

# Evaluation and Management of Chronic Kidney Disease

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# Learning outcomes



Epidemiology and risk factors of Chronic Kidney Disease (CKD).

Diagnostic criteria and stages of CKD.

How to slow disease progression and manage complications by using current guidelines.

Describe safe prescribing practices for CKD patients.

Process to refer patients to early specialist and multidisciplinary care.

# Epidemiology

- 1 in 10 Australians and 1 in 5 first nations Australians aged 18 years and over are living with signs of CKD.
- 3 out of 4 Australian adults have at least one factor increasing their risk of CKD.
- The number of patients needing treatment for kidney failure has DOUBLED in the last 20 years.
- People with CKD are up to 20 times more likely to die from a heart attack or stroke than they are to progress to kidney failure.
- CKD contributes to 1 in 6 hospitalisations in Australia.
- The prevalence of CKD increased rapidly with age, affecting around 44% of people aged 75 and over (AIWH 2018)

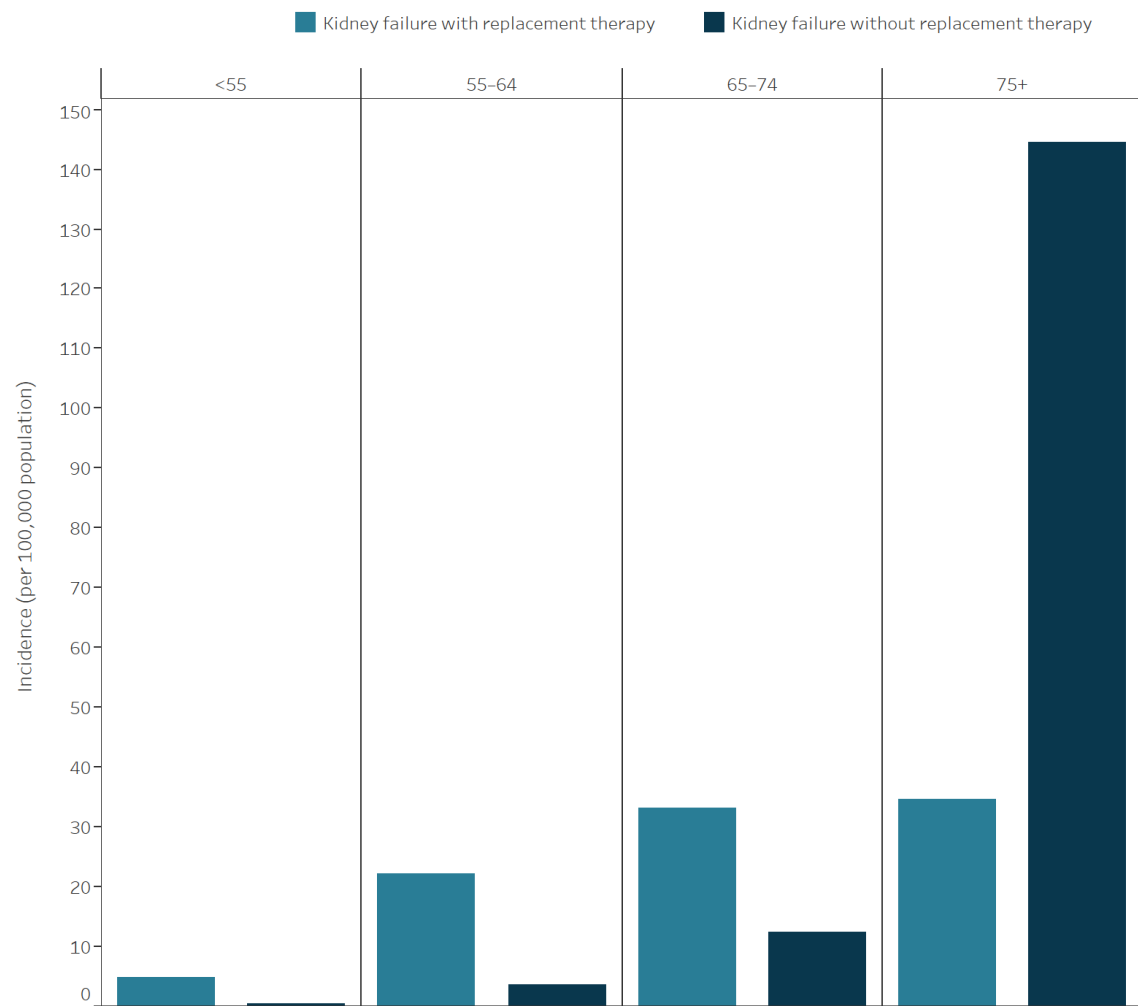


Chart: AIHW. Source: Linked data from the Australia and New Zealand Dialysis and Transplant Registry, AIHW National Mortality Database and National Death Index.  
<https://www.aihw.gov.au/>

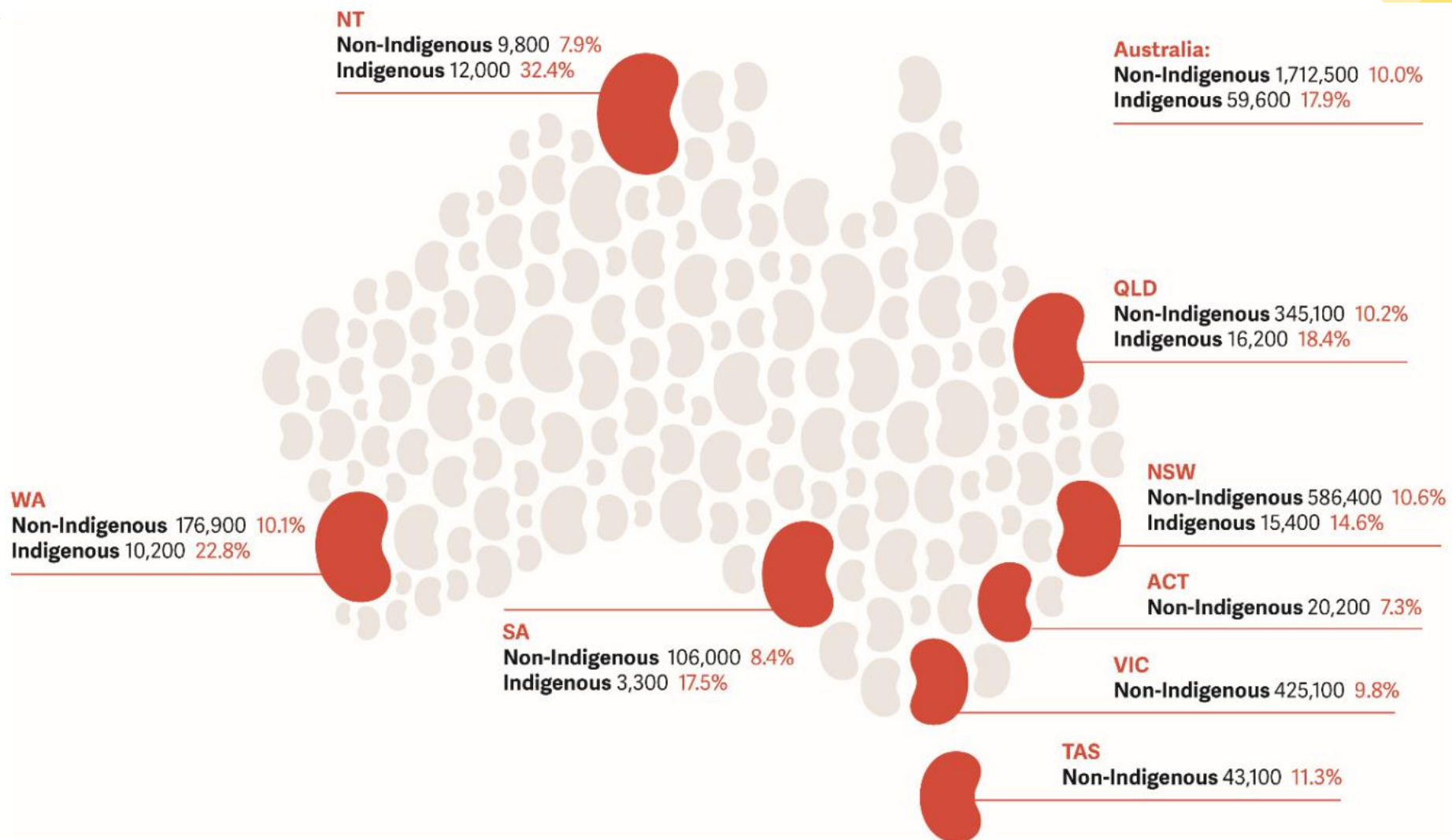
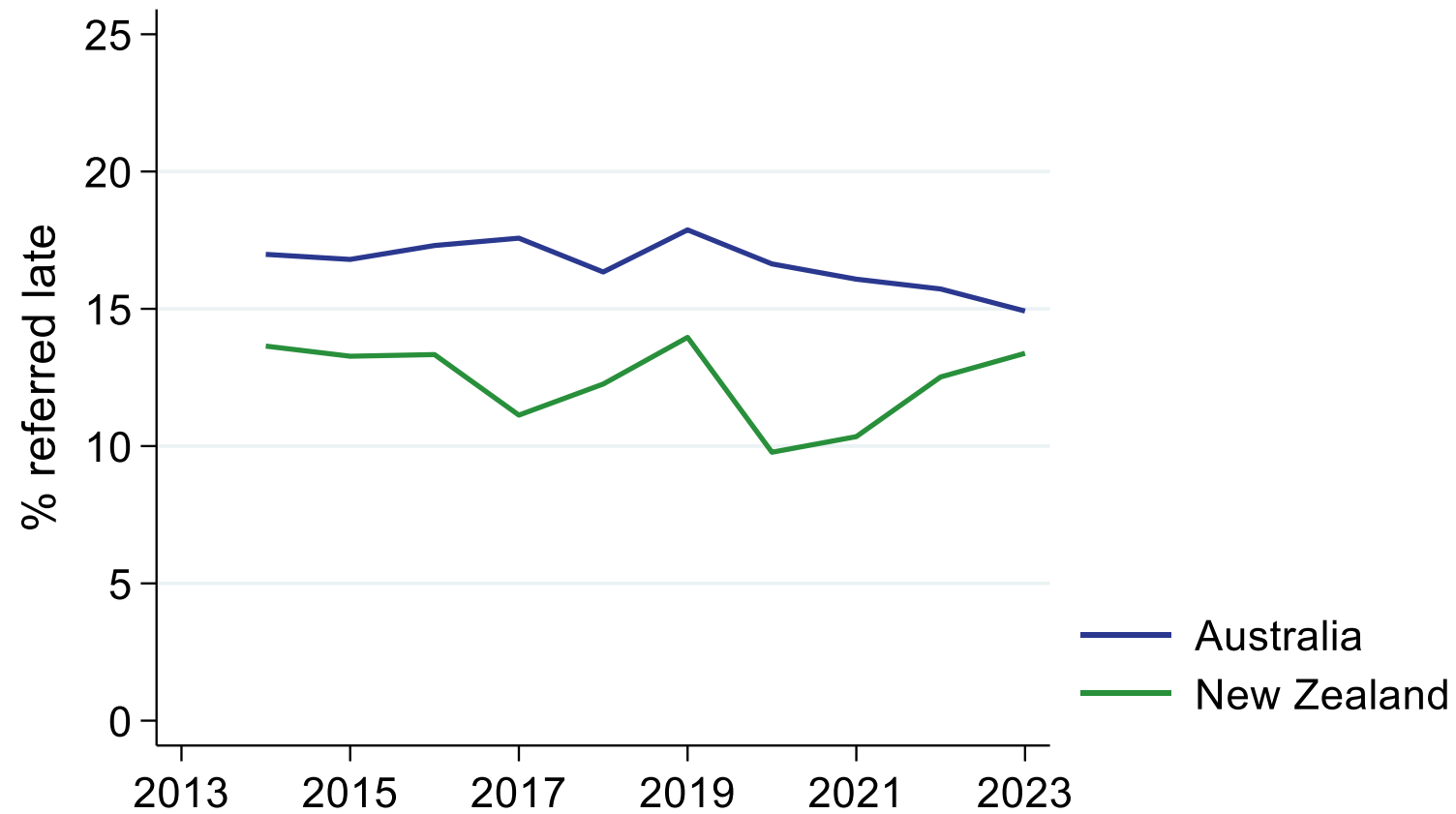


