.31	6,772	4,815	71.10	6,721	3,781	56.26	6,772	3,746	55.32
Terengganu	15,336	13,429	87.57	15,681	13,858	88.37	15,336	11,227	73.21	15,681	11,247	71.72
WP KL	3,073	2,207	71.82	3,107	2,427	78.11	3,073	1,492	48.55	3,107	1,527	49.15
WP Labuan	589	587	99.66	588	548	93.20	589	503	85.40	588	546	92.86
WP Putrajaya	752	631	83.91	755	668	88.48	752	600	79.79	755	646	85.56

NDR, 2023

RESEARCH ARTICLE

Real-world evaluation of care for type 2 diabetes in Malaysia: A cross-sectional analysis of the treatment adherence to guideline evaluation in type 2 diabetes (TARGET-T2D) study

N = 5094 (13 December 2021 to 30 June 2022)

Lim LL, et al. PLoS One. 2024 Jan 2;19(1):e0296298.
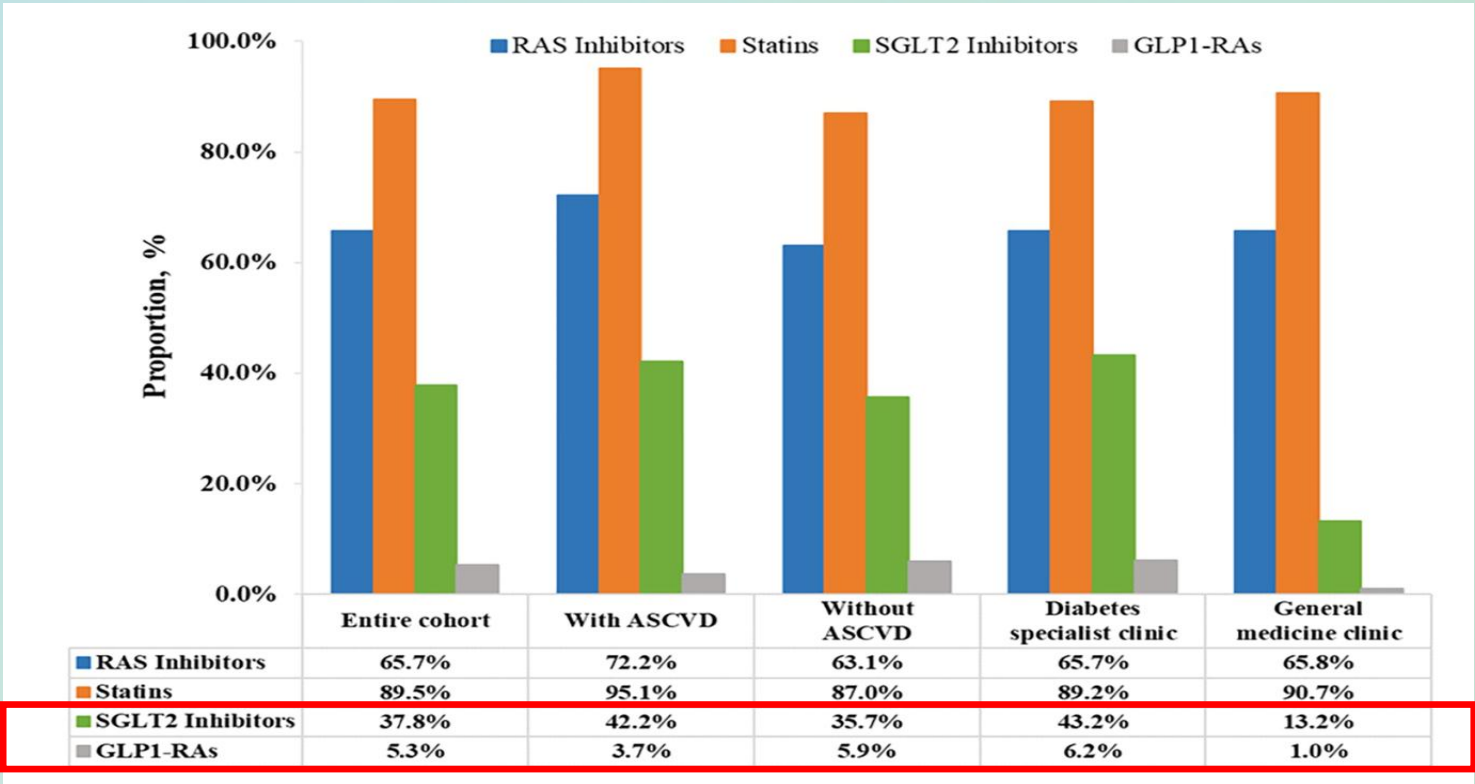
Late CKD detection → unplanned dialysis start

