Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Primary Care Cardiovascular Society

CVD Academy

Driving primary care to deliver the best in cardiovascular health

PCCS CKD QI Programme

CKD Prevention and Diagnosis

Dr Raj Thakkar

Primary Care Cardiovascular Society President Elect (and CKD representative), Oxford AHSN primary care cardiology lead, UK Director - Healthy.io, Primary Care GP – Clinical Co-Lead with the National Cardiac Pathways Improvement Programme

This programme has been solely funded by Bayer PLC. Bayer PLC were not involved in the development of the programme, content, selection of speakers or their arrangements. All content has been independently developed by PCCS.

Dr Raj Thakkar Disclosures

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

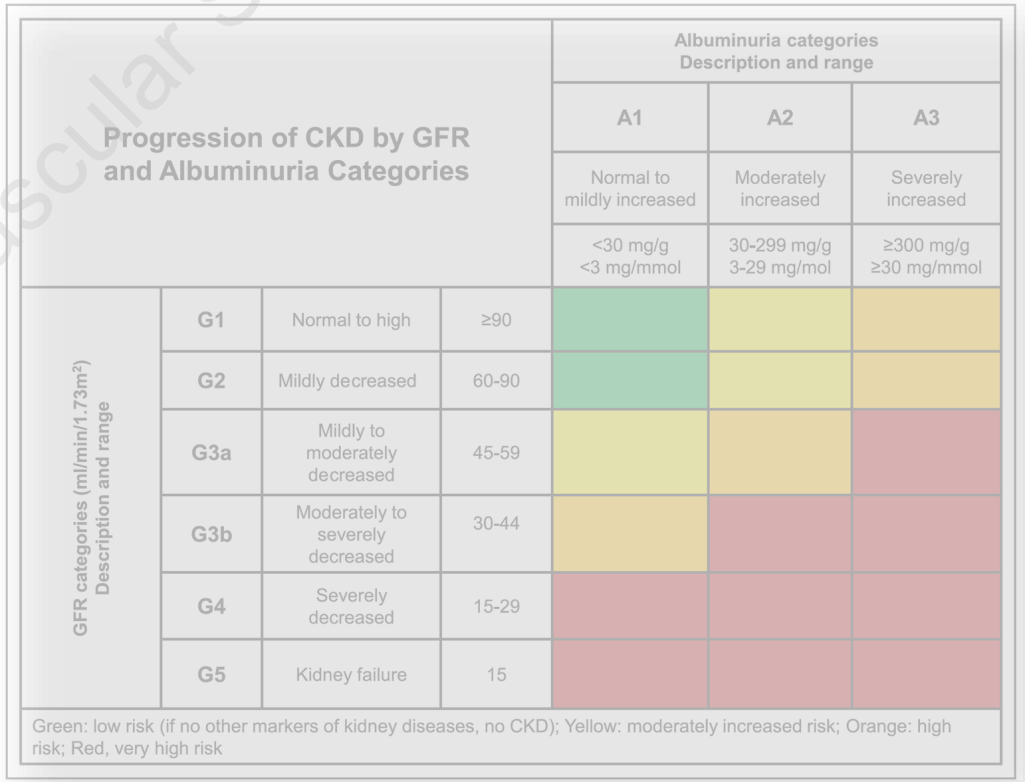
- PCCS
- AstraZeneca
- Bayer
- Novartis
- Amgen
- Medtronic
- Edwards
- Heathy.io

CKD prevention and diagnosis

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

- **Primary prevention**
  - Epidemiology of CKD
  - The association of CKD with cardiovascular disease
  - Who is at risk of developing CKD
- **Early identification – eGFR and uACR testing**
  - The importance of early CKD diagnosis
  - How to identify/diagnose CKD
  - Barriers to early CKD identification
  - Target groups suitable for CKD screening
  - Resources for patients



Progression of CKD by GFR and Albuminuria Categories				Albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				<30 mg/g <3 mg/mmol	30-299 mg/g 3-29 mg/mol	≥300 mg/g ≥30 mg/mmol
GFR categories (ml/min/1.73m²) Description and range	G1	Normal to high	≥90			
	G2	Mildly decreased	60-90			
	G3a	Mildly to moderately decreased	45-59			
	G3b	Moderately to severely decreased	30-44			
	G4	Severely decreased	15-29			
	G5	Kidney failure	15			

Green: low risk (if no other markers of kidney diseases, no CKD); Yellow: moderately increased risk; Orange: high risk; Red, very high risk

ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate.

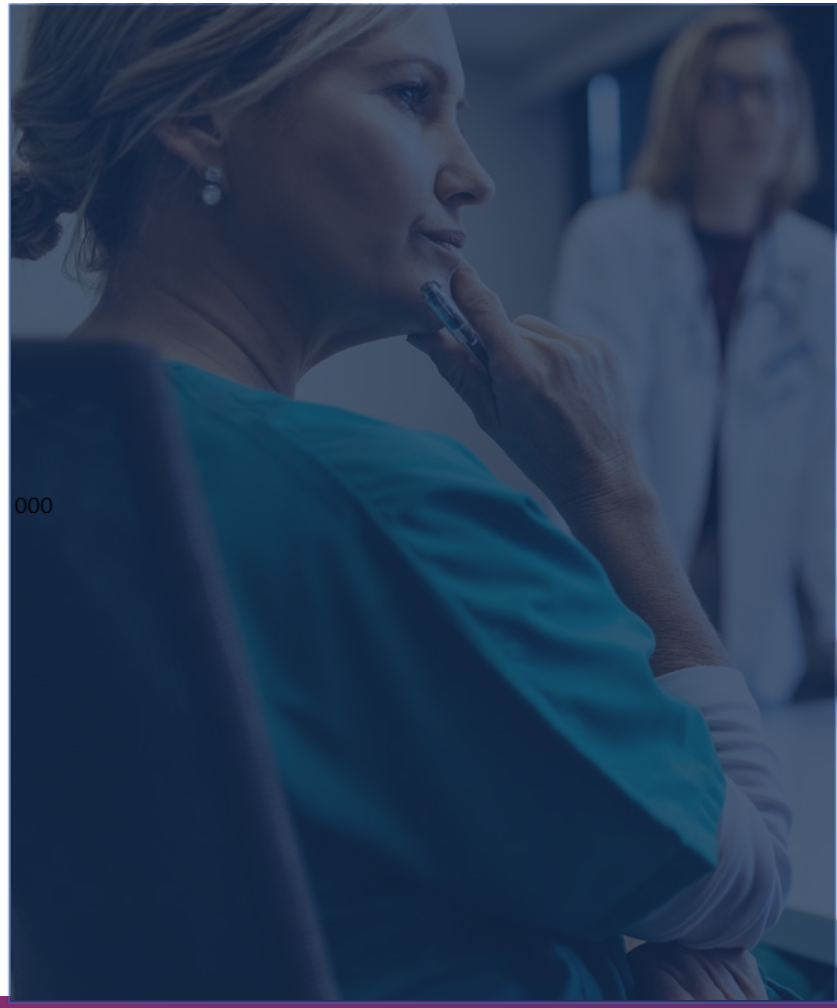
KDIGO. 2020. Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease;98. Available from: https://kdigo.org/wp-content/uploads/2020/10/KDIGO-2020-Diabetes-in-CKD-GL.pdf. Accessed March 2022

Reflection

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

- Have we forgotten about the importance of CKD as a risk factor for CVD?
- Do we understand the importance of ACR testing?
- What are we doing to improve outcomes for our patients?



ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; CVD, cardiovascular disease.

Primary prevention:
Epidemiology of CKD

What is CKD?

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

The presence of kidney damage, mainly albuminuria and/or decreased kidney function (estimated glomerular filtration rate [eGFR] <60 mL/min/1.73 m^2) for at least 3 months.[1]

[2]

AKI and acute intercurrent illness should be excluded when reviewing patients with CKD.

AKI, acute kidney injury; CKD, chronic kidney disease; CVD, cardiovascular disease.

1. Levey AS and Coresh J. Lancet 2012;379:165-180; 2. KDIGO 2022 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease. Kidney International Supplements 2022;102(5S):S1-S127.

CKD epidemic[1-4]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

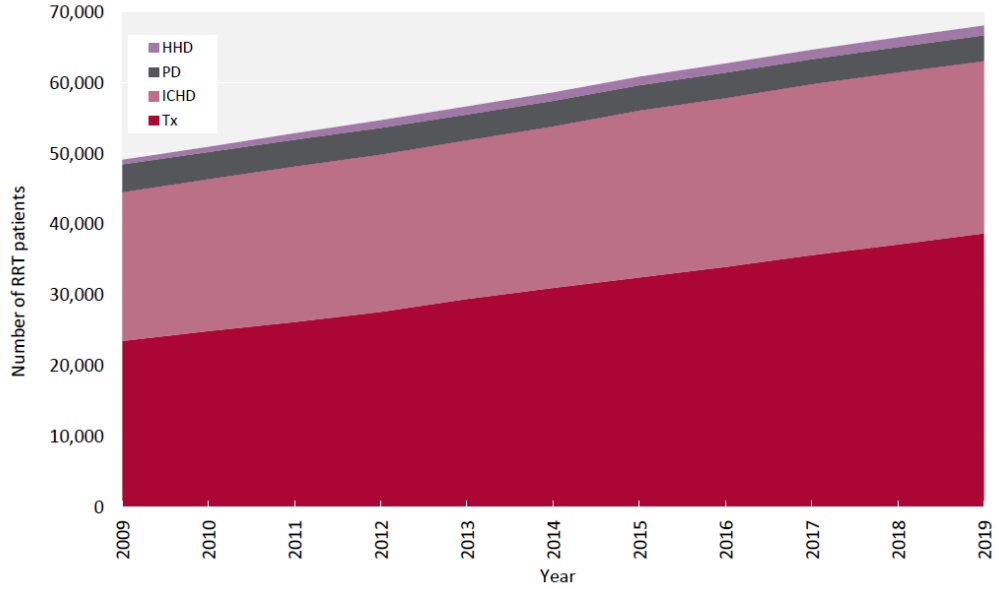
Global data

- Global prevalence of CKD has risen by 87% between 1990–2016[1]
- Estimated further increase of 17% in prevalence of CKD by 2030
- 3rd fastest growing cause of death
- 5th most common cause of years of life lost by 2040

UK data

- In the 2020 in the UK, 3.63 million have diagnosed CKD, which is predicted to increased to 4.38 million by 2030[1]
- 34% of CKD cases are undiagnosed: 'the missing million'
- Higher rates of CKD in under-served communities
- South Asians with diabetes 10x more likely to get kidney failure than Caucasians with diabetes

Growth of prevalent adult renal replacement therapy patients in the UK between 2009 and 2019[2]



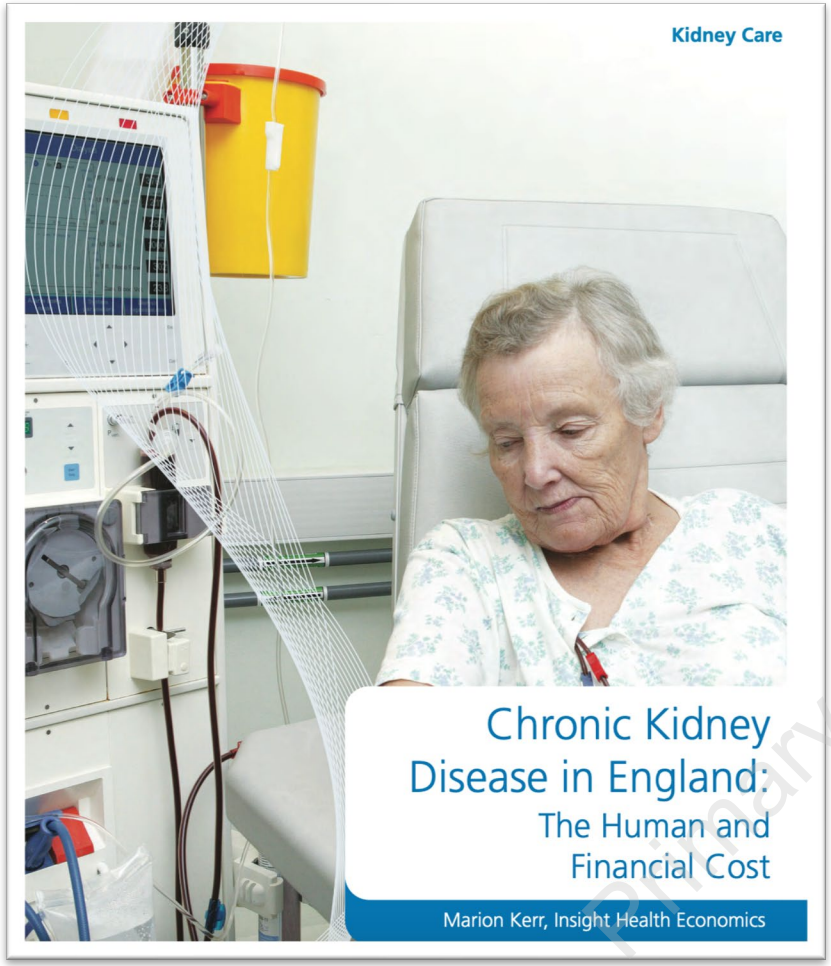
CKD, chronic kidney disease; DM, diabetes mellitus; HF, heart failure.