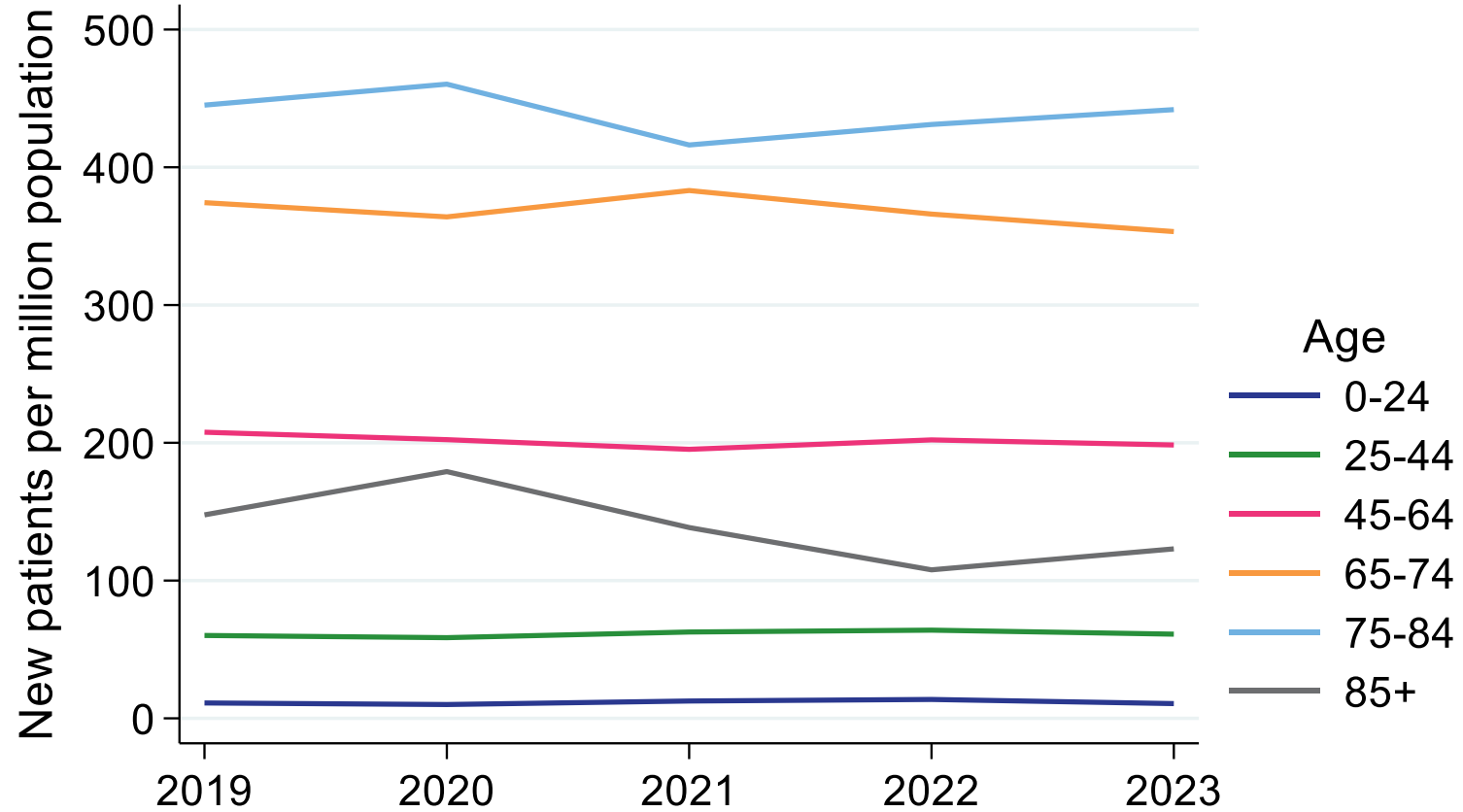
Figure 5. Living with signs of CKD – Number of people (proportion of population)<sup>8</sup>