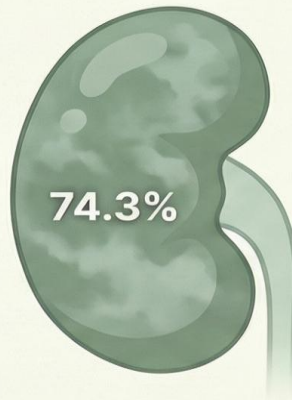The Crisis of Unplanned Dialysis: A 2014 Snapshot from Sabah

THE PROBLEM: A MAJORITY START DIALYSIS UNPREPARED

74.3%

Begin Dialysis in an Unplanned Manner

Nearly 3 in 4 patients started treatment urgently without optimal medical preparation.

74.3%

51.4%

Diabetes is the Leading Cause

Diabetic nephropathy was the primary cause of kidney failure.

74.3%

Most Rely on Temporary Catheters for Access

Initiated dialysis via a catheter, not the preferred long-term arteriovenous fistula (AVF).

THE CONSEQUENCE: A STARK IMPACT ON SURVIVAL

Preparation for Dialysis is a Key Factor in Survival

Patients who were medically prepared for dialysis had a significantly higher survival rate after one year.

90.4%

71.1%   77.9% Overall Patient Average

Prepared for Dialysis

Unprepared (but known to medical service)
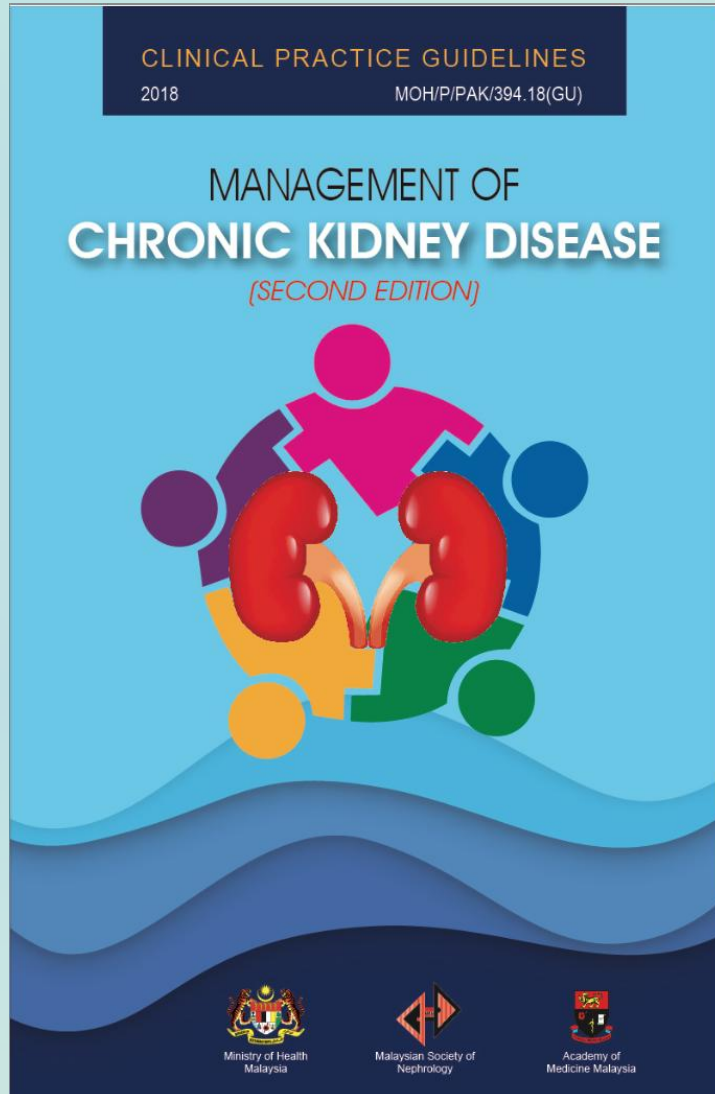
12-Month Survival Rate
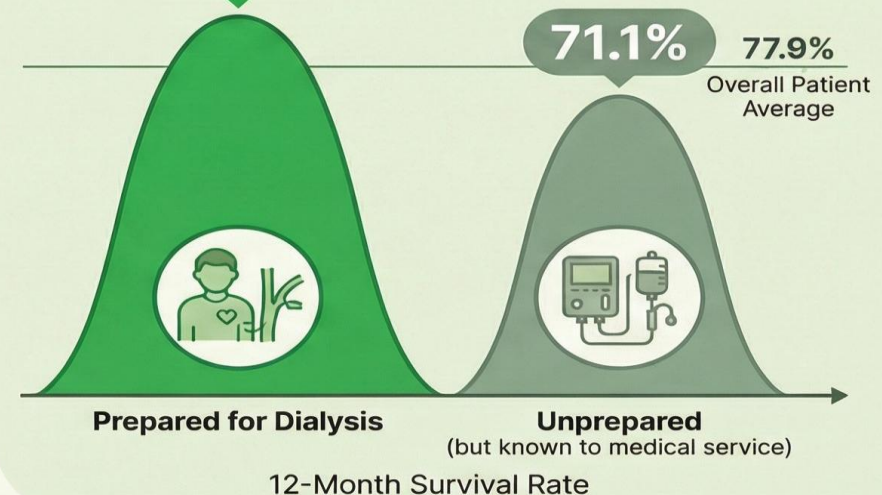
Wong KW, et al. *Med J Malaysia*. 2017 Jun;72(3):179-185.

NotebookLM

MDTR (2023): Up to 43.7% of patients started HD via dialysis catheters in Malaysia

KFRE: Turning Lab Data into Risk Flags

CKD CPG: eGFR-based nephrology referral

CLINICAL PRACTICE GUIDELINES