1. Xie Y et al. Kidney Int. 2018 Sep;94(3):567–581; 2. The Renal Association. UK Renal Registry 23rd Annual Report. https://ukkidney.org/sites/renal.org/files/23rd_UKRR_ANNUAL_REPORT.pdf. Accessed December 2022; 3. Ke C et al. BMC Nephrol 2022;23:17 doi: 10.1186/s12882-021-02597-3; 4. London School of Hygiene & Tropical Medicine. National CKD Audit. 2017 National Chronic Kidney Disease Audit (NCKDA) | LSHTM. Accessed January 2023.

Health economics of CKD

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health



- **NHS England spent an estimated £1.45 billion on CKD in 2009–10**: equivalent to £1 in every £77 of NHS expenditure. This spending estimate covers both treatment directly associated with CKD (renal care and prescribing to prevent disease progression), and also treatment for excess non-renal problems such as strokes, heart attacks and infections in people with CKD.

- **There were an estimated 7,000 extra strokes and 12,000 extra myocardial infarctions in people with CKD in 2009–2010**, relative to the expected number in people of the same age and sex without CKD. The cost to the NHS of health care related to these strokes and MIs is estimated at £174–178 million.

- **People with CKD have longer hospital stays** than people of the same age without the condition, even when they go into hospital for treatments unrelated to CKD. We estimate that the average length of stay is 35% longer for people with CKD, and that the cost to the NHS of excess hospital bed days for patients with CKD was £46 million in 2009–10.

NHS England. Chronic kidney disease in England: the human and financial cost. 2012 https://www.england.nhs.uk/improvement-hub/publication/chronic-kidney-disease-in-england-the-human-and-financial-cost/. Accessed December 2022.

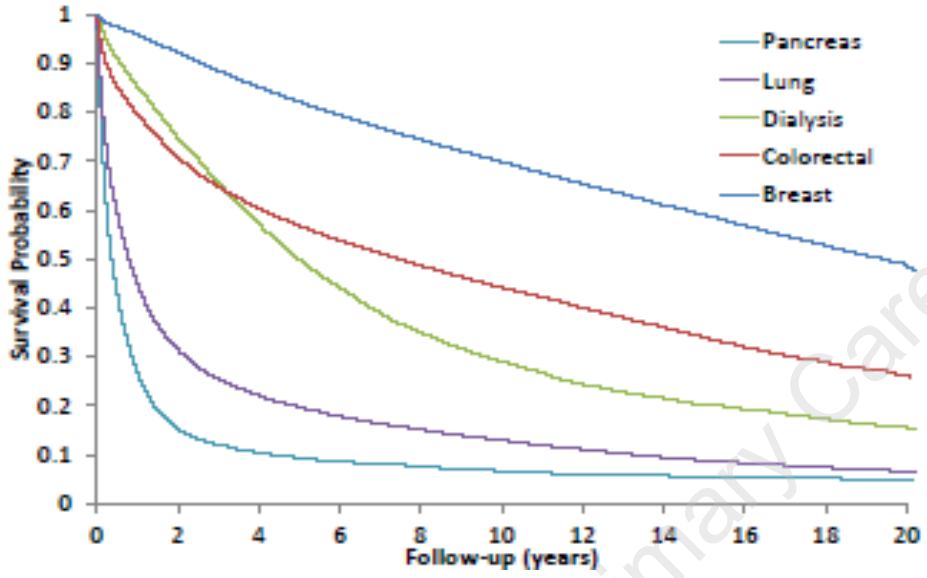
End-stage kidney disease has worse survival rates than colorectal, prostate and breast cancer

Primary Care Cardiovascular Society

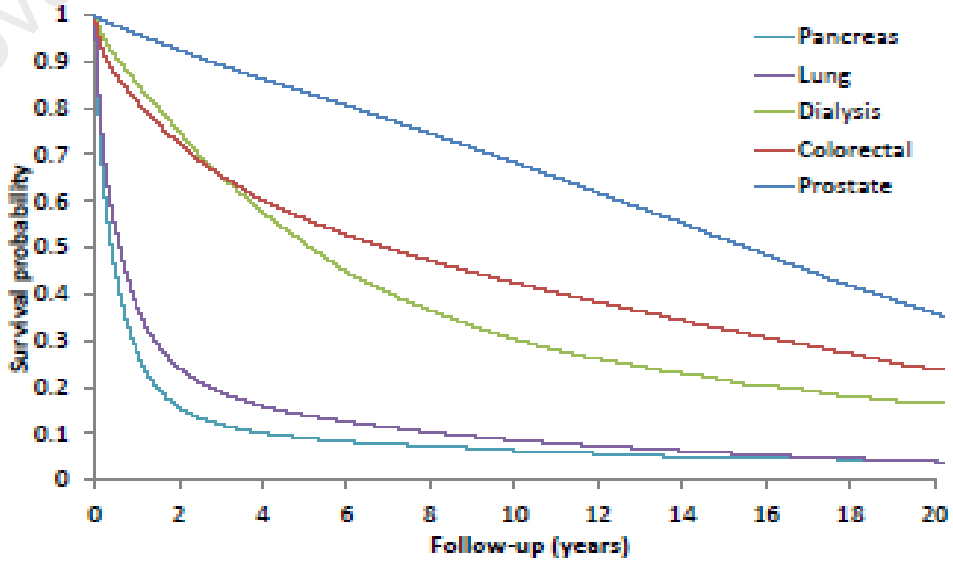
Driving primary care to deliver the best in cardiovascular health

Survival probabilities for all-cause mortality in maintenance dialysis patients and patients with cancer (log-rank P<0.001)

Females



Males

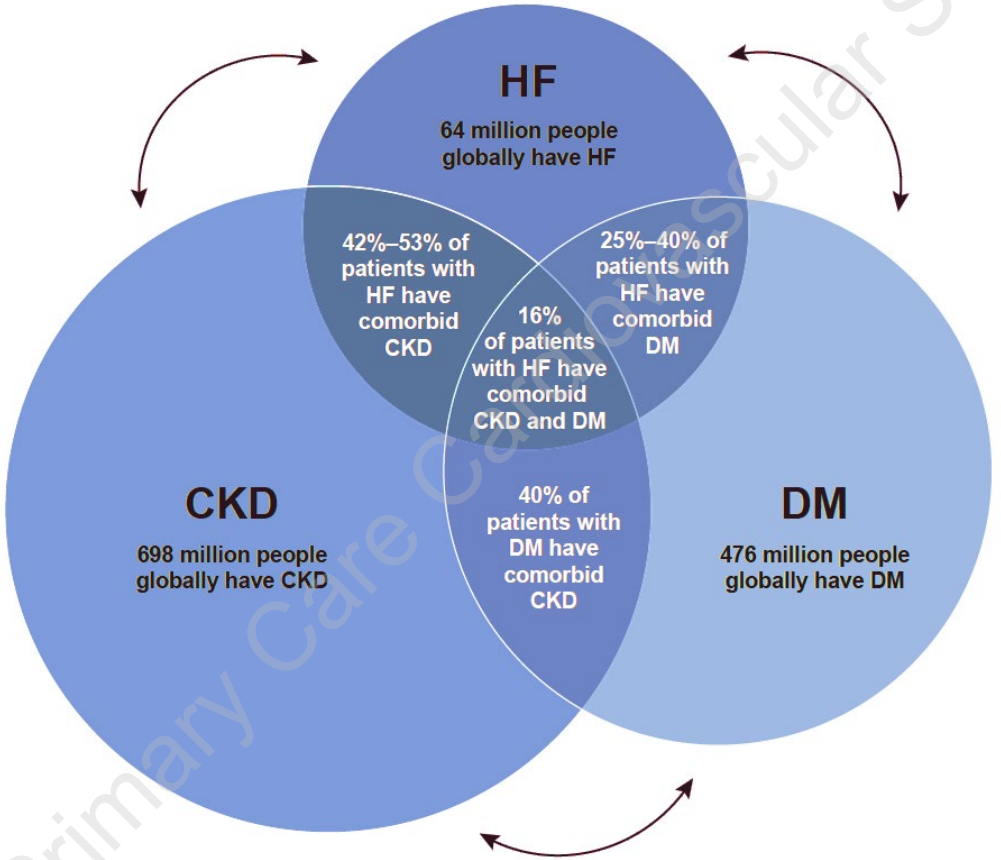


Naylor KL et al Am J Kidney Dis 2019;73:765–776. doi: 10.1053/j.ajkd.2018.12.011.

Heart failure in patients with diabetes and CKD: challenges and opportunities

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health



CKD, chronic kidney disease; DM, diabetes mellitus; HF, heart failure
Adapted from Vijay K, Neuen BL and Lerma EV. Cardiorenal Med 2022;12:1–10.

Primary prevention:
The association of CKD with cardiovascular disease

CVD prevention is a national priority

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

"Cardiovascular disease causes a quarter of all deaths in the UK and is the largest cause of premature mortality in deprived areas. This is the single biggest area where the NHS can save lives over the next 10 years."

Ambition: To prevent 150,000 strokes, heart attacks and cases of dementia in 10 years

NHS. The NHS Long Term Plan. 2019 https://www.longtermplan.nhs.uk/publication/nhs-long-term-plan/. Accessed December 2022.

Primary prevention of CKD starts in primary care

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

NICEimpact *cardiovascular disease prevention*

- 1.2 million people with CKD are undiagnosed (includes uncoded patients)
- Effective coding and management of CKD can reduce emergency admission to hospital
- Primary care is responsible for a number of key interventions in early-stage CKD
- Many of those with CKD have poor blood pressure control and poor proteinuria control

NICE. NICEimpact cardiovascular disease prevention. 2018 https://www.nice.org.uk/media/default/about/what-we-do/into-practice/measuring-uptake/nice-impact-cardiovascular-disease-prevention.pdf. Accessed December 2022.

CKD is recognized in ‘six high-risk conditions for cardiovascular disease’ by CVDPREVENT

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

1. Atrial fibrillation (AF)
2. Hypertension
3. Familial hypercholesterolemia (FH)
4. **Chronic kidney disease (CKD)**
5. Non-diabetic hyperglycemia (NDH)
6. Type 1 or 2 diabetes mellitus

Healthcare Quality Improvement Partnership. CVDPREVENT first annual audit report 2021 https://s3.eu-west-2.amazonaws.com/nhsbn-static/CVDPREVENT/2021/CVDPREVENT_First%20Annual%20Audit%20ReportFINAL.pdf. Accessed December 2022.

CVDPREVENT

For every **100 patients** with moderate to severe CKD:

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

7 events of acute kidney injury per year

6 cardiovascular events per year

38 unplanned hospital admissions per year

2 ICU admissions to the Intensive Care Unit per year

7 deaths per year

National CKDAudit
A quality improvement programme for chronic kidney disease

National CKDAudit A4 poster. December 2017. https://www.lshtm.ac.uk/media/10136 Accessed December 2022.