## Late Referral Rates

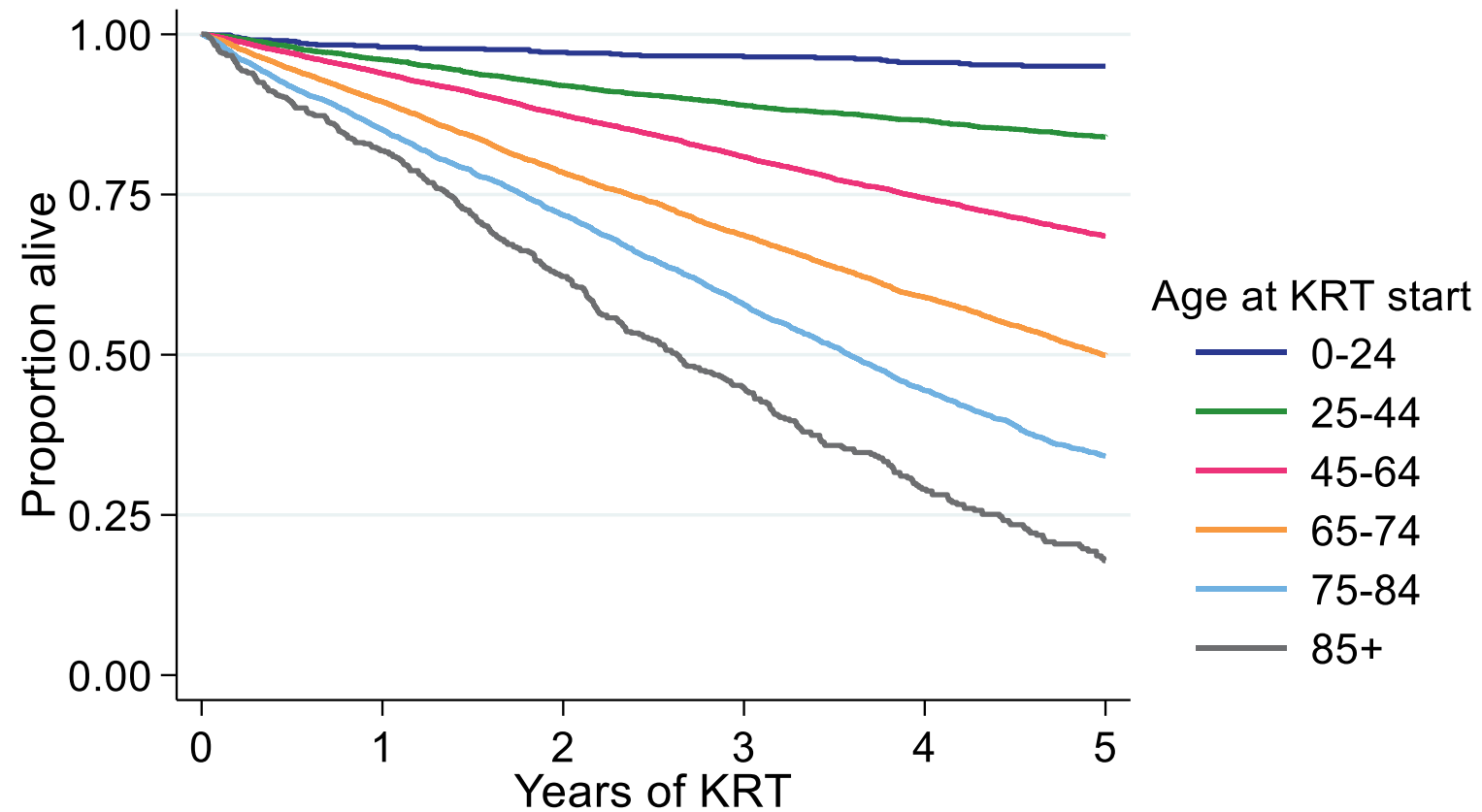
All Incident Patients 2014 - 2023



## New Patients Age Specific Rates - Australia

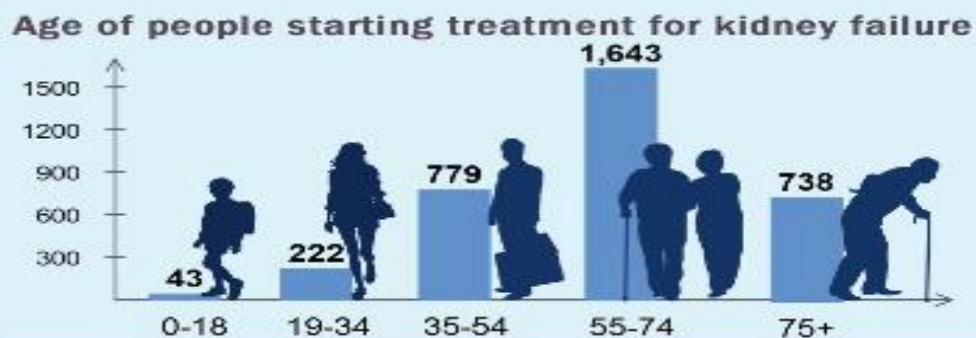
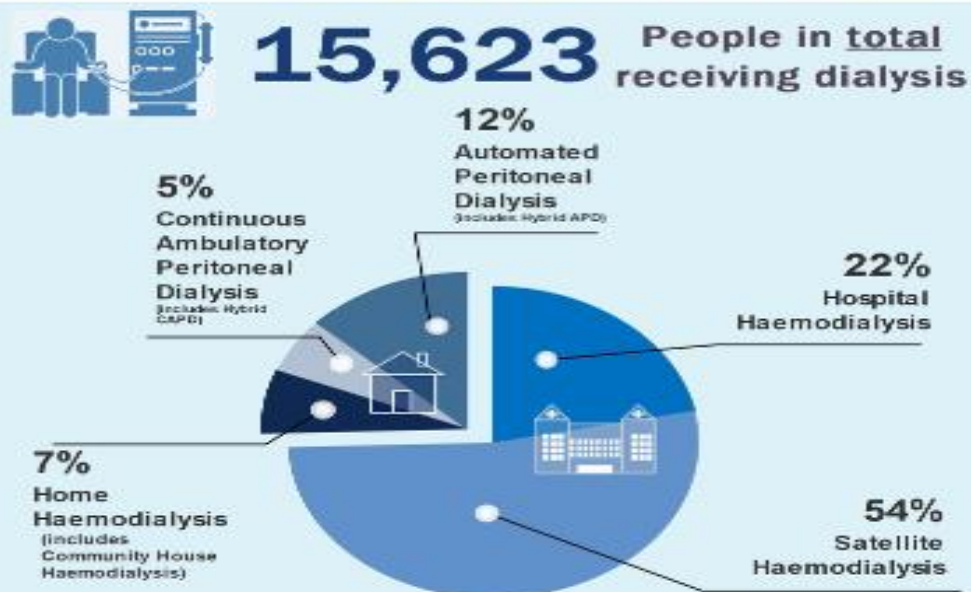
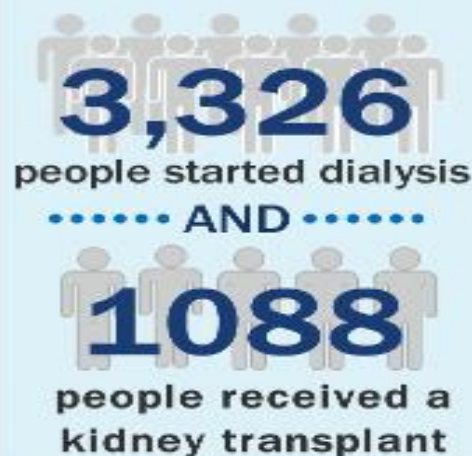


## Survival on Kidney Replacement Therapy Australia 2014-2023

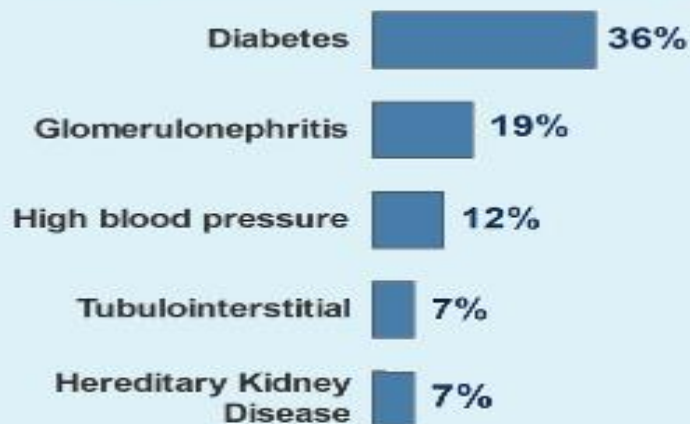


2024 ANZDATA Annual Report, Figure 3.1.1

# Dialysis and Kidney Transplantation in Australia 2023 Summary



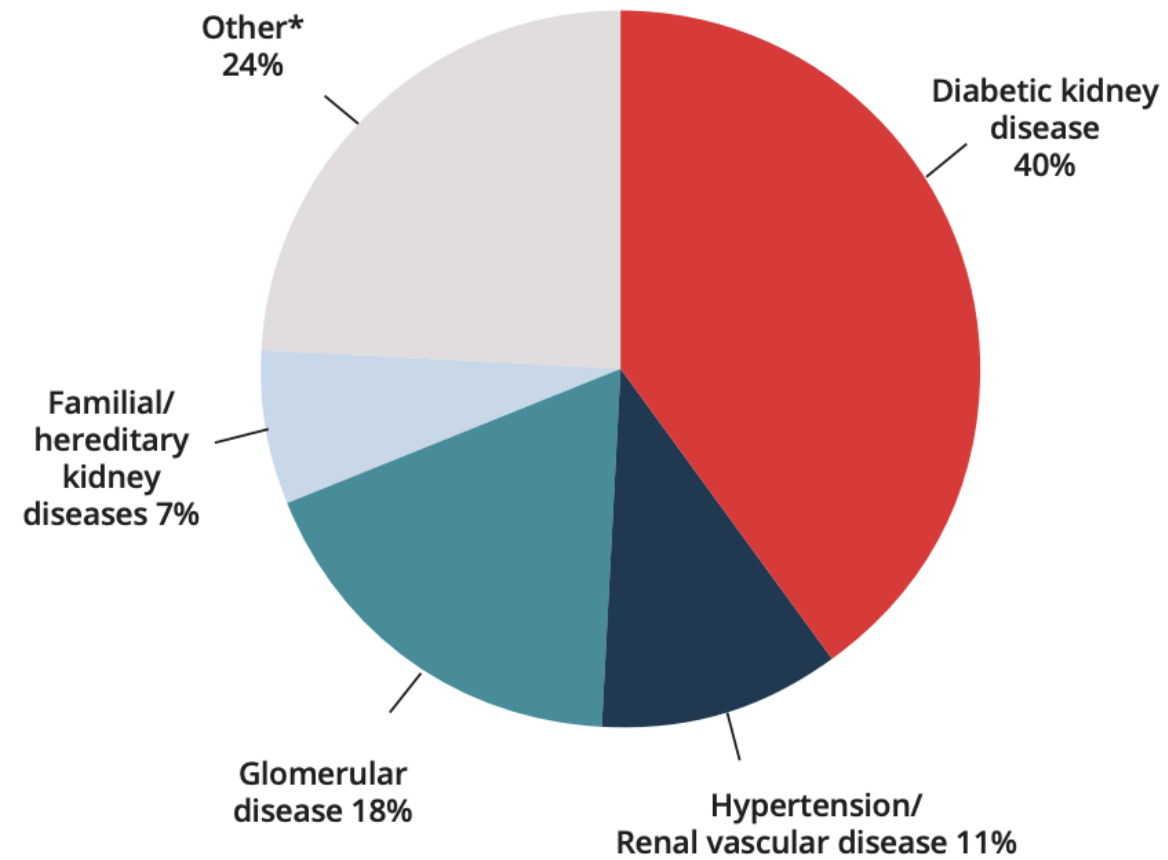
## Causes of kidney disease among people who received a transplant or started dialysis



## Sources of kidney donation in 2023

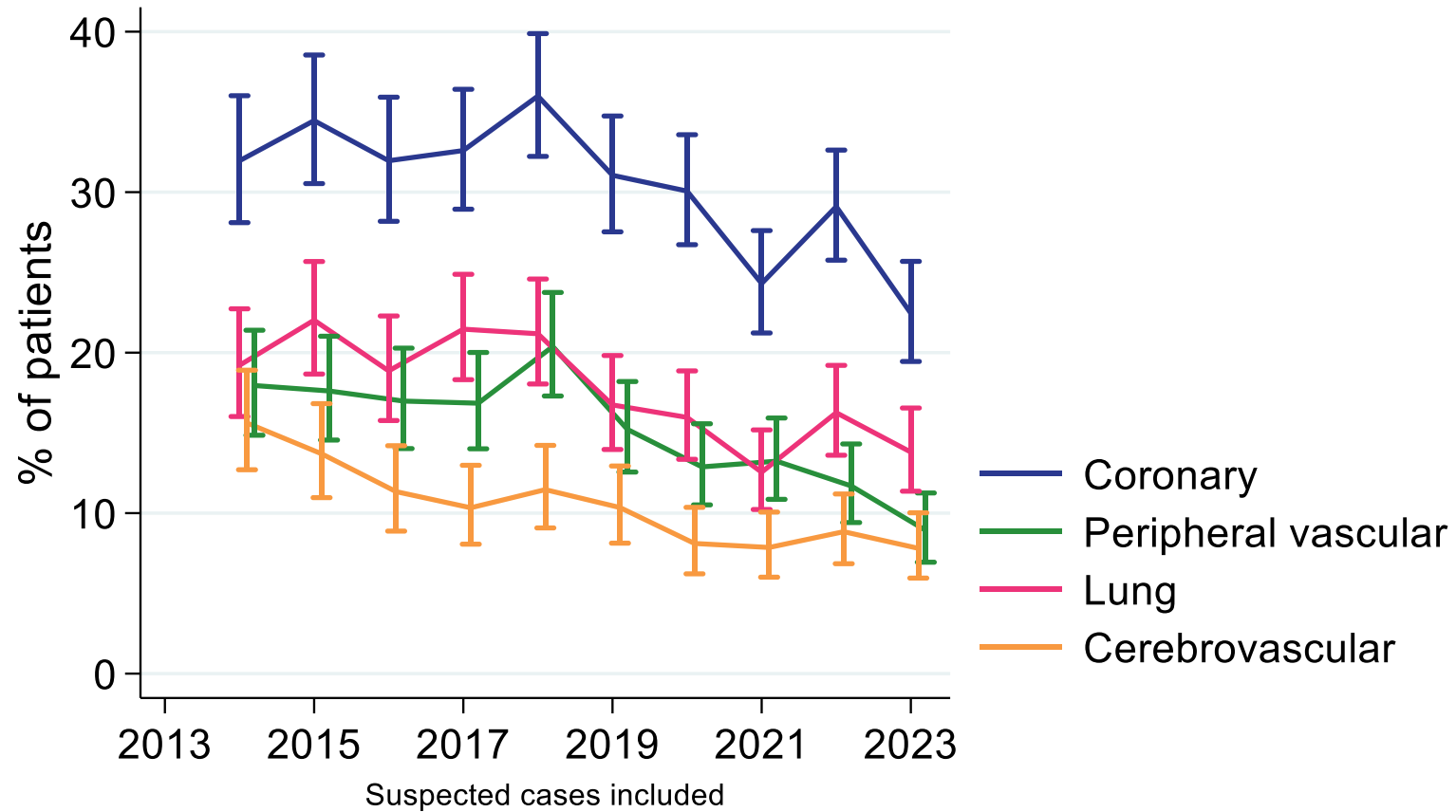


Developed with members of the  
BEAT-CKD Consumer Advisory Board and  
National Kidney Consumer Council Research  
Network



\* 'Other' includes: tubulointerstitial disease (8%), other systemic diseases affecting the kidney (2%), miscellaneous kidney disorders (13%), not reported (1%).