2018   MOH/P/PAK/394.18(GU)

MANAGEMENT OF CHRONIC KIDNEY DISEASE
(SECOND EDITION)

Ministry of Health Malaysia

Malaysian Society of Nephrology

Academy of Medicine Malaysia

7. REFERRAL

Recommendation 12

- A patient with chronic kidney disease (CKD) with any of the following criteria should be referred to a nephrologist/physician:
  - persistent heavy proteinuria [urine protein ≥1 g/day or urine protein: creatinine ratio (uPCR) ≥100 mg/mmol*] despite optimal treatment
  - persistent isolated microscopic haematuria after excluding urogynaecological cause
  - persistent haematuria with proteinuria (urine protein ≥0.5 g/day or uPCR ≥50 mg/mmol*)
  - rapidly declining renal function [loss of estimated glomerular filtration rate (eGFR) >5 ml/min/1.73 m^2 in one year or >10 ml/min/1.73 m^2 within five years]
  - eGFR <30 ml/min/1.73 m^2 (eGFR categories G4 - G5)
  - resistant hypertension (failure to achieve target blood pressure despite three antihypertensive agents including a diuretic)
  - suspected renal artery stenosis
  - suspected hereditary kidney disease
  - pregnant or when pregnancy is planned
  - persistent abnormalities of serum potassium
  - unexplained cause of CKD

The Kidney Failure Risk Equation (KFRE)