CKD is associated with unplanned admissions

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Findings for every **100 Patients**

With CKD **Stage 3:**

36 unplanned admissions annually

With CKD **Stage 4:**

75 unplanned admissions annually

Classification of chronic kidney disease using GFR and ACR categories

GFR and ACR categories and risk of adverse outcomes			ACR categories (mg/mmol), description and range		
			<3 Normal to mildly increased	3–30 Moderately increased	>30 Severely increased
			A1	A2	A3
GFR categories (ml/min/1.73m²), description and range	≥90 Normal and high	G1	No CKD in the absence of markers of kidney damage		
	60–89 Mild reduction related to normal range for a young adult	G2			
	45–59 Mild–moderate reduction	G3a[1]			
	30–44 Moderate–severe reduction	G3b			
	15–29 Severe reduction	G4			
	<15 Kidney failure	G5			

Increasing risk

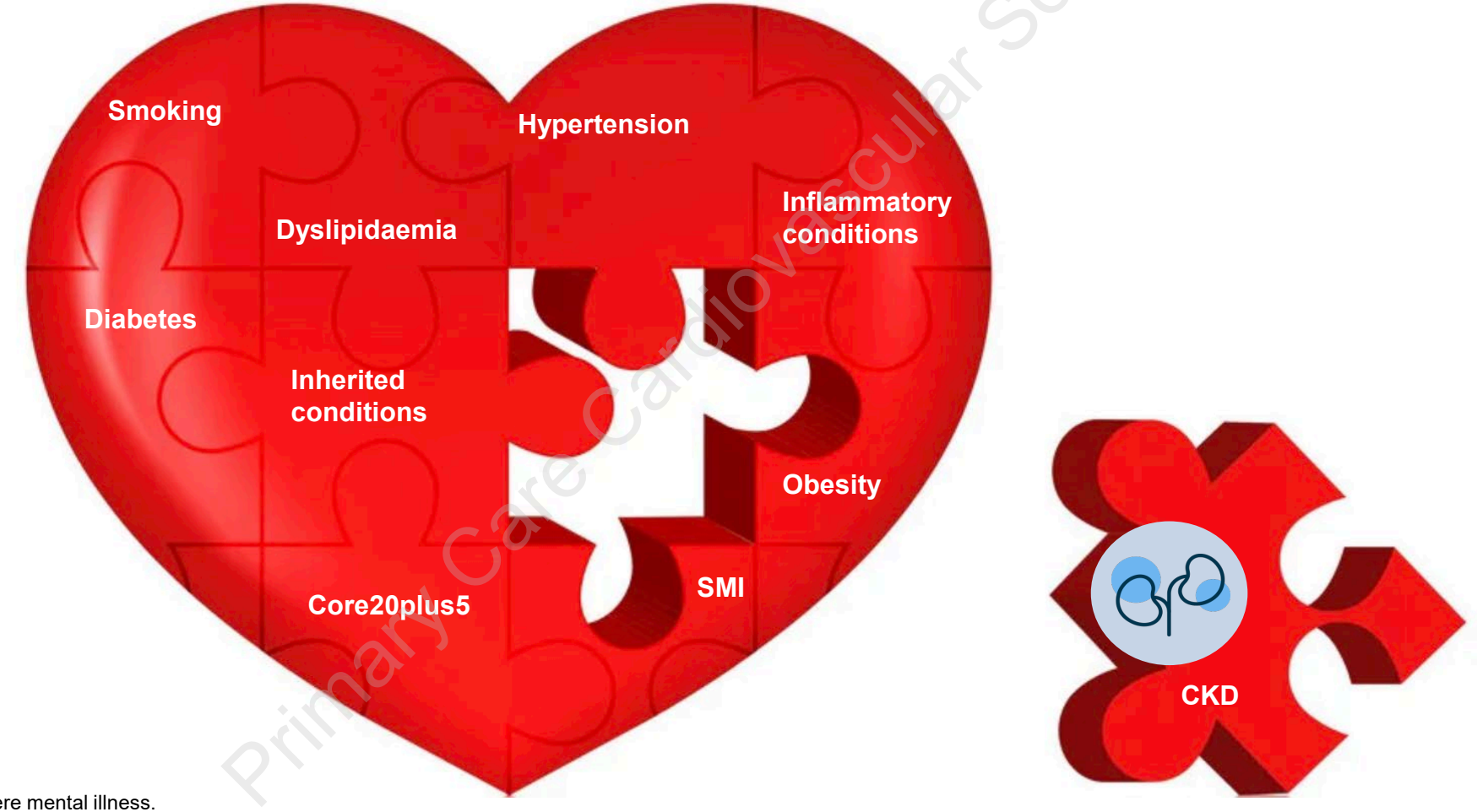
Increasing risk

1. National CKDAudit. National Report: Part 2 December 2017. https://www.lshtm.ac.uk/media/9951. Accessed December 2022; 2. KDIGO. 2020. Clinical practice guideline for diabetes management in chronic kidney disease. Available from: https://kdigo.org/wp-content/uploads/2020/10/KDIGO-2020-Diabetes-in-CKD-GL.pdf. Accessed March 2022

CKD is an under-recognised risk factor for CVD

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health



CKD, chronic kidney disease; SMI, severe mental illness.

1. NICE CKS 2020 CVD risk assessment and management: What are the risk factors? Risk factors for CVD | Background information | CVD risk assessment and management | CKS | NICE. Accessed December 2022; 2. NHS England. Core20PLUS5 (adults) – an approach to reducing healthcare inequalities NHS England » Core20PLUS5 (adults) – an approach to reducing healthcare inequalities. Accessed December 2022.

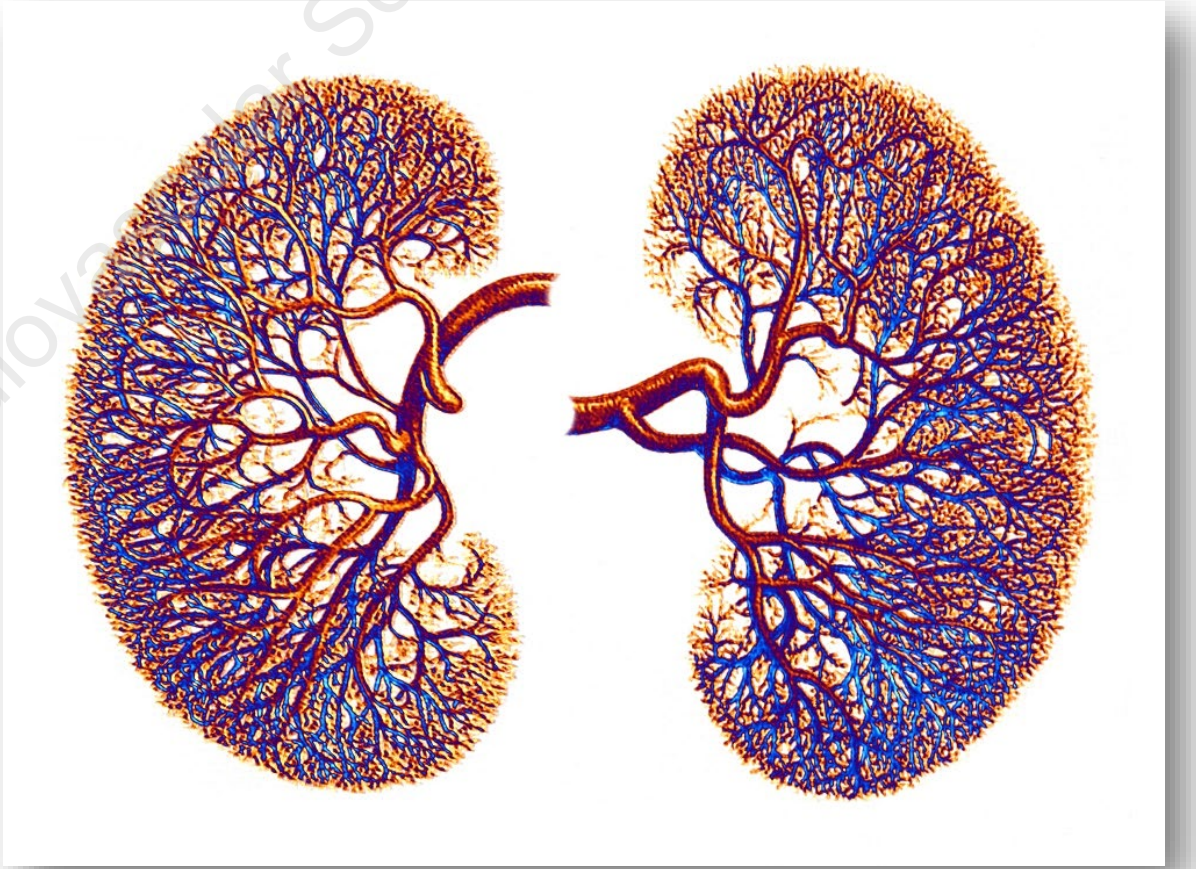
Kidney vasculature is a lens into the body's cardiovascular health[1-4]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

- Approximately 10 km of capillaries in both kidneys
- 180 L plasma filtered by kidneys in 24 hours
- 20–25% cardiac output
- CKD is a cardiovascular risk state[1]
- Patients with CKD are 20x more likely to die from CVD than renal failure

CKD must be considered one of the strongest risk factors for the development of CVD[2]

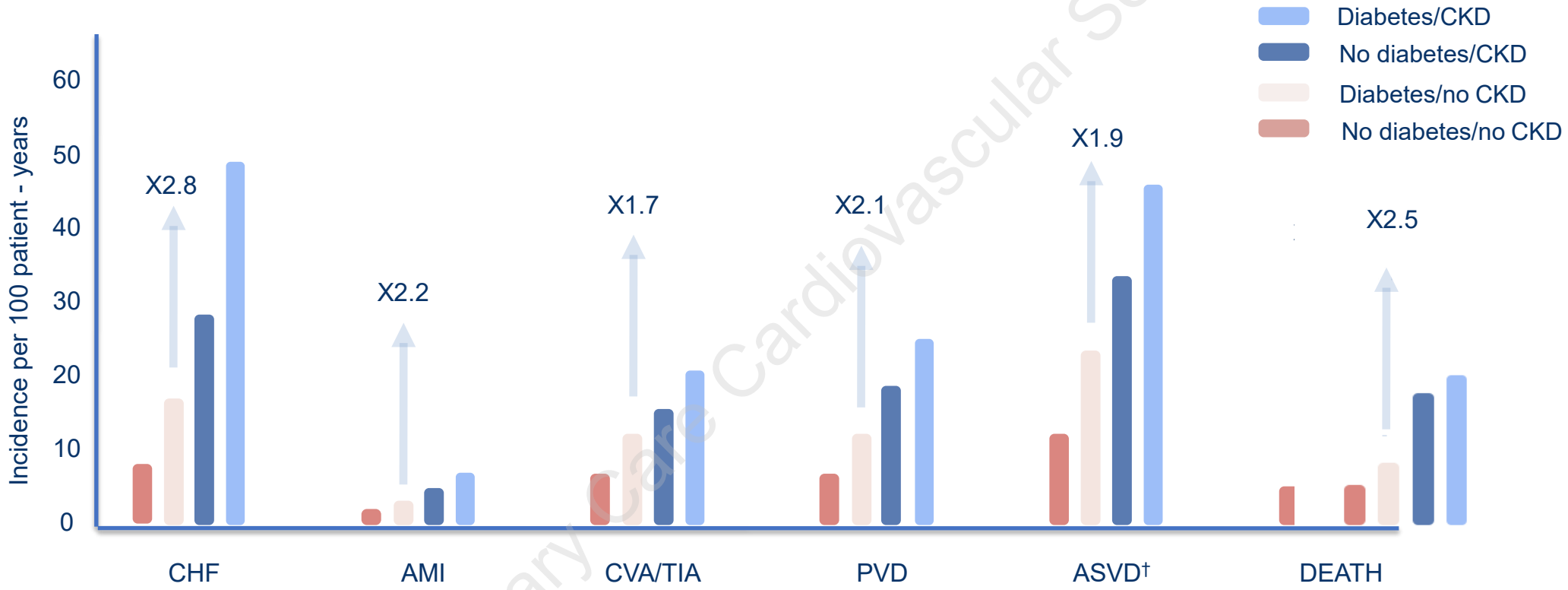


1. Healthcare Quality Improvement Partnership. CVDPREVENT first annual audit report 2021 https://s3.eu-west-2.amazonaws.com/nhsbn-static/CVDPREVENT/2021/CVDPREVENT_First%20Annual%20Audit%20ReportFINAL.pdf. Accessed December 2022; 2. Tonelli M, et al. Chronic kidney disease and mortality risk: a systematic review. J Am Soc Nephrol. 2006;17:2034–2047; 3. McCullough PA and Ronco C (eds.). Textbook of Cardiorenal Medicine. 1st edition. Springer, Cham; 2020; 4. NICE. CVD prevention: chronic kidney disease detection and management. How NICE resources can support local priorities. CVD prevention: chronic kidney disease detection and management (nice.org.uk). Accessed January 2023.