## Comorbid Conditions at KRT Entry New Zealand



# What is CKD?

Chronic kidney disease is defined as:

Glomerular Filtration Rate (GFR)  $< 60 \text{ mL/min/1.73 m}^2$  for  $\geq 3$  months with or without evidence of kidney damage.

or

Evidence of kidney damage (with or without decreased eGFR) for  $\geq 3$  months:

- . Albuminuria
- . Haematuria after exclusion of urological causes
- . Pathological abnormalities (e.g kidney biopsy)
- . Anatomical abnormalities. (e.g on kidney imaging tests)

| Albuminuria Stage     |                                  |                                                                             |                                              |                                           |
|-----------------------|----------------------------------|-----------------------------------------------------------------------------|----------------------------------------------|-------------------------------------------|
| Kidney Function Stage | GFR (mL/min/1.73m <sup>2</sup> ) | Normal (A1)<br>uACR <3.0 mg/mmol                                            | Microalbuminuria (A2)<br>uACR 3.0-30 mg/mmol | Macroalbuminuria (A3)<br>uACR >30 mg/mmol |
| 1                     | ≥90                              | Not CKD unless haematuria, structural or pathological abnormalities present |                                              |                                           |
| 2                     | 60-89                            |                                                                             |                                              |                                           |
| 3a                    | 45-59                            |                                                                             |                                              |                                           |
| 3b                    | 30-44                            |                                                                             |                                              |                                           |
| 4                     | 15-29                            |                                                                             |                                              |                                           |
| 5                     | <15 or on dialysis               |                                                                             |                                              |                                           |

# GP role in CKD

Reduce the impact of CKD

Early detection & initial assessment

Diagnosis

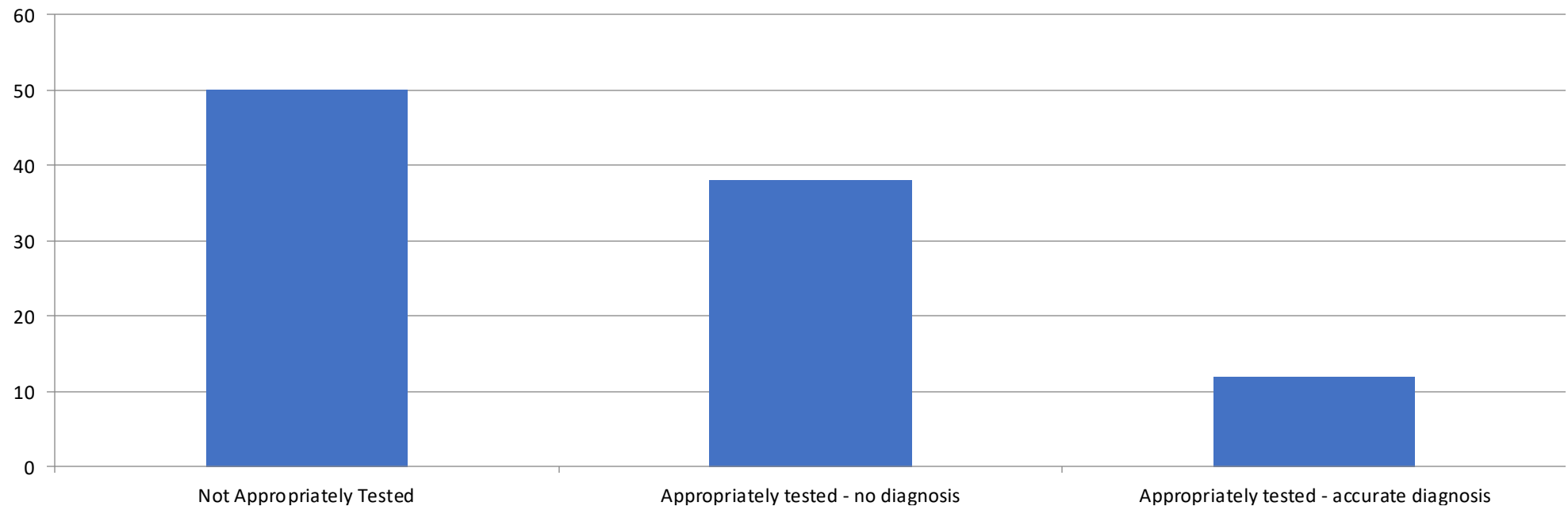
Management of CKD

Assessing and modifying cardiovascular risk factors

Treatment to slow or prevent progression to kidney failure

Avoiding nephrotoxic drugs

**CKD Screening in Primary Care**  
(% of patients)



# Screening for CKD

| Indications for assessment                                  | Recommended assessments                                                                                                                                                         | Frequency       |
|-------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Diabetes                                                    | Urine ACR, eGFR, Blood pressure<br><br>If urine ACR positive repeat twice over 3 months (preferably first morning void)<br><br>If eGFR < 60 ml/min/1.73 m2 repeat within 7 days | Every 1-2 years |
| Hypertension                                                |                                                                                                                                                                                 |                 |
| Established cardiovascular disease                          |                                                                                                                                                                                 |                 |
| Family history of kidney failure                            |                                                                                                                                                                                 |                 |
| Obesity (BMI > 30 kg/m2)                                    |                                                                                                                                                                                 |                 |
| Smoker                                                      |                                                                                                                                                                                 |                 |
| Aboriginal or Torres Strait Islander origin aged > 30 years |                                                                                                                                                                                 |                 |
| History of acute kidney injury                              |                                                                                                                                                                                 |                 |

# What is eGFR?

- Is accepted as the best measure of kidney function
- Can be estimated from serum creatinine using CKD-EPI formula 2009.
- GFR calculators are available online at [www.kidney.org/GFR](http://www.kidney.org/GFR).

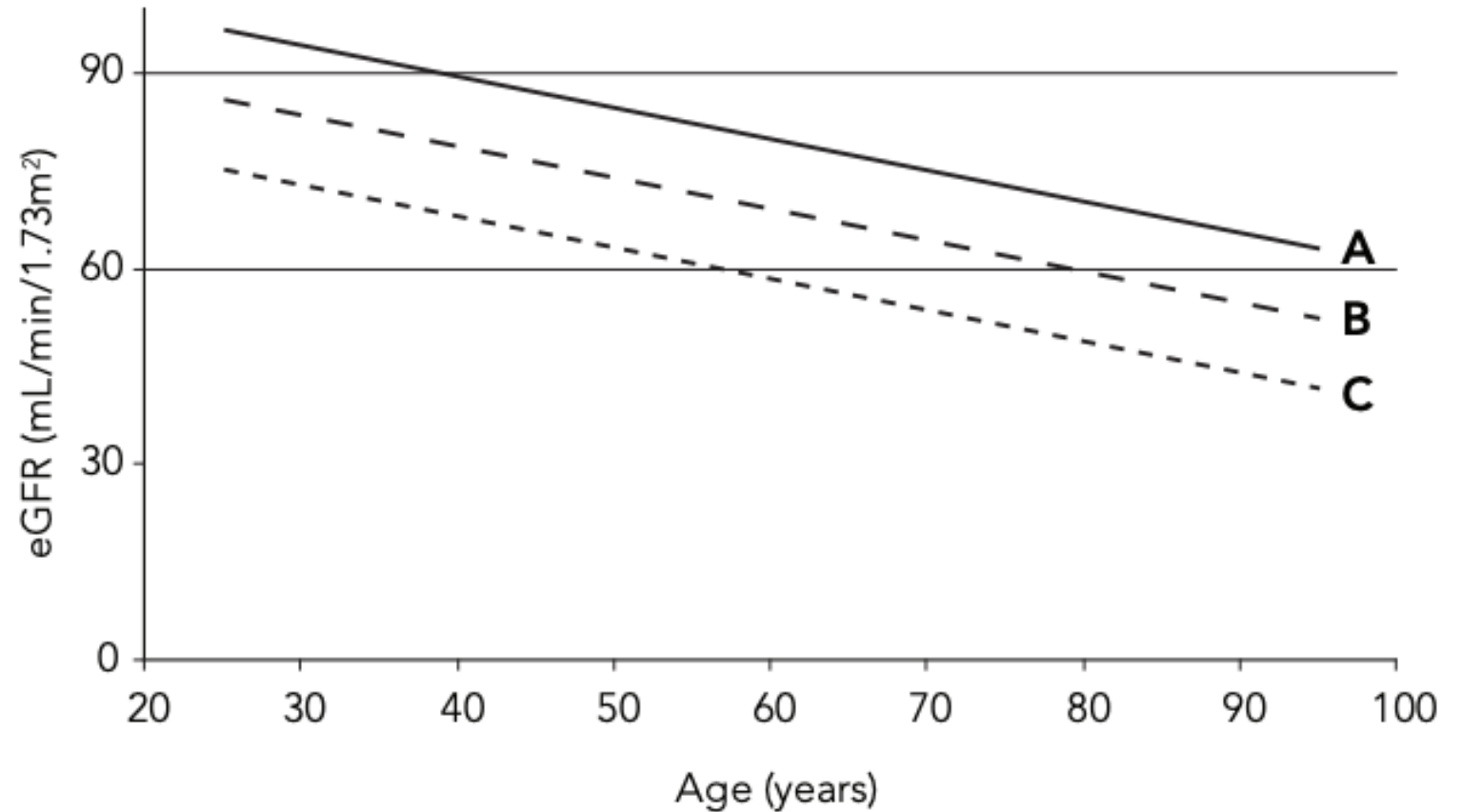
| eGFR                                         | Indicates                                                                    |
|----------------------------------------------|------------------------------------------------------------------------------|
| >90 ml/min/1.73 m <sup>2</sup>               | Normal GFR in healthy adults (declines with age)                             |
| 60-90 ml/min/ 1.73 m <sup>2</sup>            | Should not be considered abnormal unless there is evidence of kidney damage. |
| Consistently < 60 ml/min/1.73 m <sup>2</sup> | Indicates CKD                                                                |

# The significance of CKD staging using eGFR



# Relationship of eGFR to age

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## Urine tests – Albumin/Creatinine ratio (uACR)

- An initial ACR test should be repeated on a first void sample if the results are positive for CKD.
- Albuminuria is present if at least 2 out of 3 ACR are positive (Including initial test).
- CKD is present if albuminuria persists for at least 3 months.
- Dipsticks for protein are no longer recommended.

|                  | Urine ACR<br>(mg/mmol)             | 24h urine<br>albumin<br>(mg/day) | Urine PCR<br>(mg/mmol)     | 24h urine<br>protein<br>(mg/day) |
|------------------|------------------------------------|----------------------------------|----------------------------|----------------------------------|
| Microalbuminuria | Male: 2.5 - 25<br>Female: 3.5 - 35 | 30-300                           | Male: 4-40<br>Female: 6-60 | 50-500                           |
| Macroalbuminuria | Male: >25<br>Female: >35           | >300                             | Male: >40<br>Female: >60   | >500                             |

# Case Study

## Background

- Margaret
- 70-year-old female
- Retired teacher

She is a new patient to your practice

## Past Medical History

- Overweight (BMI 31 kg/m<sup>2</sup>)
- Chronic back pain
- Mild Hypertension but not on any medications

## Family history

- Maternal grandmother died of a heart attack in her 60's but also had a history of 'kidney problems'
- Mother has type 2 diabetes
- Father has angina and hypertension

Smoking – Current smoker with 40 pack year history

Alcohol – 1-2 glasses of wine, 3-4 nights per week

Medications – Uses Salbutamol 100mcg/dose as needed

Q: Does Margaret have an increased risk of CKD?