A Lab-Based Predictive Equation

Age Sex eGFR ACR

Uses four core variables: **Age, Sex, eGFR,** and **Urine Albumin-to-Creatinine Ratio (ACR).**
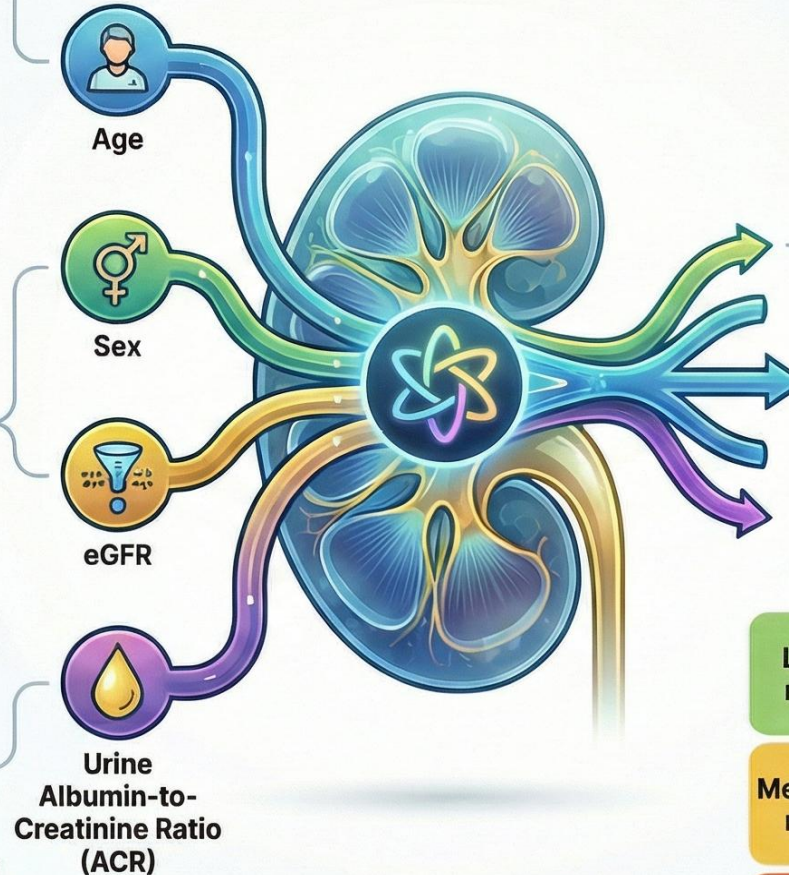
Extensively Validated & Trusted

100,000+
Validated in over 30 countries and used by more than 100,000 physicians worldwide.

Integrated into Global Guidelines

UK NICE KDIGO

Incorporated into UK NICE and international KDIGO clinical practice guidelines for CKD.

Age

Sex

eGFR

Urine Albumin-to-Creatinine Ratio (ACR)

Clinical Use

Guides Key Clinical Decisions: Prioritize nephrology referrals.

Time dialysis access planning.

Counsel patients objectively.

Risk Levels & Clinical Application

	Patients with eGFR 30-59 (CKD Stage 3)		Patients with eGFR 15-29 (CKD Stage 4)	
Low risk		<5% risk over 5 years		<10% risk over 2 years
Medium risk		5-15% risk over 5 years		10-20% risk over 2 years
High risk		>15% risk over 5 years		>20% risk over 2 years

KFRE Auto-Reporting: Making Risk Visible

42-year-old lady

- T2DM

- HPT

Medications:

- Losartan 100mg OD

RENAL FUNCTION TEST (SERUM)

Test		Value	Units	Reference Range
Sodium (Serum)		137	mmol/L	136 - 145
Potassium (Serum)		4.6	mmol/L	3.6 - 5.2
Chloride (Serum)		104	mmol/L	99 - 109
Total CO2 (Serum)		25.0	mmol/L	20.0 - 31.0
Anion Gap (Serum)		13	mmol/L	10 - 20
Urea (Serum)	H	10.3	mmol/L	3.2 - 8.2
Creatinine (Serum)	H	174	umol/L	44 - 71
eGFR	L	31		> 90
Probability of kidney failure at 2 years		6.71		< 10% - Low Risk 10% - 20 % - Medium Risk > 20% - High Risk
Probability of kidney failure at 5 years		26.85		< 5% - Low Risk 5% - 15% - Medium Risk > 15% - High Risk