CKD is a ‘stronger’ risk factor for ALL cardiovascular events than diabetes*

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health



***Increase in risk is shown between the diabetes/no CKD group and the diabetes/CKD group.**

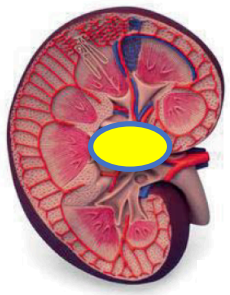
†ASVD was defined as the first occurrence of AMI, CVD/TIA or PVD. AMI, acute myocardial infarction; ASVD, atherosclerotic vascular disease; CHF, chronic heart failure; CKD, chronic kidney disease; CVA, cerebrovascular accident; PVD, peripheral vascular disease; TIA, transient ischaemic attack. Adapted from Foley RN, et.al. Am Soc Nephrol 2005;16:489–495.

Cardiorenal syndromes[1,2]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

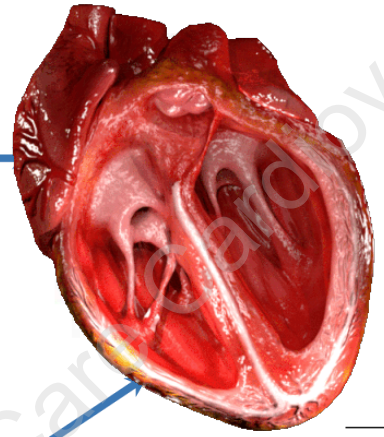
Schematic of CRS type 4



Stage 1–2
- Comorbidities: DM, smoking, HP, obesity, dyslipidemia
- Genotype
- Chronic inflammation

Stage 3–5
- Comorbidities
- Anemia
- Uremic toxin
- Malnutrition
- Calcio-phosphorus abnormalities
- Neurohormonal activation (sympathetic overactivity, activation of RAAS)
- Oxidative stress
- Endothelial dysfunction, LV hypertrophy, ischemic intolerance

Stage 5 with dialysis
- Increased inflammation
- Blood-membrane interaction
- Blood-catheter interaction
- Dialysate contaminant, endotoxin, catheter infection
- Hemodynamic stress



Hypertension
Valve disease
Heart failure, LVH, cardiomyopathy, myocardial fibrosis
AF
CAD
Stroke
Sudden cardiac death – fatal arrhythmias (2/3 advanced CKD; 59x population adjusted risk)

Definitions of different types of CRS

CRS type 1	Acute worsening of heart function causing acute kidney injury and/or dysfunction
CRS type 2	Chronic abnormalities in cardiac function leading to progressive CKD
CRS type 3	Sudden worsening of renal function causing acute cardiac injury and/or dysfunction
CRS type 4	Condition of primary CKD leading to a reduction in cardiac function (ventricular hypertrophy, diastolic dysfunction) and/or increased risk of cardiovascular events
CRS type 5	Systemic disorders (e.g. sepsis) that concurrently induce cardiac and kidney injury and/or dysfunction

DM, diabetes mellites; HP, hypertension; RAAS, renin angiotensin aldosterone system.

1. Clementi A et al. Cardiorenal Med 2013;3:63–70; 2. McCullough PA and Ronco C (eds.). Textbook of Cardiorenal Medicine. 1st edition. Springer, Cham; 2020.

Why does CKD cause cardiovascular complications?

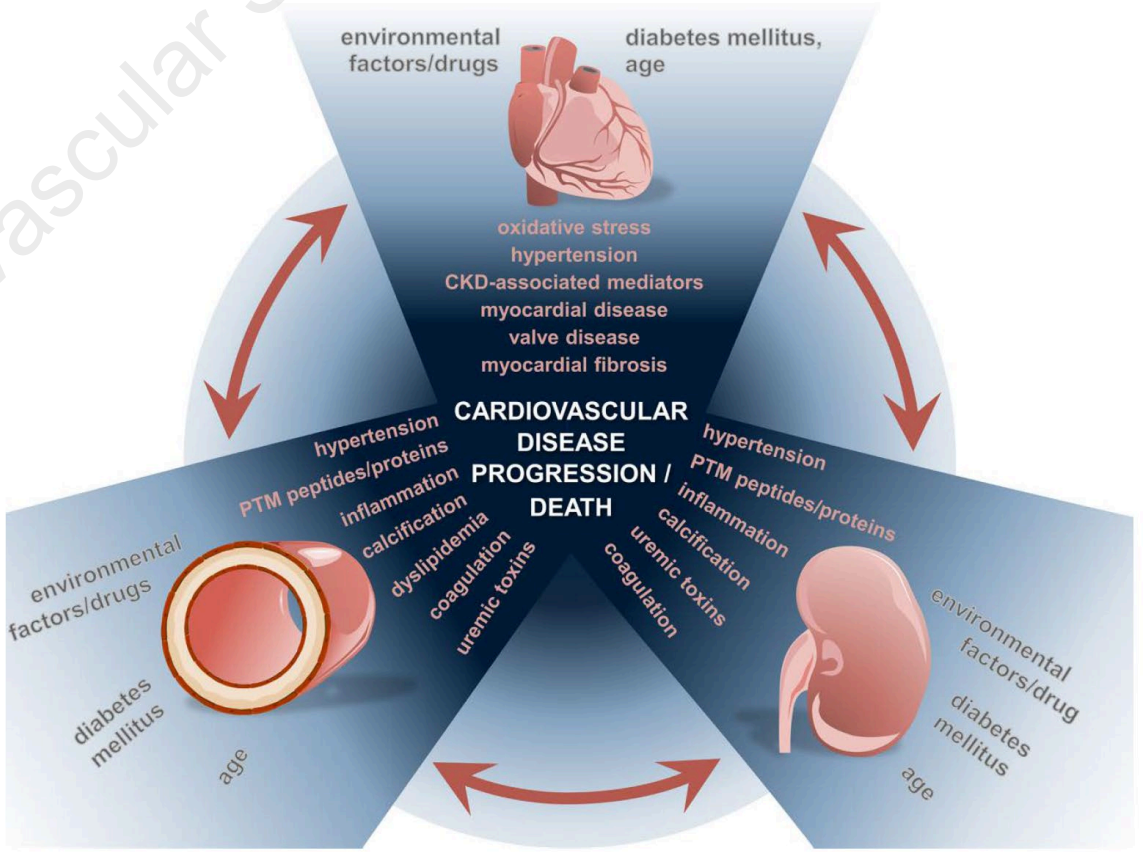
Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

CKD increases CVD for the following reasons:

- Traditional CAD risk factors also damage the kidney e.g. smoking, dyslipidaemia, HTN, diabetes etc
- Activation of renin–aldosterone system
- Arterial stiffening
- Instability of atherosclerotic plaque in uraemia
- Renal anaemia
- Cardiac remodelling including LVH (30–80%) and fibrosis
- Marked accelerated vascular (45x) and valve calcification especially aortic (40% CKD3, almost all CKD5)
- Chronic inflammation – endothelial dysfunction and NO production

Interaction of CVD and CKD



CAD, coronary artery disease; HTN, hypertension; LVH, left ventricular hypertrophy; NO, nitric oxide.
Jankowski J et al. Circulation. 2021;143:1157–1172.

Primary prevention

Who is at risk of developing CKD?

Importance of improving identification of CKD[1,2]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

CKD can result in:[1]

Increased risk of AKI → possible death / increased risk of CV disease / premature mortality

Primary care teams can prove valuable in delivering these benefits to patients with CKD:[1]

- Proactive identification of patients at risk of CKD aligned to NICE using eGFR and uACR
- Improve CKD coding and therefore reduce the risk of hospital admissions[1,2]
- Provision of personalised education about CKD
- Opportunity for patients to make lifestyle changes to maintain kidney health
- Improved management of BP and CV risk
- Safer prescribing of medicines
- Regular review of renal function
- Refer to nephrology if and when necessary

AKI, acute kidney injury; BP, blood pressure; CKD, chronic kidney disease; CV, cardiovascular.

1. London School of Hygiene and Tropical Medicine. 2017. National Chronic Kidney Disease Audit: National Report (Part 1). Available from: https://www.lshtm.ac.uk/files/ckd_audit_report.pdf. Accessed August 2022; 2. London School of Hygiene and Tropical Medicine. 2017. National Chronic Kidney Disease Audit: National Report (Part 2). Available from: https://www.lshtm.ac.uk/media/9951. Accessed August 2022.

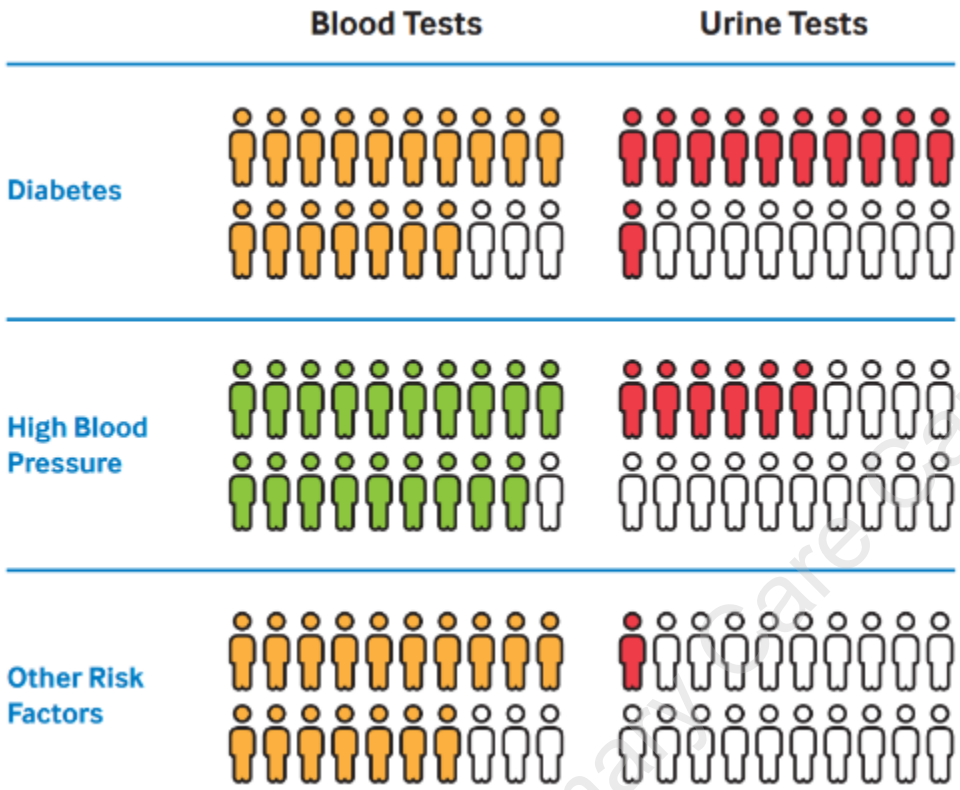
Early identification of CKD: eGFR and uACR testing

The importance of early CKD diagnosis

We need to identify patients with/at risk of CKD early

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health



To identify CKD early in high risk people, there needs to be greater urinary testing of uACR across all healthcare sectors, and maybe incentivisation to do so.

We are not saving kidneys and improving cardiovascular outcomes early enough.

We also need to improve the coding of patients with CKD so that management is optimised as early as possible

Red <70%, Amber 71-90%, Green >90%.
uACR, Urine albumin to creatinine ratio; CKD, chronic kidney disease.
NHSE. Chronic Kidney Disease. 2019. Available from: https://www.england.nhs.uk/mids-east/wp-content/uploads/sites/7/2019/03/chronic-kidney-disease.pdf. Accessed July 2022.