- Diabetes
- Hypertension
- Established cardiovascular disease
- Family history of kidney failure
- Obesity
- Smoker
- Aboriginal or Torres Strait Islander origin
- History of acute kidney injury
- Age over 60 years

X Diabetes

✓ Hypertension

X Established cardiovascular disease

X Family history of kidney failure

✓ Obesity

✓ Smoker

X Aboriginal or Torres Strait Islander origin

X History of acute kidney injury

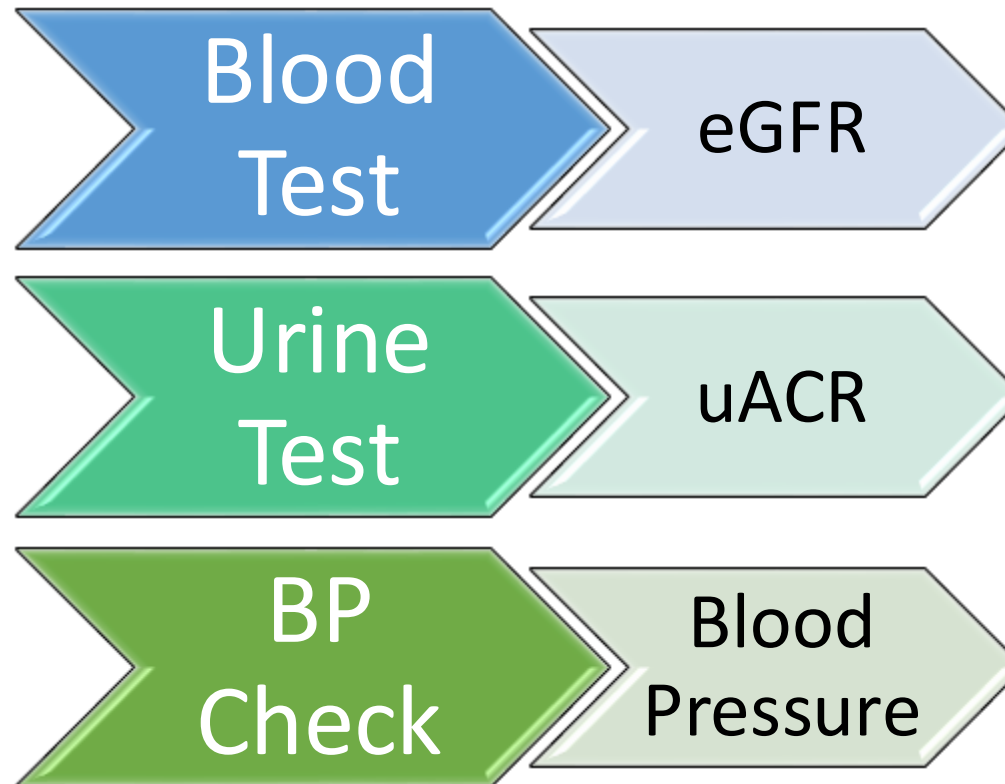
✓ Age over 60 years



Margaret  
has 4 of the  
risk factors of CKD

# What should you do next?

- Establish that Margaret needs annual kidney health check.



# Margaret's results

|                   |                      |
|-------------------|----------------------|
| Creatinine        | 118 umol/L           |
| eGFR              | 55 ml/min/1.73<br>m2 |
| Urine ACR         | 5.7 mg/mmol          |
| Blood<br>Pressure | 155/95 mmHG          |

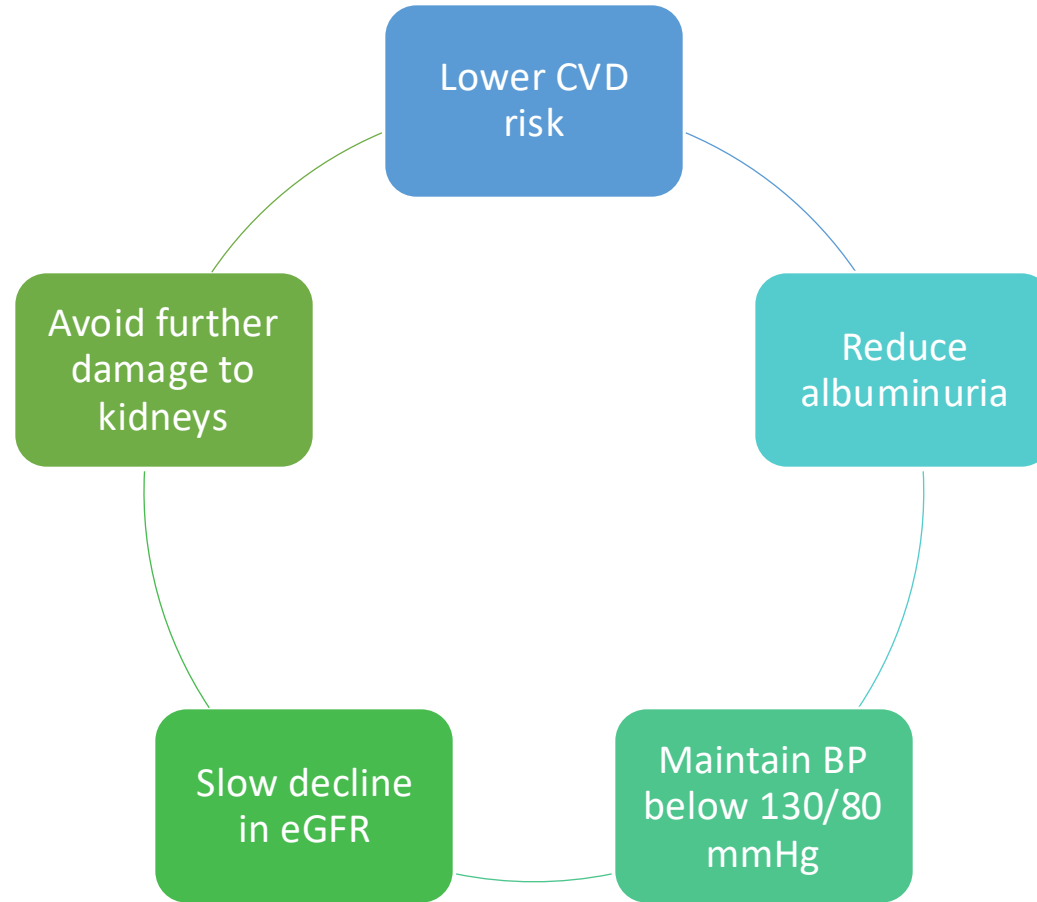
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| 2                     | 60-89                            |                                                                             |                                              |                                           |
| 3a                    | 45-59                            |                                                                             | RESULTS STAGE HER HERE                       |                                           |
| 3b                    | 30-44                            |                                                                             |                                              |                                           |
| 4                     | 15-29                            |                                                                             |                                              |                                           |
| 5                     | <15 or on dialysis               |                                                                             |                                              |                                           |

Do Margaret's kidney health check results mean she has Chronic Kidney Disease?

**Not Yet**

To diagnose Margaret with CKD, her urine ACR & eGFR needs to be repeated and results must be consistent over 3 months or more.