Collaboration with private sector in CKD initiative

Home » Pemimpin industri kesihatan lancar MyCKD CPG intervensi penyakit buah pinggang

NEGARA

Pemimpin industri kesihatan lancar MyCKD CPG intervensi penyakit buah pinggang

Oleh NUR FATIN ZAHRA · 7 Mei 2024, 1:36 pm

Dr. Mohamed Iqbal (enam dari kiri) melakukan gimik pelancaran aplikasi MyCKD CPG ketika ditemui di Majlis Pelancaran MyCKD CPG di Menara KEN, Taman Tun Dr Ismail di ibu negara hari ini.
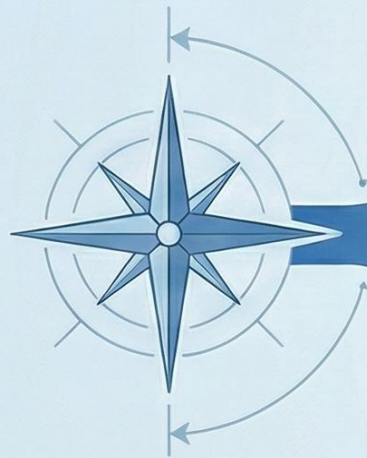
KFRE: A Tool to Guide Chronic Kidney Disease Management in Primary Care

STUDY CONTEXT

Retrospective study of 2,293 patients with Moderate to Advanced Chronic Kidney Disease (CKD Stage 3 & 4) in primary care, assessing KFRE's alignment with clinical decisions.

KFRE RISK SCORE

KFRE GUIDES SPECIALIST REFERRALS

STAGE 3 CKD

In Stage 3 CKD, referral rates climb dramatically with KFRE risk.

High-risk patients over 7 times more likely to be referred than low-risk patients.

- Low Risk: 8.3%
- High Risk: 58.0%

Nephrology Clinic

STAGE 4 CKD

The trend continues for Stage 4 CKD.

Referral rates for medium and high-risk patients significantly higher than for low-risk patients.

- Low Risk: 63.9%
- High Risk: 86.7%
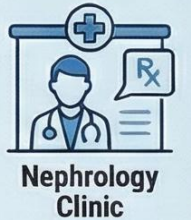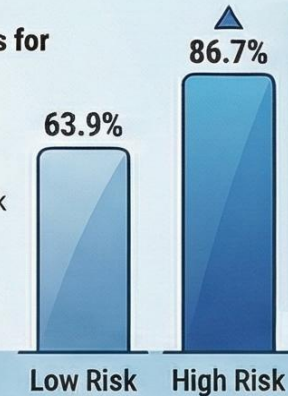
Nephrology Clinic

KFRE INFORMS TREATMENT STRATEGY

STAGE 3 CKD

For Stage 3 CKD, KFRE effectively prioritizes intensive therapy.

High-risk patients nearly 3 times more likely to receive combination therapy (RAS-i & SCLT2-i).

- Low Risk: 18.2%
- High Risk: 53.6%
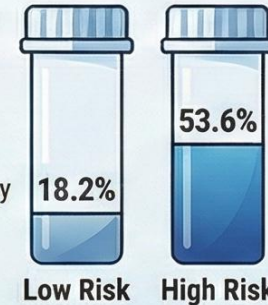
STAGE 4 CKD

For Stage 4 CKD, high baseline risk limits treatment differentiati.

Therapy was similar across all risk levels, highlighting the need for universal intensive management.