Early identification of CKD: eGFR and uACR testing

How to identify/diagnose CKD

When to suspect CKD and offer testing

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Incidental finding of:[1]

- **Raised serum creatinine and/or serum eGFR** < 60 mL/min/1.73m^2
- **Proteinuria** (uACR > 3 mg/mmol)
- **Persistent haematuria** (2/3 urine dipstick tests show 1+ or more of blood)*
- **Urine sediment abnormalities** such as RBC, WBC, or granular casts and renal tubular epithelial cells†

NICE NG203:[2]

Offer CKD testing using eGFRcreatinine and ACR to adults with the following risk factors:

- Diabetes
- Hypertension
- Previous AKI
- CVD (IHD, chronic HF, PVD or cerebral vascular disease)
- Structural renal tract disease, recurrent renal calculi or prostatic hypertrophy
- Multisystem diseases with potential kidney involvement, e.g. systemic lupus erythematosus
- Gout
- Family history of ESRD or hereditary kidney disease
- Incidental detection of haematuria or proteinuria

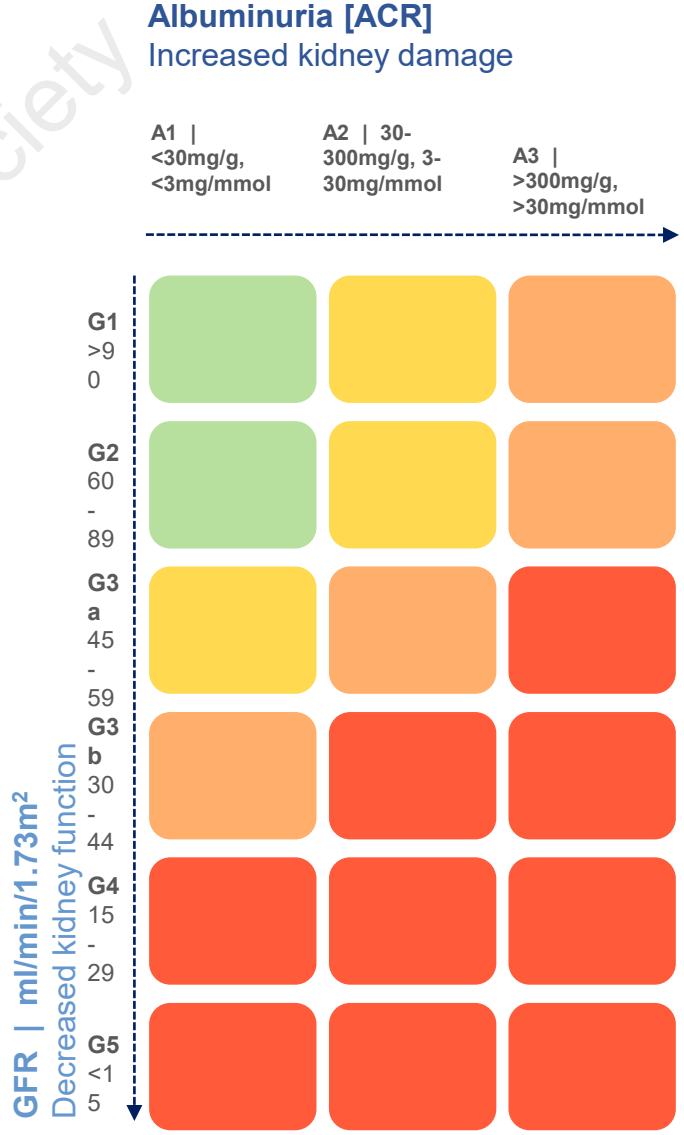
*after exclusion of a UTI. †RBCs may indicate glomerular disease, WBCs may indicate pyelonephritis or interstitial nephritis, granular casts and renal tubular epithelial cells are seen in many parenchymal diseases.
ACR, albumin:creatinine ratio; AKI, acute kidney injury; CKD, chronic kidney disease; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; ESRD, end-stage renal disease; HF, heart failure; IHD, ischaemic heart disease; PVD, peripheral vascular disease; RBCs, red blood cells; uACR, urinary albumin:creatinine ratio; WBCs, white blood cells.
1. NICE CKS: Chronic Kidney Disease 2022. https://cks.nice.org.uk/topics/chronic-kidney-disease/diagnosis/diagnosis/. Accessed November 2022; 2. NICE Guideline (NG203). https://www.nice.org.uk/guidance/ng203. Accessed November 2022.

Diagnosing and classifying CKD[1,2]

Both blood testing (eGFR) and urine testing (ACR) is required to investigate patients for CKD

Key:

- Low risk
- Medium risk
- High risk
- Very high risk



ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate. 1. Adapted from NICE Guidelines NG203 2021 https://www.nice.org.uk/guidance/ng203. Accessed December 2022; 2. Adapted from KDIGO 2022 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease. Kidney International Supplements 2022;102(5S):S1-S127.

Classification of CKD in adults

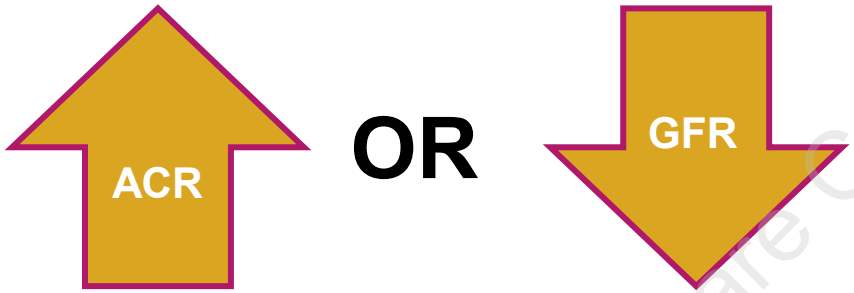
Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

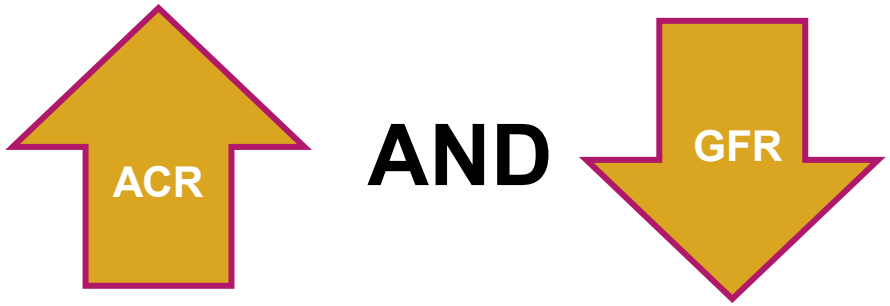
NICE NG203:[1]

- CKD should be classified using a combination of GFR and ACR categories.

There is an increased risk of adverse outcomes if:



There is a multiplied risk of adverse outcomes if:



- CKD management should not be determined by age alone

ACR, albumin:creatinine ratio; CKD, chronic kidney disease; GFR, glomerular filtration rate.

1. NICE Guideline (NG203). https://www.nice.org.uk/guidance/ng203. Accessed October 2022.

Risk of adverse outcomes in adults by GFR and ACR category[1,2]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Use the person's GFR and ACR categories to indicate their risk of adverse outcomes (for example, CKD progression, AKI, all-cause mortality and CV events) and discuss this with them.[1]

		ACR categories		
		A1: normal to mildly increased (<3 mg/mmol)	A2: moderately increased (3 to 30 mg/mmol)	A3: severely increased (> 30 mg/mmol)
GFR categories (ml/min/1.73m²)	G1: normal and high (≥ 90)	**Low risk***	**Moderate risk**	**High risk**
	G2: mild reduction related to normal range for a young adult (60 – 89)	**Low risk***	**Moderate risk**	**High risk**
	G3a: mild to moderate reduction (45 – 59)	**Moderate risk**	**High risk**	**Very high risk**
	G3b: moderate to severe reduction (30 – 44)	**High risk**	**Very high risk**	**Very high risk**
	G4: severe reduction (15 – 29)	**Very high risk**	**Very high risk**	**Very high risk**
	G5: kidney failure (under 15)	**Very high risk**	**Very high risk**	**Very high risk**

*No CKD if there are no other markers of kidney disease. Markers of kidney disease include albuminuria ACR more than 3 mg/mmol), urine sediment abnormalities, electrolyte and other abnormalities due to tubular disorders, abnormalities detected by histology, structural abnormalities detected by imaging, and a history of kidney transplantation. ACR, albumin:creatinine ratio; AKI, acute kidney injury; CKD, chronic kidney disease; CV, cardiovascular; GFR, glomerular filtration rate. 1. Adapted from NICE Guideline (NG203). https://www.nice.org.uk/guidance/ng203. Accessed October 2022; 2. Adapted from KDIGO 2022 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease. Kidney International Supplements 2022;102(5S):S1-S127.

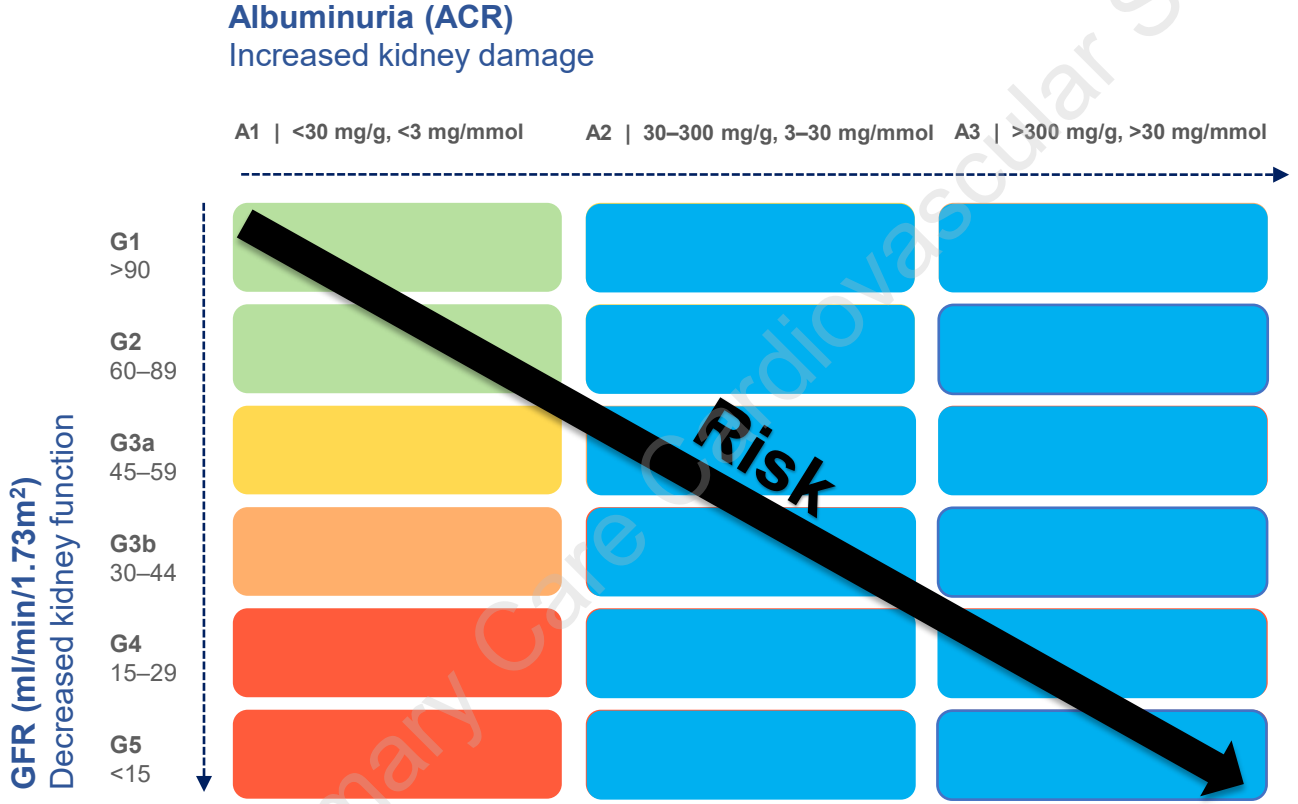
What happens if we don't check the urine for albuminuria?[1,2]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Key

- Low risk
- Medium risk
- High risk
- Very high risk



Underdiagnosis

Under-estimation of severity

Under-estimation of risk

ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; CVD, cardiovascular disease.

1. Adapted from NICE Guidelines NG203 2021 https://www.nice.org.uk/guidance/ng203. Accessed December 2022; 2. Adapted from KDIGO 2022 Clinical Practice Guideline for Diabetes Management in Chronic Kidney Disease. Kidney International Supplements 2022;102(5S):S1-S127.