# Key management strategies for all people with CKD

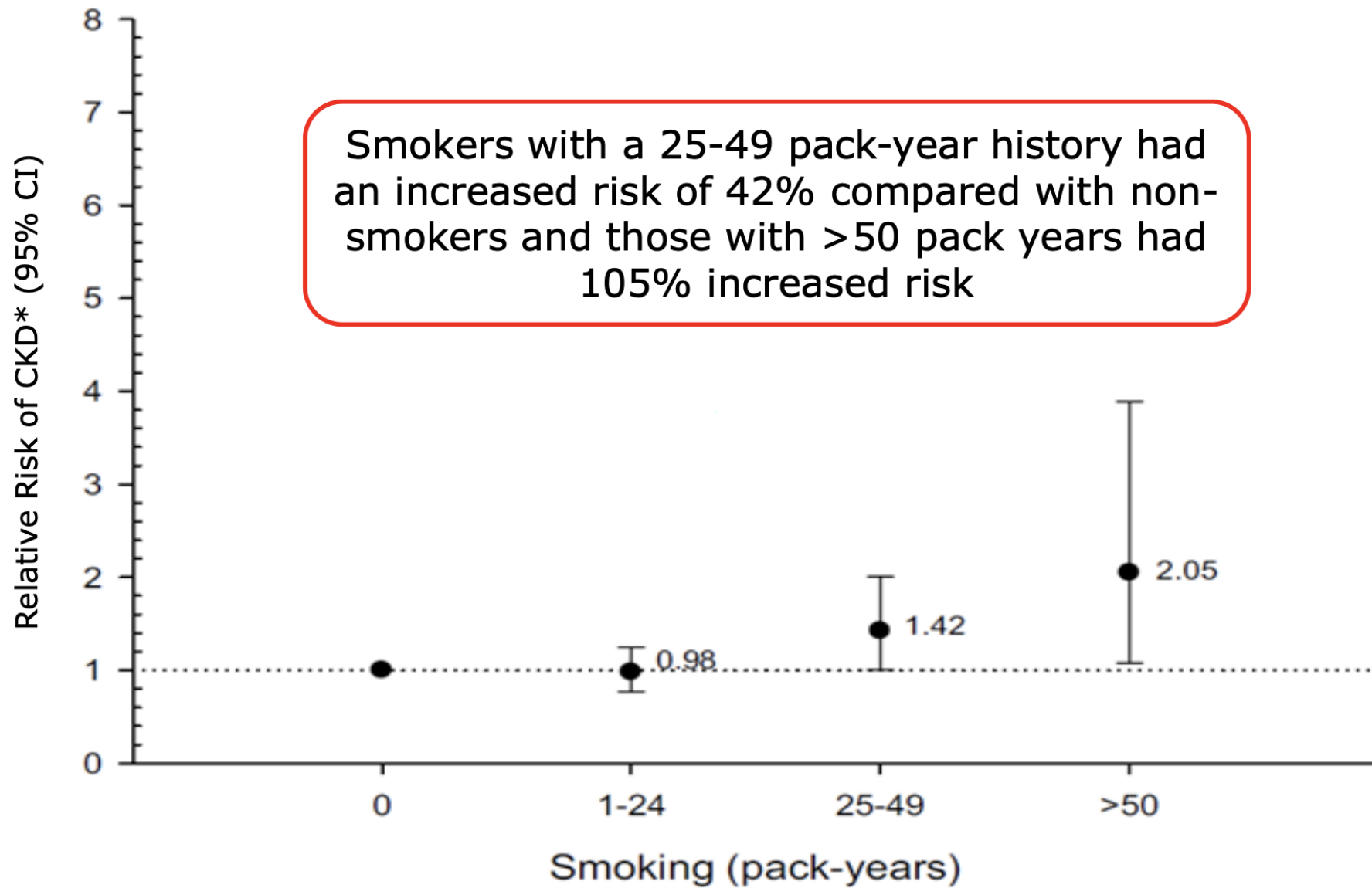


# Cardiovascular reduction in CKD

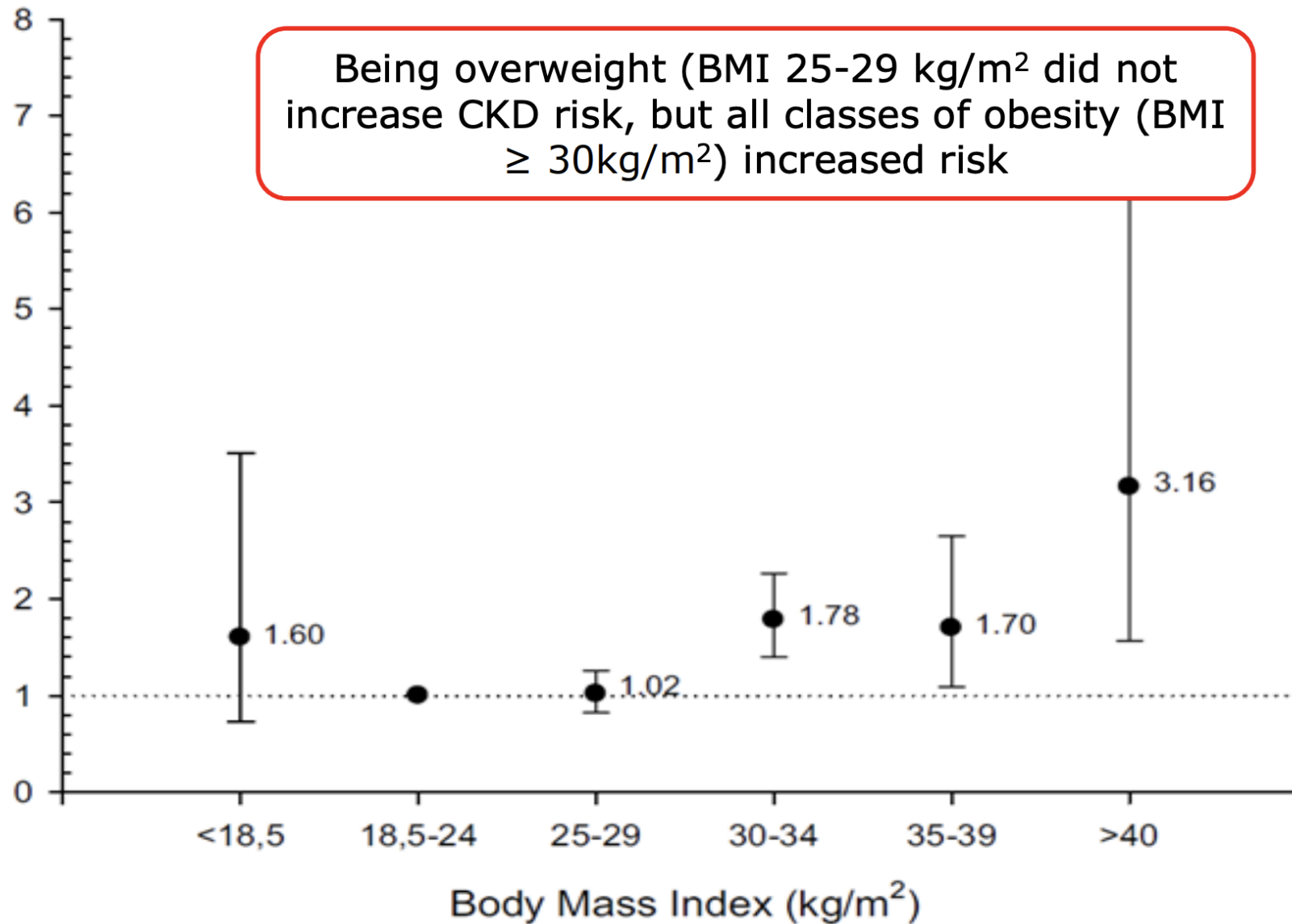
- CKD is one of the most potent known risk factors for cardiovascular disease.
- Calculate the risk using the Australian absolute cardiovascular risk tool ([www.cvdcheck.org.au](http://www.cvdcheck.org.au)) to accurately calculate cardiovascular risk.
- People with CKD are at least 20 times more likely to die from cardiovascular disease than survive to need dialysis or transplant.

# Lifestyle changes to help manage CKD

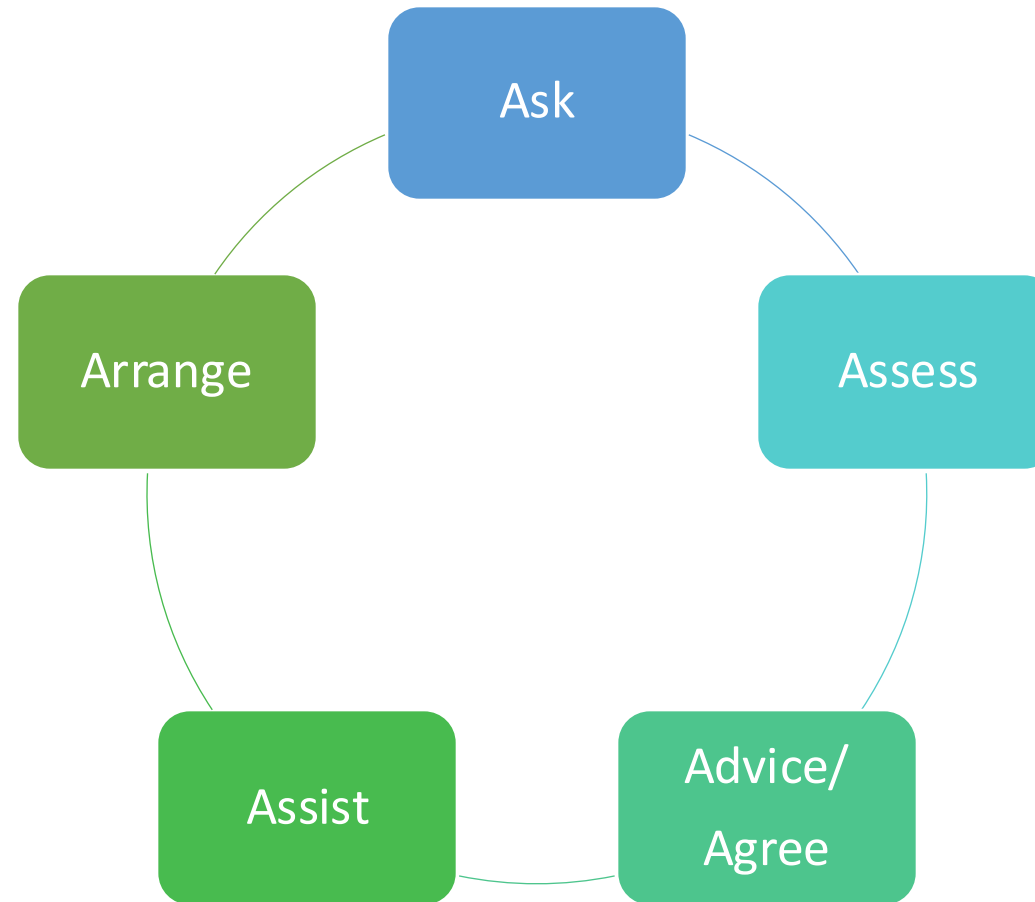
|                   |                                  |                                                                                         |
|-------------------|----------------------------------|-----------------------------------------------------------------------------------------|
| Smoking           | Stop smoking                     | Increased by 34% current smokers and 15% for former smokers.                            |
| Nutrition         | Adopt a healthy dietary pattern. | Low salt <5 g per day<br>Packaged foods with <120 mg sodium per 100 grams.              |
| Alcohol           | Decrease consumption             | 10 SD per week and no more than 4 SD on any one day.                                    |
| Physical Activity | Be active                        | Aim for 2.5 to 5 hours of moderate intensity activity across the week. Muscle strength. |



Smokers with a 25-49 pack-year history had an increased risk of 42% compared with non-smokers and those with >50 pack years had 105% increased risk



# Framework for addressing lifestyle changes



# Lifestyle effect on BP

| Modification                      | Recommendation                                                         |                                                                |
|-----------------------------------|------------------------------------------------------------------------|----------------------------------------------------------------|
| Weight reduction                  | BMI 18-24.9 kg/m <sup>2</sup>                                          | 4.4 mmHg(for 5.1 kg weight lost)                               |
| Dietary sodium restriction        | Reduce dietary sodium intake to no more than 2.4 g sodium (or 6g salt) | 4-7 mmHg (for reduction by 6g in daily salt intake)            |
| DASH diet                         | Fruit, vegies, low saturated and total fat.                            | 5.5-11.4 mmHg (5.5 for normotensives & 11.4 for hypertensives) |
| Physical activity                 | Aerobic activity for 30-60 mins/day, 3-5 days/week                     | 5 mmHg                                                         |
| Moderate alcohol consumption only | No more than 2 drinks per day (men) or 1 drink per day (women)         | 3 mmHg (for 67% reduction from baseline of 3-6 drinks per day) |

# Weight Management

- Waist circumference <94 cm in men (<90 cm in Asian men) or < 80 cm in women (including Asian women).
- BMI < 25 kg/m<sup>2</sup> (<23 kg/m<sup>2</sup> in Asian population).
- Central obesity is a strong predictor of CKD progression.
- People with BMI > 30 kg/m<sup>2</sup> may be more likely to develop albuminuria.