- Low Risk: 36.1%
- High Risk: 36.7%
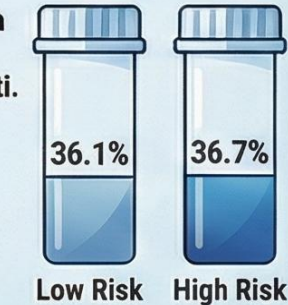
Optimized Medical Therapy

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eGFR-based criteria

| eGFR 30–60 | → | eGFR <30 | → | eGFR <20 |

Managed by PCP/FMS

Refer to nephrology

Access & transplant planning

eGFR   90   60   30   15

STAGE 1
STAGE 2
STAGE 3A
STAGE 3B
STAGE 4
STAGE 5

KFRE-based criteria

KFRE <15% 5 years

KFRE >15% 5 years

KFRE >40% 2 years

Dialysis-Centre Cascade Screening Workflow

Dialysis Center: Family Screening Workflow

1. Identify Participants — Screen first-degree relatives (ages 18-75) of current dialysis patients.

2. Conduct On-Site Screening — Perform registration, a risk questionnaire, and key point-of-care tests.
- BP (Blood Pressure)
- BMI (Body Mass Index)
- eGFR (Estimated Glomerular Filtration Rate)
- ACR (Albumin-to-Creatinine Ratio)

3. Deliver Results & Counseling — A nurse or pharmacist explains the results and provides personalized lifestyle advice.
- RESULTS
- LIFESTYLE ADVICE
- PERSONALIZED

4. Refer High-Risk Individuals — Refer patients with CKD or high cardio-kidney-metabolic risk for specialist care.

HIGH CARDIO-KIDNEY-METABOLIC RISK

SPECIALIST CARE

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MEMO

CKM Risk Bundle

- *Brief lifestyle counselling*
- *Smoking cessation referral/support*
- *Exercise/weight management advice*
- *Vaccination review*

Klinrisk: From Research to Real-World Use

Why Bring AI/ML into CKD Prevention?

- CKD is very common & data-rich (repeated labs, BP, meds)

- AI/ML can:
i. Detect risk patterns earlier
ii. Stratify large populations automatically
iii. Support personalized follow-up plans

———◇———

- KFRE vs ML models:
a. KFRE – simple, transparent, CKD-focused
b. ML (e.g., Klinrisk) – more variables, longitudinal, higher flexibility

AI/ML = Artificial Intelligence/Machine Learning

Klinrisk

The next generation model for CKD risk prediction

- **■** KFRE does not predict CKD progression in earlier stages of CKD

- **■ Klinrisk**
- For CKD **Stage 1-5**
- Predict kidney function decline **(Composite of 40 % decline in eGFR or kidney failure)**
- Use routinely collected laboratory data
- Does not require biomarkers
- Does not require EHR access

Unpublished data

Klinrisk (Sample Report)

KLINRISK
CLINICAL RISK PREDICTION FOR KIDNEY DISEASE

Accession Number
2023-1M3270036

Patient Information

Name	LFLBLACK, DIAMOND ALICE		
Date of Birth	01-Nov-96		
Sex	Female		

Test Information

Ordered By	IT TESTING	Date of Receipt	23-Nov-24
Collection Day	23-Nov-23	Time of Receipt	11:15 AM
Report Date	24-Jan-25	Medical Record (HCN/PHN)	2000012852

Test Report

Risk of progressive decline in kidney function

51%
High

Low	Medium	High
0 – 5	6 – 24	25+

Patients at high risk can work with their physician to implement an evidence based care plan to improve their kidney health.

The Klinrisk algorithm uses data from blood and urine tests including CBC, metabolic panel, and urine albumin to estimate the probability of kidney function loss of up to 40% or kidney failure in the next 5 years. The risk categories and recommendations are provided to alert providers to the risk of progression of CKD, complications of kidney disease and associated care pathways recommended by clinical practice guidelines.