CVDPREVENT data

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

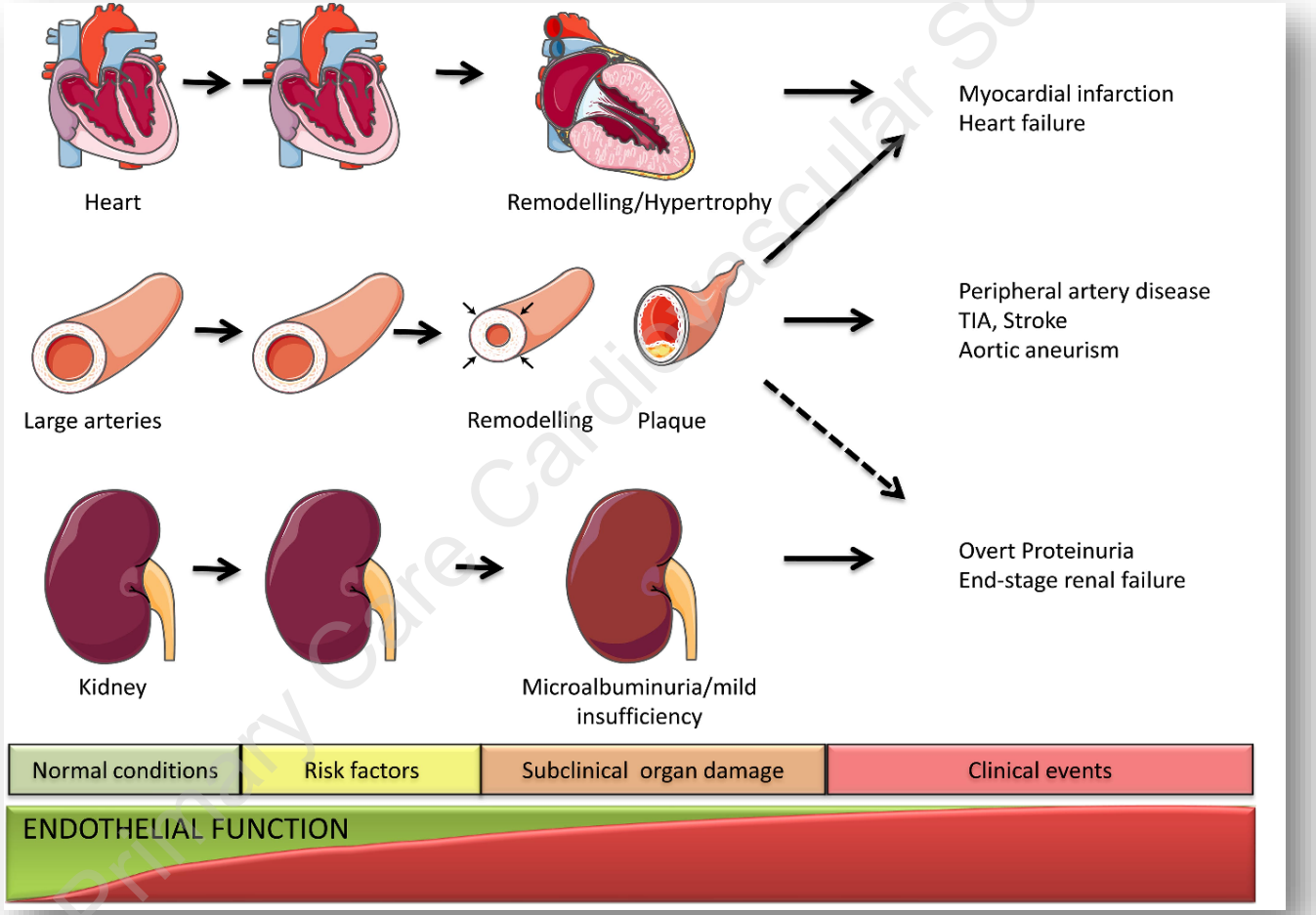
CVDP004CKD: Percentage of patients aged 18 and over with GP recorded CKD (G3a to G5), with a record of a urine albumin:creatinine ratio (or protein:creatinine ratio) test in the preceding 12 months

23.56%

Area value

Healthcare Quality Improvement Partnership. CVDPREVENT first annual audit report 2021 https://s3.eu-west-2.amazonaws.com/nhsbn-static/CVDPREVENT/2021/CVDPREVENT_First%20Annual%20Audit%20ReportFINAL.pdf. Accessed December 2022.

Albuminuria is an early marker of cardiovascular disease



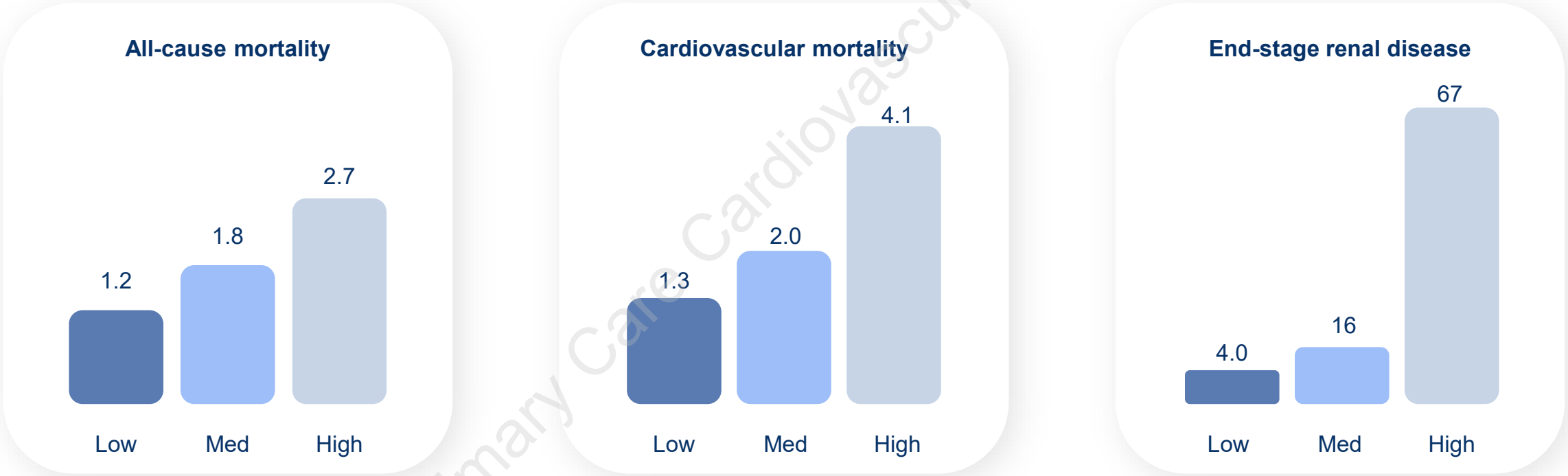
Versari D et al. Diabetes Care 2009;32:S314-S321.

Albuminuria is a strong independent risk predictor for end-stage renal disease (ESRD), CVD and death

Primary Care Cardiovascular Society

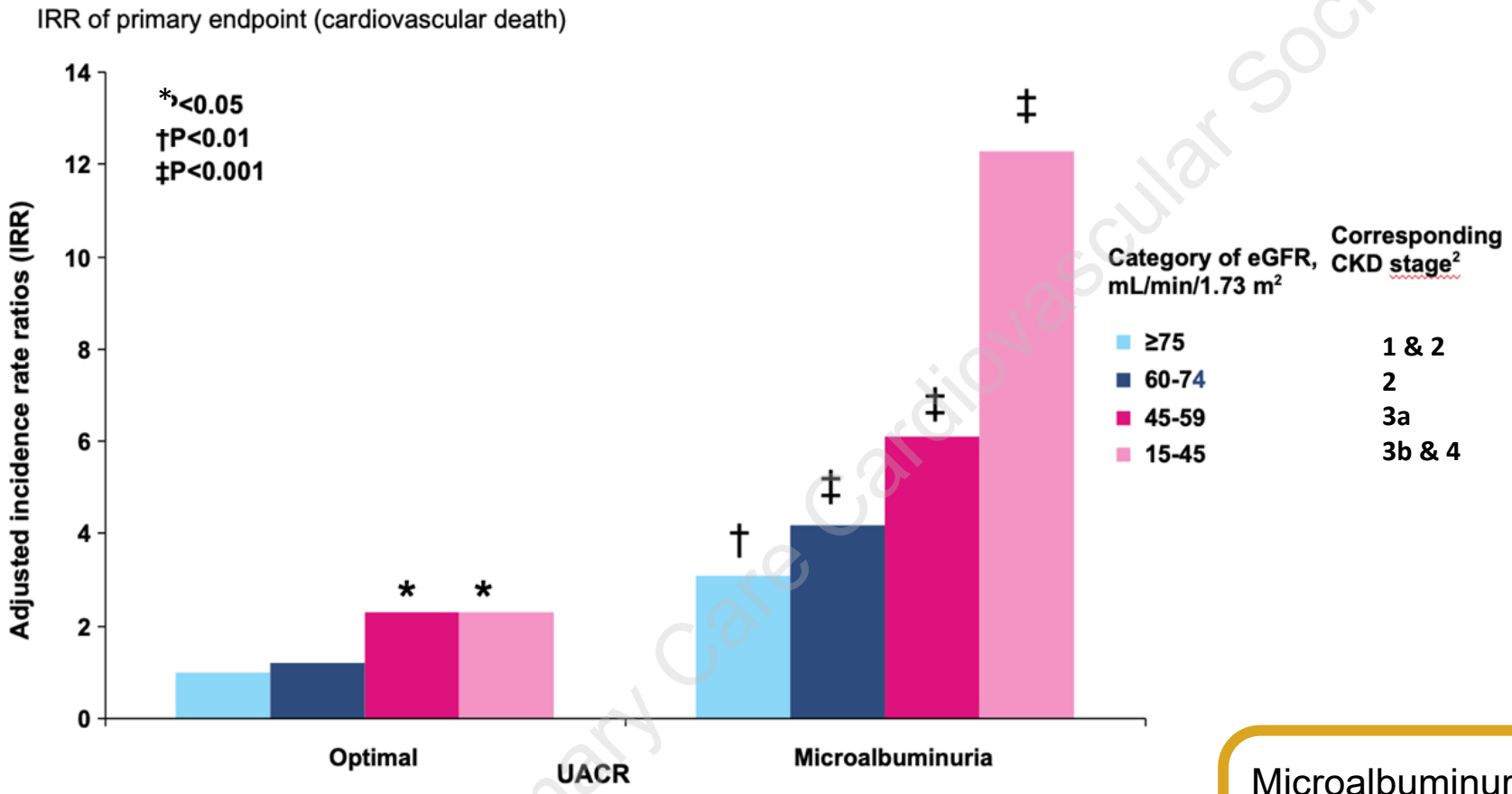
Driving primary care to deliver the best in cardiovascular health

Adjusted hazard ratio for cohort with eGFR stage 3, by ACR level*



*Low=ACR <3 mg/mmol, Med=ACR 3–30 mg/mmol; High=ACR >30 mg/mmol.
ACR, albumin-to-creatinine ratio; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate.
Adapted from Levey AS, et al. The definition, classification, and prognosis of chronic kidney disease: a KDIGO Controversies Conference report. Kidney Int. 2011; 80:17–28.

Risk is intensified with microalbuminuria



Microalbuminuria with eGFR >75 mL/min/1.73 m^2 is associated with a higher risk of cardiovascular death than CKD stage 4 without albuminuria

eGFR, estimated glomerular filtration rate; IRR, incidence rate ratio; UACR, urine albumin-creatinine ratio.

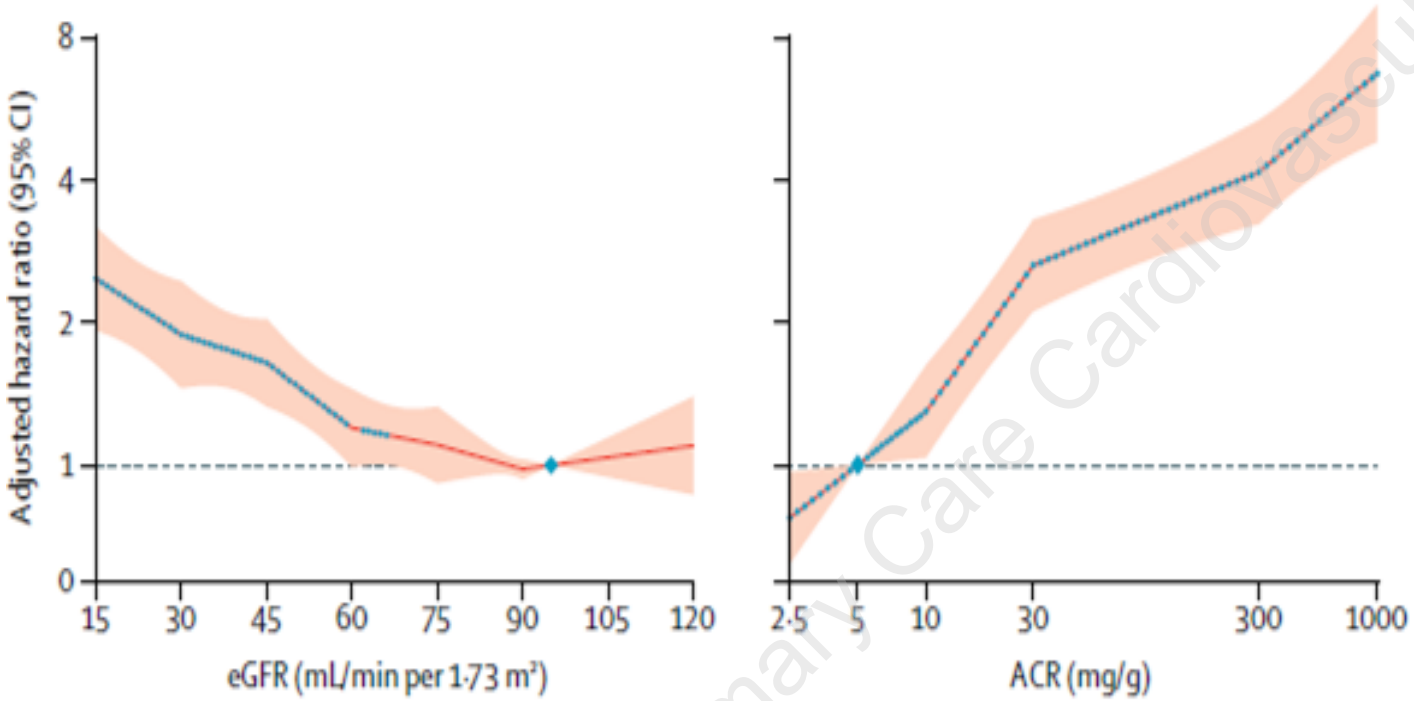
Adapted from Hallan S et al. Arch Int Med. 2007;167:2490–2496; 2. NICE Management of CKD Accessed December 2022.