# Pharmacological management of CKD



| ACE inhibitor or ARB                                                                                                                                                                                 | Statin (+/- ezetimibe)                                                                                                                                                                                                                                                | SGLT2 inhibitor*                                                                                                                                                                                                                                                                                  | Non-steroidal MRA*                                                                                                                                                                                                                                                                                          | GLP-1 RA*                                                                                                                                                                                                 |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• First-line treatment for all people with CKD.</li> <li>• Up-titrate to maximum tolerated dose to reduce albuminuria and kidney function decline.</li> </ul> | Consider use in: <ul style="list-style-type: none"> <li>• people with CKD (eGFR <math>\geq 15</math> mL/min/1.73m<sup>2</sup>) and CVD risk <math>\geq 10\%</math> and</li> <li>• First Nations Australians with CKD and a CVD risk <math>\geq 5\%</math>.</li> </ul> | <ul style="list-style-type: none"> <li>• Recommended for use in people with CKD and proteinuria, with or without diabetes to reduce the risk of progressive decline in kidney function*.</li> <li>• Not recommended to initiate if eGFR <math>&lt; 25</math> mL/min/1.73m<sup>2</sup>.</li> </ul> | <ul style="list-style-type: none"> <li>• Indicated for use in people with CKD (with albuminuria) associated with type 2 diabetes.</li> <li>• Not recommended to initiate if eGFR <math>&lt; 25</math> mL/min/1.73m<sup>2</sup> or in patients with a K<sup>+</sup> <math>&gt; 5.0</math> mmol/L.</li> </ul> | <ul style="list-style-type: none"> <li>• Indicated for use in people with CKD if they also have concomitant type 2 diabetes.</li> <li>• Not recommended for use in people with kidney failure.</li> </ul> |

- A reversible drop in eGFR is expected with the introduction of ACE inhibitors or ARB's. Check eGFR within 2 weeks following initiation and if reduction of eGFR is more than 25% below baseline value, cease the medication and consider referral to nephrologist.
- A reversible drop in eGFR is also expected with the introduction of SGLT2 inhibitors. The drop is at its greatest at 4 weeks after initiation of therapy after which the eGFR rebounds. Specific testing of eGFR for this purpose is not required.

## Medications that may need to be started at a reduced in dose or ceased in patients with CKD include but are not limited to<sup>#</sup>

### Anti-infective

- famciclovir
- nirmatrelvir
- valaciclovir
- certain antibiotics e.g., ciprofloxacin, trimethoprim, and sulfamethoxazole, aminoglycosides, nitrofurantoin

### Cardiovascular

- apixaban
- dabigatran
- digoxin
- rivaroxaban
- sotalol
- spironolactone

### Diabetes

- acarbose
- all gliptins except linagliptin
- insulin
- metformin<sup>\*</sup>
- sulfonylureas

### Pain

- gabapentin
- opioid analgesics
- pregabalin

### Other

- allopurinol
- benzodiazepines
- colchicine
- baclofen
- duloxetine
- escitalopram
- solifenacin
- fenofibrate
- denosumab<sup>^</sup>
- lithium

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- sulfonylureas

### Pain

- gabapentin
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- pregabalin

### Other

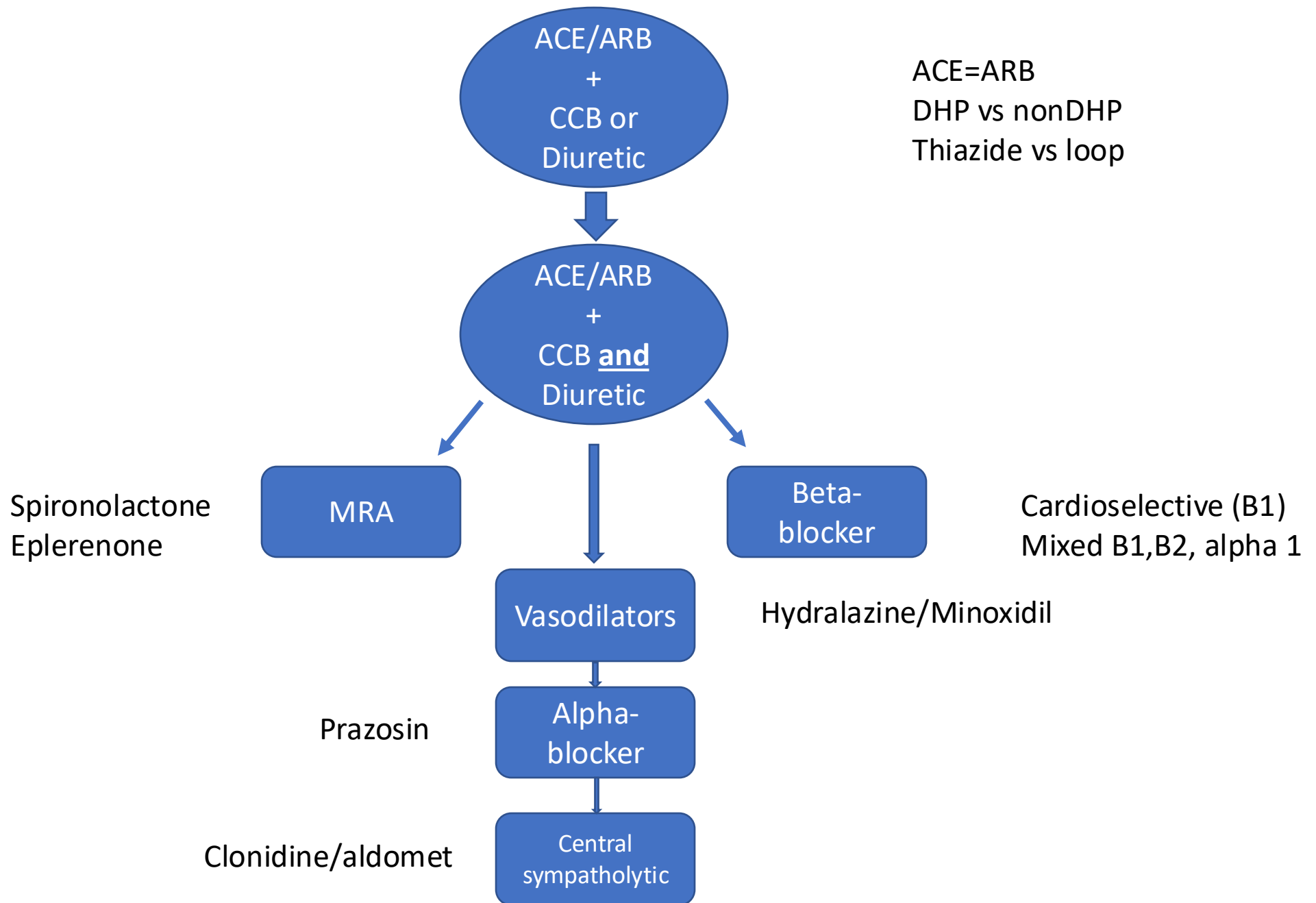
- allopurinol
- benzodiazepines
- colchicine
- baclofen
- duloxetine
- escitalopram
- solifenacin
- fenofibrate
- denosumab<sup>^</sup>
- lithium

# Sick day routine

- Sulfonylureas
- ACE inhibitors
- Diuretics
- Metformin
- ARB's or ACE inhibitors
- NSAIDs
- SGLT2 inhibitors

# Sick day routine

- S ulfonylureas
- A CE inhibitors
- D iuretics
- M etformin
- A RB's or ACE inhibitors
- N SAIDs
- S GLT2 inhibitors



## Lipids

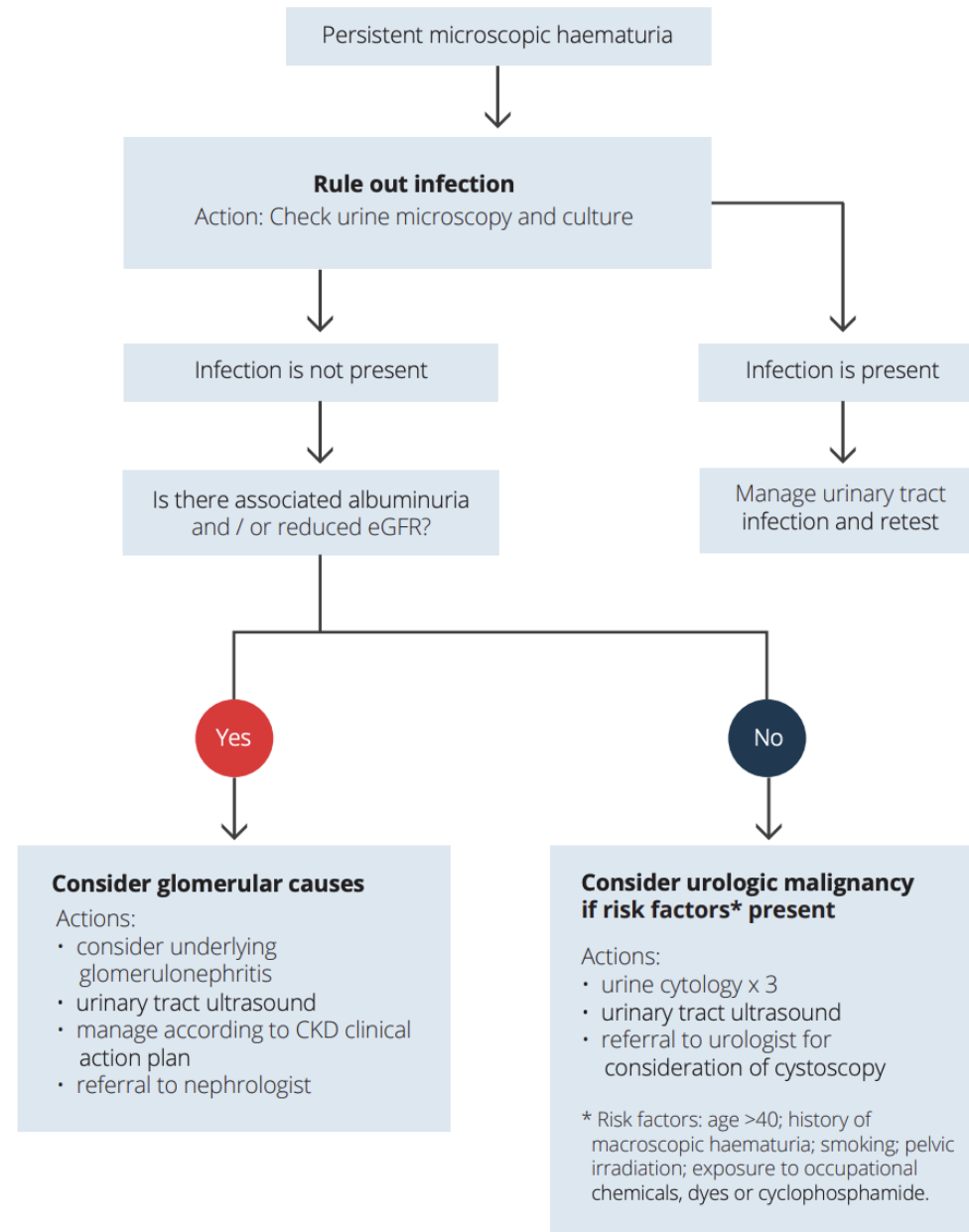
- CKD patients have a characteristic lipid pattern of hypertriglyceridaemia and low HDL cholesterol levels but normal LDL levels.
- More severe in individuals with albuminuria, particularly those with nephrotic syndrome.
- No target lipid level is recommended.
- Management consists of a combination of both lifestyle and medications.