This algorithm is developed by Klinrisk Inc. and has been tested for accuracy in independent populations. It is not an accredited algorithm, nor cleared or approved by Health Canada and it is not required to be.
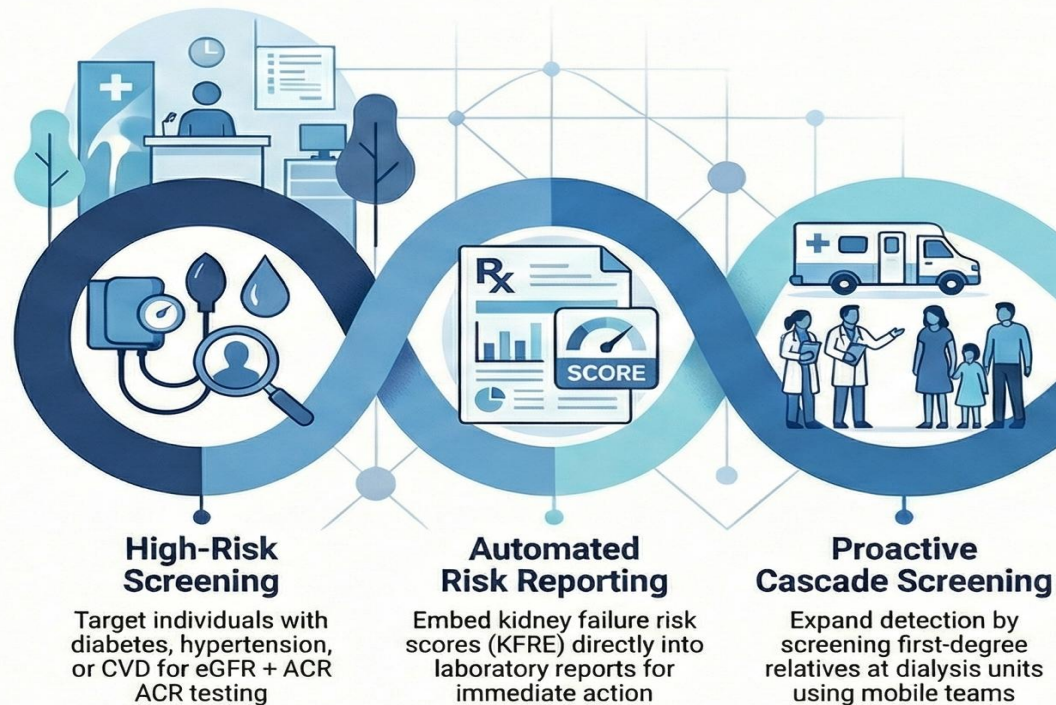
Klinrisk algorithm is for clinical care and should be considered as an aid to help with clinical decision making and is not meant to replace a physician's advice or diagnosis.

The laboratory tests required for the algorithm were performed at LifeLabs.

Clinical Decision Support

Frequency of Monitoring
3 times per year

Blood Pressure Target
Target standardized BP < 120 systolic

Referral
Nephrology referral is indicated

Complications of CKD

(Anemia) (Hyperkalemia)

(Metabolic Acidosis) (CKD-MBD)

Anemia - Hemoglobin 119 g/L
Reference range : Hemoglobin 120 to 160 g/L
CKD-MBD - Phosphate - 1.1 mmol/L & Calcium - 2.11 mmol/L
Reference range : Serum phosphate 0.8 - 1.5 mmol/L & Serum calcium 2.15 - 2.60 mmol/L

Other Recommendations
- **Suggest iron studies including ferritin, total iron-binding capacity and serum iron**
- **Monitor and treat as per CKD-MBD guidelines**

Disease Modifying Treatment to Slow CKD Progression

(RAASi) (SGLT2i Therapy)