Risk of leg amputation in diabetic kidney disease

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

PAD by leg amputation according to eGFR and ACR



Amputation risk is significantly higher with declining eGFR, and rising albuminuria

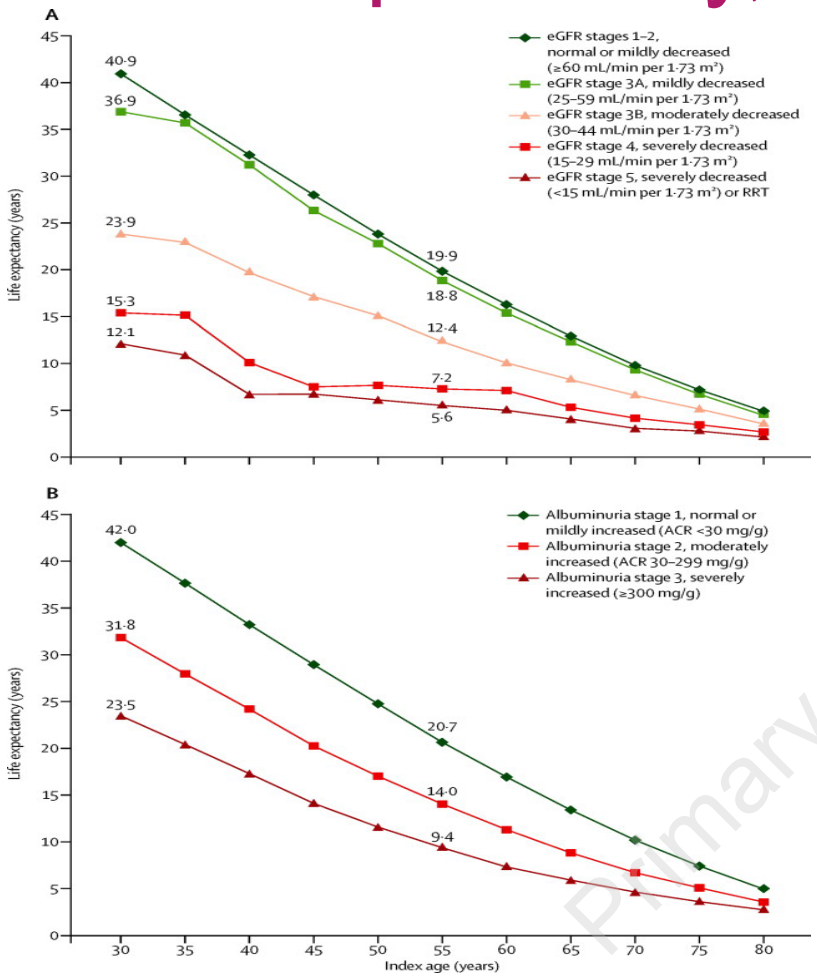
ACR, albumin-to-creatinine ratio; eGFR, estimated glomerular filtration rate.

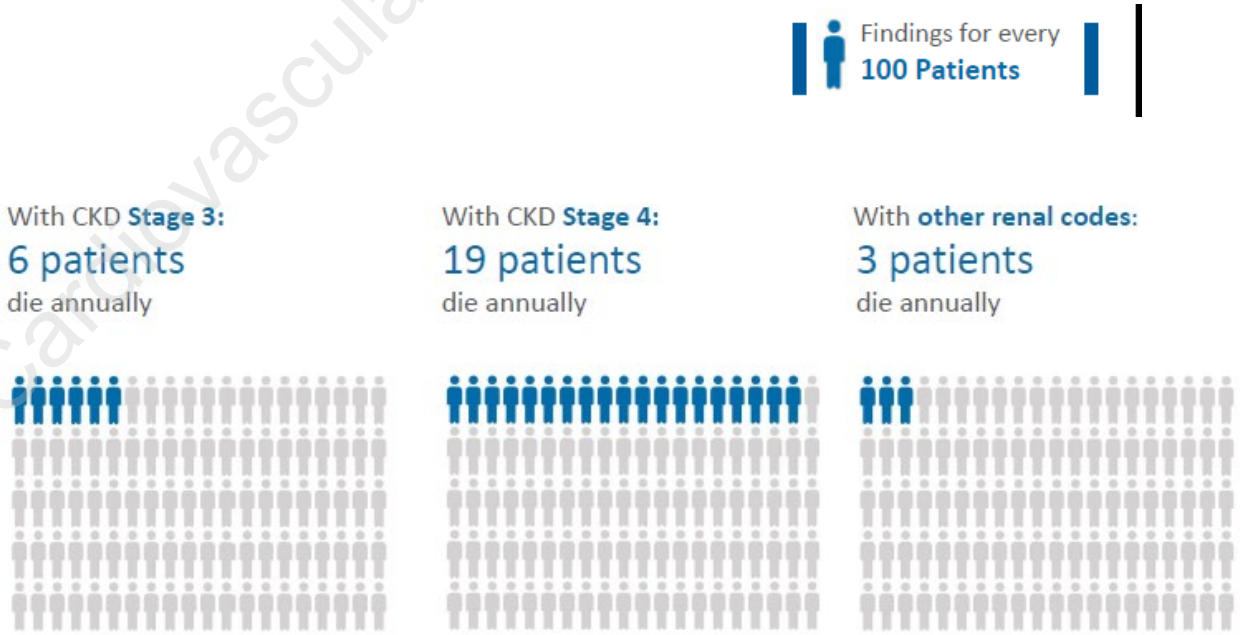
Matsushita K, et al. Lancet Diabetes Endocrinol. 2017;5:718–728.

Low eGFR and raised ACR are independently associated with reduced life expectancy, even at early stages[1,2]

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health





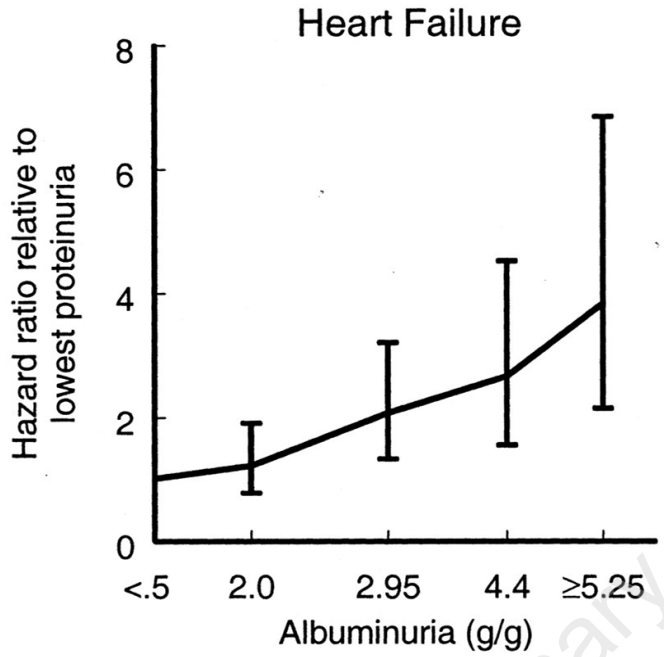
1. Gansevoort RT, et al. Lancet 2013;382:339-352; 2. National Chronic Kidney Disease Audit slide presentation. Test. - ppt download (slideplayer.com). Accessed December 2022.

Heart failure and its link to albuminuria

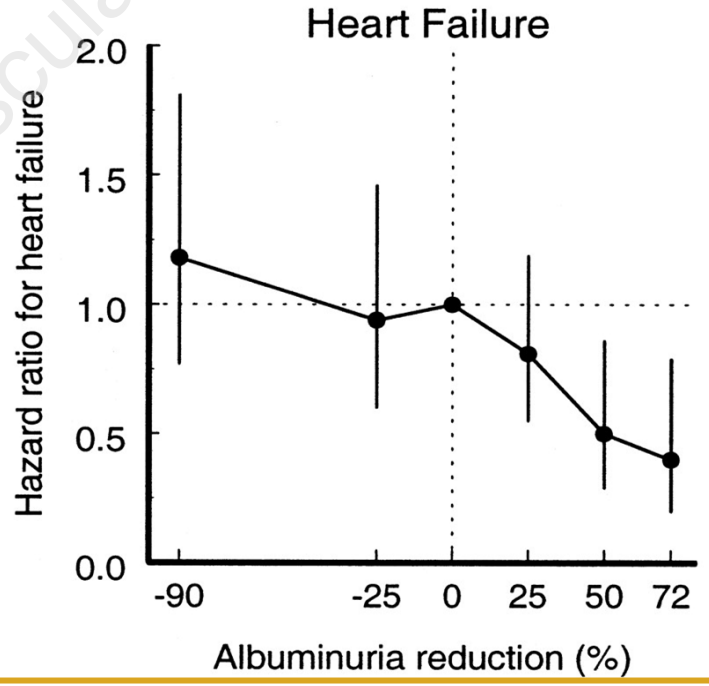
Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Posthoc analysis of RENAAL trial data*: Kaplan-Meier curves for heart failure endpoint as functions of baseline albumineria and percent change in month-6 albumineria



Risk of heart failure is higher with high baseline albuminuria



Risk of heart failure is significantly reduced at six months with albuminuria reduction

*1513 patients with diabetic nephropathy treated with losartan vs placebo

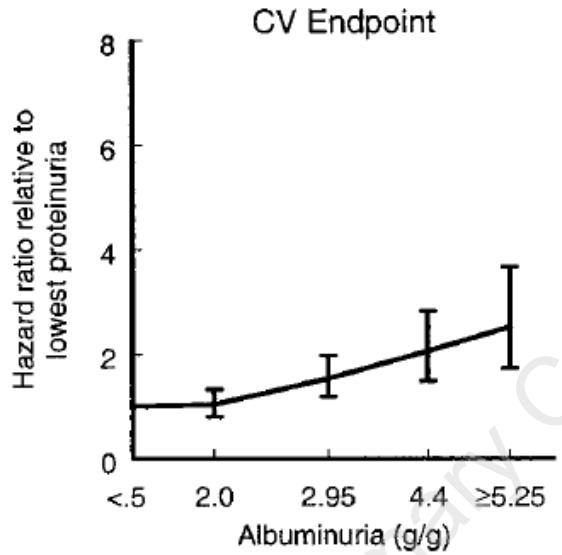
De Zeeuw D, et al. Circulation 2004;110:921–927. (Posthoc analysis of RENAAL trial)

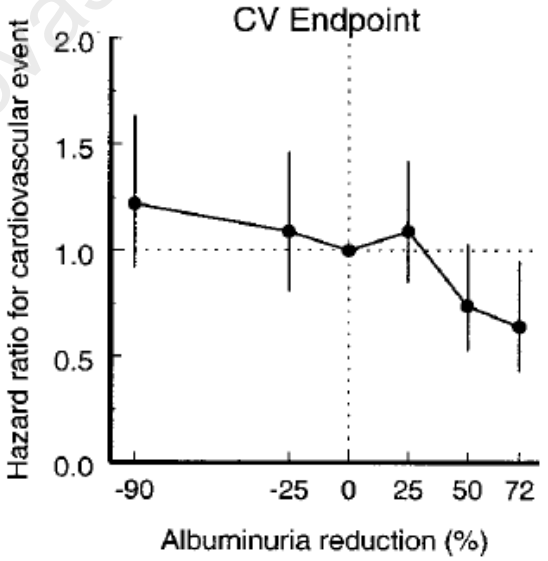
CV events are more common with albuminuria and less likely to occur if albuminuria is reduced