# Common Issues in CKD

- Acidosis – Decreased kidney acid excretion compounded by a reduction in bicarbonate production and reabsorption.
- Supplemental sodium bicarbonate (840mg). Monitor sodium load.
- Anaemia – reduced erythropoietin production by the kidney and also the resistance to the action of EPO.
- Usually starts once  $\text{eGFR} < 60 \text{ ml/min/1.73 m}^2$ .
- Target Hb 100-115 g/L
- Maintain Ferritin  $>100 \text{ mcg/L}$  and TSAT  $>20\%$

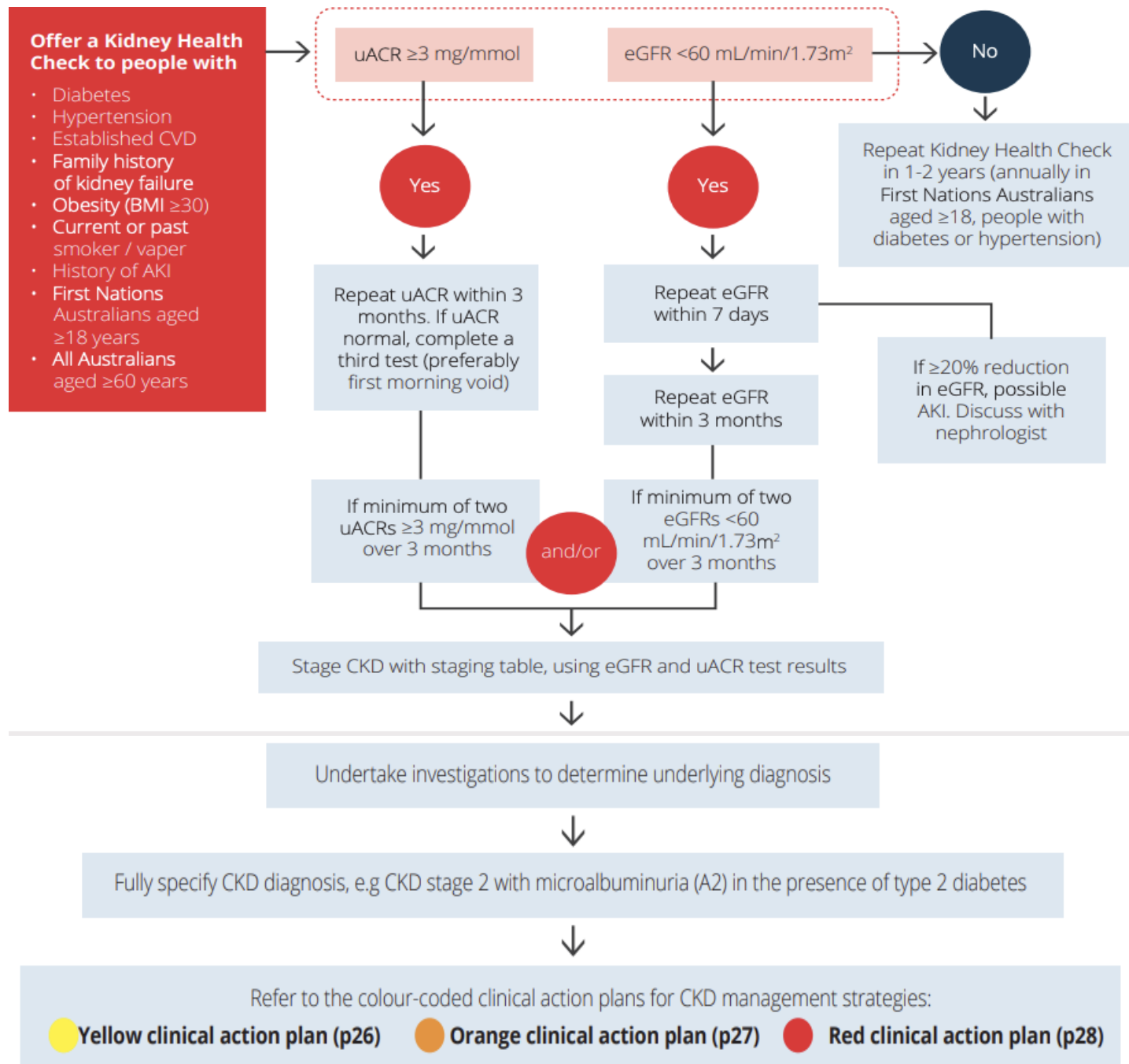
- Cognitive decline – Common in people with CKD and prevalence increases with CKD severity.
- Double the risk of physical impairment, cognitive dysfunction and frailty in those >70 years.
- MMSE, safety, medication review, falls, risk of delirium, association with depression.
- Depression – 1 in 5 people with CKD and 1 in 3 people on dialysis can be affected by depression.
- Screen regularly, modifiable causes, treatment with non-medication therapies and medications (SSRIs).

# Haematuria



- Hyperuricaemia – dietary changes, allopurinol and colchicine.
- Hyperkalemia – Target < 6.0 mmol/L.
- Hyperlipidaemia – No target level is recommended. Consider medication for people with CKD (eGFR > 15 ml/min/1.73 m<sup>2</sup>) and CVD risk of >10% and for First Nations Australians with CKD and CVD risk > 5%.
- Malnutrition
- Mineral and bone disorder – complex management. Vitamin D and Calcitriol supplementation. Care to not overload.

- Oedema – Clinical assessment. Suspicion for nephrotic syndrome. Diuretics and diet. Diuretic resistance in later stages of CKD.
- Pruritis – Common and affect 70% of patients with stage 4 CKD. Rule out other causes for pruritis, evening primrose oil, gabapentin, difelikefalin.
- Restless legs – More than one quarter of patients with CKD have it. Check iron levels. Pramipexole.
- Sleep apnoea – Weight reduction and usage of CPAP therapy.



# Yellow clinical action plan

**eGFR  $\geq 60$  mL/min/ $1.73\text{m}^2$  with microalbuminuria (A2) or  
eGFR 45-59 mL/min/ $1.73\text{m}^2$  with normoalbuminuria (A1)**

## Management goals

- Slow progression of CKD.
  - Slow decline in eGFR.
  - Reduce albuminuria by at least 30%.
- Assess and lower cardiovascular risk.
- Avoid nephrotoxic medications or volume depletion.
- Encourage positive lifestyle changes and self-management practices.



# Orange clinical action plan

**eGFR 30-59mL/min/1.73m<sup>2</sup> with microalbuminuria (A2) or  
eGFR 30-44 mL/min/1.73m<sup>2</sup> with normoalbuminuria (A1)**

## Management goals

- Slow progression of CKD.
  - Slow decline in eGFR.
  - Reduce albuminuria by at least 30%.
- Assess and lower cardiovascular risk.
- Avoid nephrotoxic medications or volume depletion.
- Encourage positive lifestyle changes and self-management practices.



- Early detection and management of complications.
- Adjust medication doses to levels appropriate for kidney function.
- Appropriate referral to a nephrologist when indicated.



# Red clinical action plan

**Macroalbuminuria irrespective of eGFR or  
eGFR <30 mL/min/1.73m<sup>2</sup> irrespective of albuminuria**

## Management goals

- Slow progression of CKD.
  - Slow decline in eGFR.
  - Reduce albuminuria by at least 30%.
- Assess and lower cardiovascular risk.
- Avoid nephrotoxic medications or volume depletion.
- Encourage positive lifestyle changes and self-management practices.

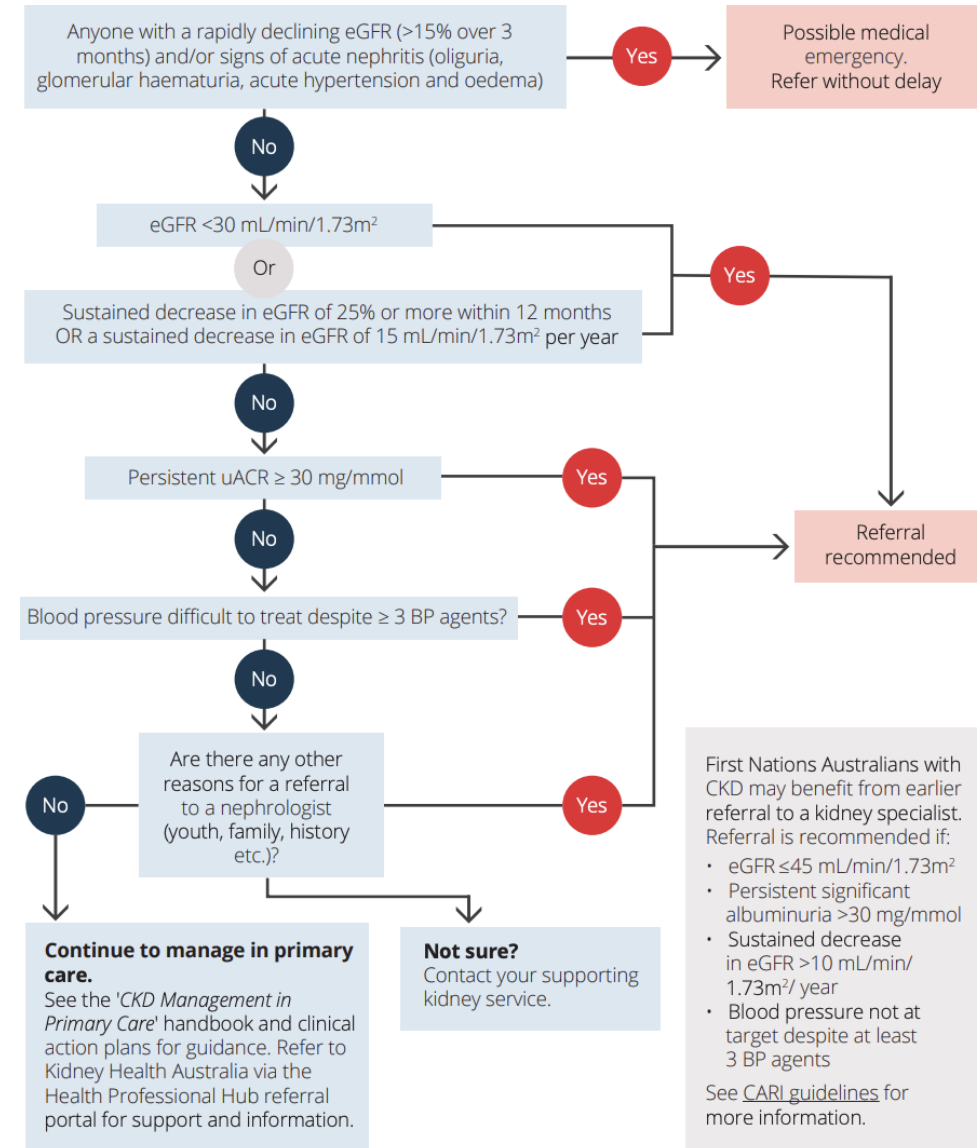


- Early detection and management of complications.
- Adjust medication doses to levels appropriate for kidney function.
- Appropriate referral to a nephrologist when indicated.



- Prepare for kidney replacement therapy if appropriate.
- Prepare for comprehensive conservative care if appropriate.

# Indications for referral to nephrologist



- Questions?