(Non Steroidal MRA)
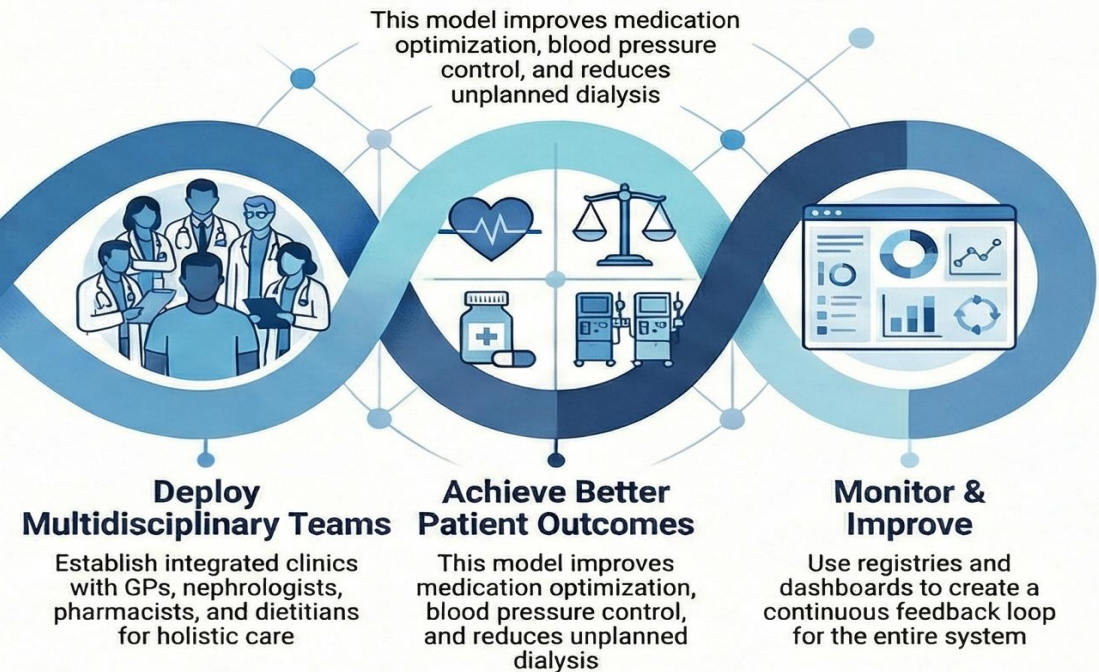
- **Consider RAASi therapy with potassium monitoring**

Integrated CKD Care: Evidence for MDT and Virtual Models

From Risk to Action: An Integrated Pathway for CKD Care

PHASE 1: IDENTIFY & STRATIFY AT-RISK PATIENTS

PHASE 2: DELIVER INTEGRATED CARE & TRACK OUTCOMES

This model improves medication optimization, blood pressure control, and reduces unplanned dialysis

High-Risk Screening

Target individuals with diabetes, hypertension, or CVD for eGFR + ACR ACR testing

Automated Risk Reporting

Embed kidney failure risk scores (KFRE) directly into laboratory reports for immediate action

Proactive Cascade Screening

Expand detection by screening first-degree relatives at dialysis units using mobile teams

Deploy Multidisciplinary Teams

Establish integrated clinics with GPs, nephrologists, pharmacists, and dietitians for holistic care

Achieve Better Patient Outcomes

This model improves medication optimization, blood pressure control, and reduces unplanned dialysis

Monitor & Improve

Use registries and dashboards to create a continuous feedback loop for the entire system

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Monitoring Outcomes: Towards a Learning System

Indicators for CKD Prevention Program

ACR Testing Coverage
Measuring the percentage of high-risk groups screened using Albumin-to-Creatinine Ratio (ACR) tests.
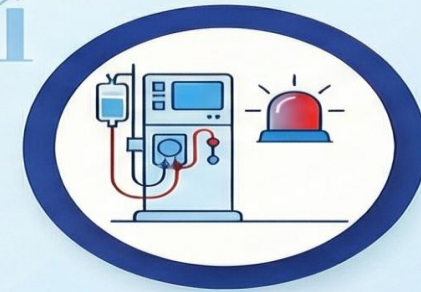
Appropriate Patient Referrals
Tracking the percentage of high-risk patients (per KFRE/Klinrisk scores) who are correctly referred.

Medication Uptake
Monitoring the adoption of SGLT2I/RAASi medications among eligible CKD patients.

Unplanned Dialysis Rate
Assessing the rate at which patients start dialysis on an emergency or unplanned basis.

- Data sources: lab systems, CKD/ESKD registries, pharmacy data
- Continuous quality improvement cycles

Key Messages & Call to Action

- Awareness alone is **not enough** – prevention must be embedded in systems

- KFRE + cascade screening + Klinrisk provide a practical risk architecture

- Integrated CKD/CKM care translates risk into **GDMT** and lifestyle action

- Equity and governance must guide implementation

- Collaborate to test, refine, and scale these strategies in Malaysia and the region

THANK YOU !

Lim Soo Kun

Malaysia

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