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Posthoc analysis of RENAAL trial data*: Kaplan-Meier curves for CV endpoint as functions of baseline albumineria and percent change in month-6 albumineria





*1513 patients with diabetic nephropathy treated with losartan vs placebo

De Zeeuw D, et al. Circulation 2004;110:921–927. (Posthoc analysis of RENAAL trial)

Frequency of CKD monitoring

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

- **NICE NG203:**[1]
  - Agree frequency of CKD monitoring with the patient, following the recommendations on patient views and preferences in NICE's guideline on patient experience in adult NHS services[2] and NICE guidance on shared decision making[3]

Minimum number of eGFR/creatinine monitoring checks annually for adults, children and young people with or at risk of CKD*		**ACR categories**		
		A1: normal to mildly increased (<3 mg/mmol)	A2: moderately increased (3 to 30 mg/mmol)	A3: severely increased (> 30 mg/mmol)
GFR categories (ml/min/1.73m²)	G1: normal and high (≥ 90)	**0 – 1**	**1**	**1 or more**
	G2: mild reduction related to normal range for a young adult (60 – 89)	**0 – 1**	**1**	**1 or more**
	G3a: mild to moderate reduction (45 – 59)	**1**	**1**	**2**
	G3b: moderate to severe reduction (30 – 44)	**1 - 2**	**2**	**2 or more**
	G4: severe reduction (15 – 29)	**2**	**2**	**3**
	G5: kidney failure (under 15)	**4**	**4 or more**	**4 or more**

*Monitoring should be tailored according to the underlying cause of CKD, rate of decline in eGFR or increase in ACR (but be aware that CKD progression is often non-linear) other risk factors, including heart failure, diabetes and hypertension, changes to their treatment (such as renin-angiotensin-aldosterone system [RAAS] antagonists, NSAIDS and diuretics), intercurrent illness (e.g., AKI) and whether they have chosen conservative management of CKD. ACR monitoring should be individualised based on a person's individual characteristics, risk of progression and whether a change in ACR is likely to lead to a change in management.[1] ACR, albumin:creatinine ratio; AKI, acute kidney injury; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate.

1. NICE Guideline (NG203). https://www.nice.org.uk/guidance/ng203. Accessed October 2022; 2. NICE Guidelines (CG138). https://www.nice.org.uk/guidance/cg138/chapter/1-Guidance. Accessed October 2022; 3. NICE Guideline (NG197). https://www.nice.org.uk/guidance/ng197. Accessed October 2022.

Early identification of CKD: eGFR and uACR testing

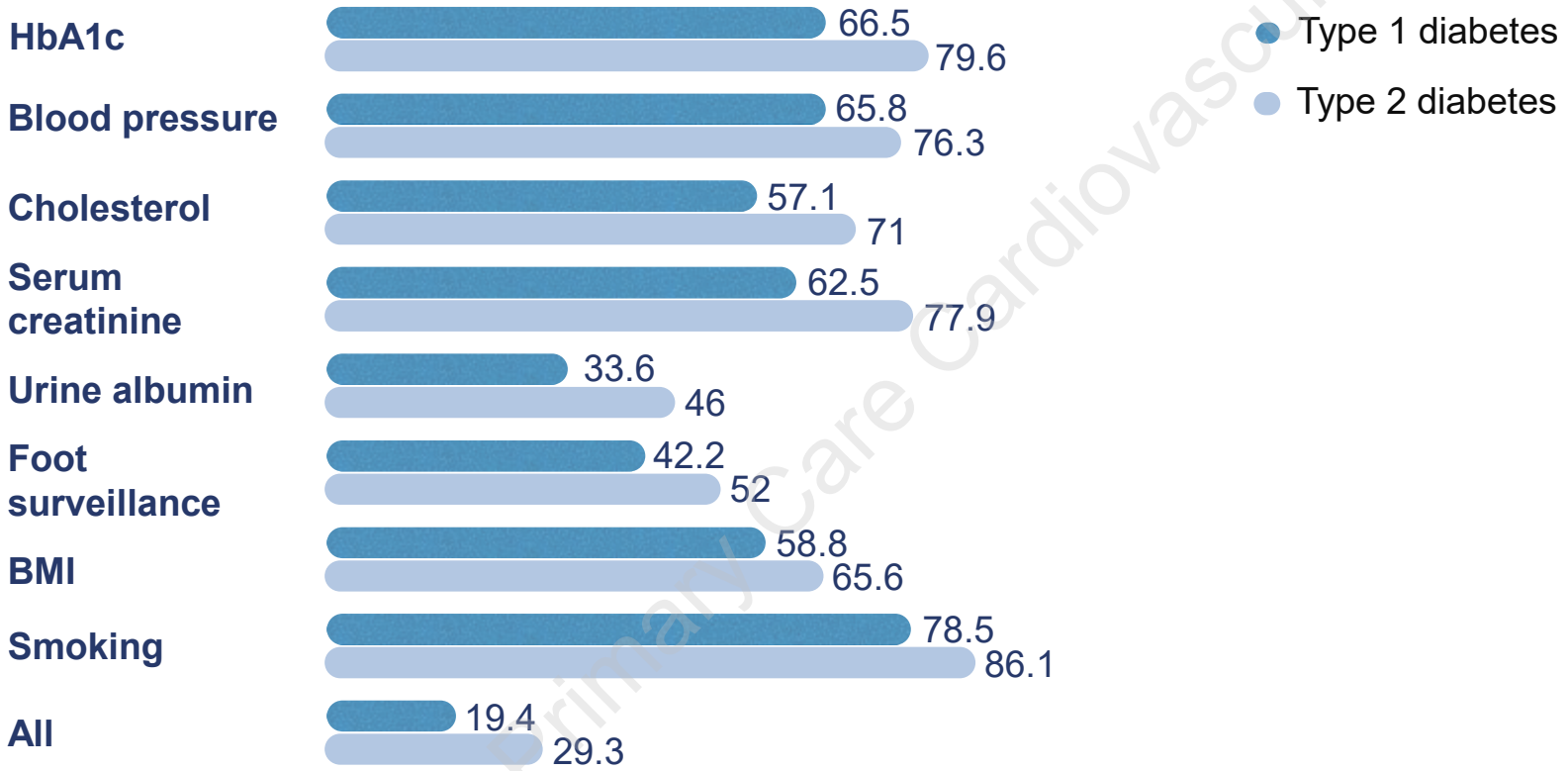
Barriers to early CKD identification

Clear guidance, but low compliance

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

National uptake of ACR testing compared with other care processes for people with diabetes



NHS Digital. National Diabetes Audit Programme. National Diabetes Audit Programme - NHS Digital. Accessed January 2023.

Why don’t patients complete their test?

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Clinician factors

- Do we take the test seriously enough?
- Do we check to see its been done at reviews?
- Contractual levers
- Workload

Patient factors

- How easy is it to get a test done?
- How much do they really know about it?

Early identification of CKD: eGFR and uACR testing

Target groups suitable for CKD screening

Who should be tested for CKD?

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

NICE Guidelines NG203:

1.1.21: Offer testing for CKD using eGFR and ACR to adults with any of the following risk factors:

- Diabetes
- Hypertension
- Previous episode of acute kidney injury
- Cardiovascular disease
- Structural renal tract disease, including stones, prostate disease
- Gout
- Multisystem diseases – e.g. SLE
- Family history of end-stage renal disease (GFR category grade 5) or hereditary kidney disease

ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; SLE, systemic lupus erythematosus.

NICE Guidelines NG203 2021 https://www.nice.org.uk/guidance/ng203. Accessed December 2022.

Early identification of CKD: eGFR and uACR testing

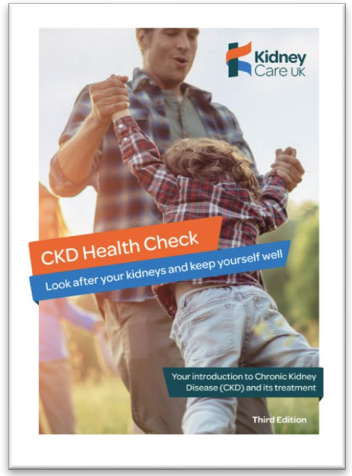
Resources for patients

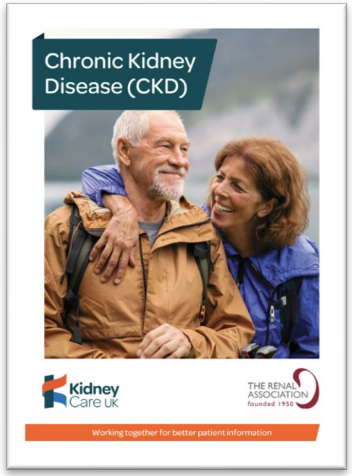
Patient resources

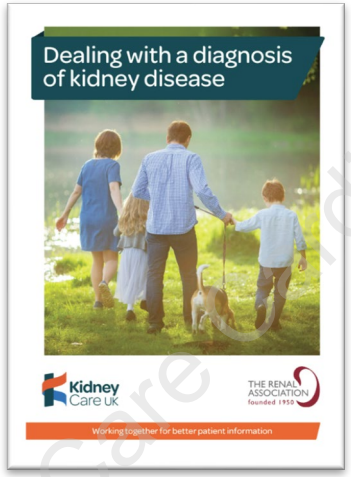
Primary Care Cardiovascular Society

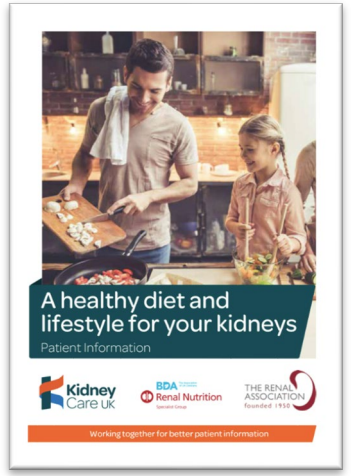
Driving primary care to deliver the best in cardiovascular health

Kidney Care UK has a multitude of useful information resources relating to kidney disease, free to download or order at [Kidney Care UK]









Kidney Care UK: Free information booklets. Available at: Order or download booklets | Kidney Care UK. Accessed January 2023.

Identification and management in primary care

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Identification

- CKD coding
- Case finding for unidentified CKD using eGFR and ACR
- Inequalities
- Frailty and EOL

Management

- Education – cardiovascular health / lifestyle / modifiable risk-factors

Medical optimisation

- Blood pressure optimisation
- Lipid lowering therapy
- Maximum renin angiotensinogen aldosterone inhibition
- Sodium glucose transporter-2 inhibitor (SGT2i) and or finerenone

ACR, albumin-to-creatinine ratio; CKD, chronic kidney disease; eGFR, estimated glomerular filtration rate; EOL, end of life.
Speaker's own experience.

Quality improvement ideas in CKD

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

Clinician factors

- Code patients with CKD
- Actively look for patients at risk of having CKD using eGFR and ACR
- Ensure patients with CKD are auscultated for valve disease
- Have a high index of suspicion for HF

Patient factors

- Ensure patients with CKD especially with albuminuria are optimised
- Optimise CVD risk at an early stage
- Optimise secondary prevention

ACR, albumin to creatinine ratio; CKD, chronic kidney disease; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate; HF, heart failure.

Summary

Primary Care Cardiovascular Society

Driving primary care to deliver the best in cardiovascular health

- CKD is a strong predictor of adverse cardiovascular outcomes
- CKD is a greater risk factor for CVD than diabetes
- Testing for eGFR alone is not enough
  - Albuminuria is a strong independent predictor of CVD and renal failure
- Failure to test for albuminuria underestimates prevalence, severity of CKD and risk
- Treatment of albuminuria significantly improves outcomes
- Coding patients with CKD can reduce admissions and death
- It is important to look for CKD in at risk patients[1]

CKD, chronic kidney disease; CVD, cardiovascular disease; eGFR, estimated glomerular filtration rate.

1. NICE Guidelines NG203 2021 https://www.nice.org.uk/guidance/ng203. Accessed December 2022.

For more information on using searches in primary care for identifying CKD please refer to video 2:

Coding and Searches