



# Chronic Kidney Disease

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# In Northland.....

- 58.3% of all dialysis patients have diabetic nephropathy as the cause
- Of all dialysis patients, 70% are Maori...and 89% of those with diabetic nephropathy are Maori
- It costs \$60,000 a year for hospital based haemodialysis for one patient
- Transport costs for renal patients is \$1.8 - \$2 million per year
- Currently, demand outstrips resource provision - means referrals to secondary care are currently for patients with eGFR < 30



# CKD is related to CVD

- CKD is one of the most potent known risk factors for Cardiovascular Disease – 10-20 fold greater risk of cardiac death
- **People with moderate/severe CKD (defined as eGFR < 45ml/min/1.73m<sup>2</sup> or persistent urine ACR > 25 mg/mmol (males) or 35 mg/mmol (females) = highest risk of a CV event**
- Does not require to be assessed using the cardiovascular risk tool as automatically high risk

**In slowing down the progression of CKD, we are also reducing cardiovascular risk**

# The Risk Factors for CKD:

- Diabetes
- Hypertension
- Obesity
- Smoking
- Elderly (>50?)



- Family History of kidney disease
- Low socioeconomic status
- Known vascular disease
- Genetics
  - ?(Maori & Pacific people)



# How Does CKD Present?

## Generally asymptomatic

Up to 90% of kidney function lost before symptoms present

1<sup>st</sup> signs may be general and can include:

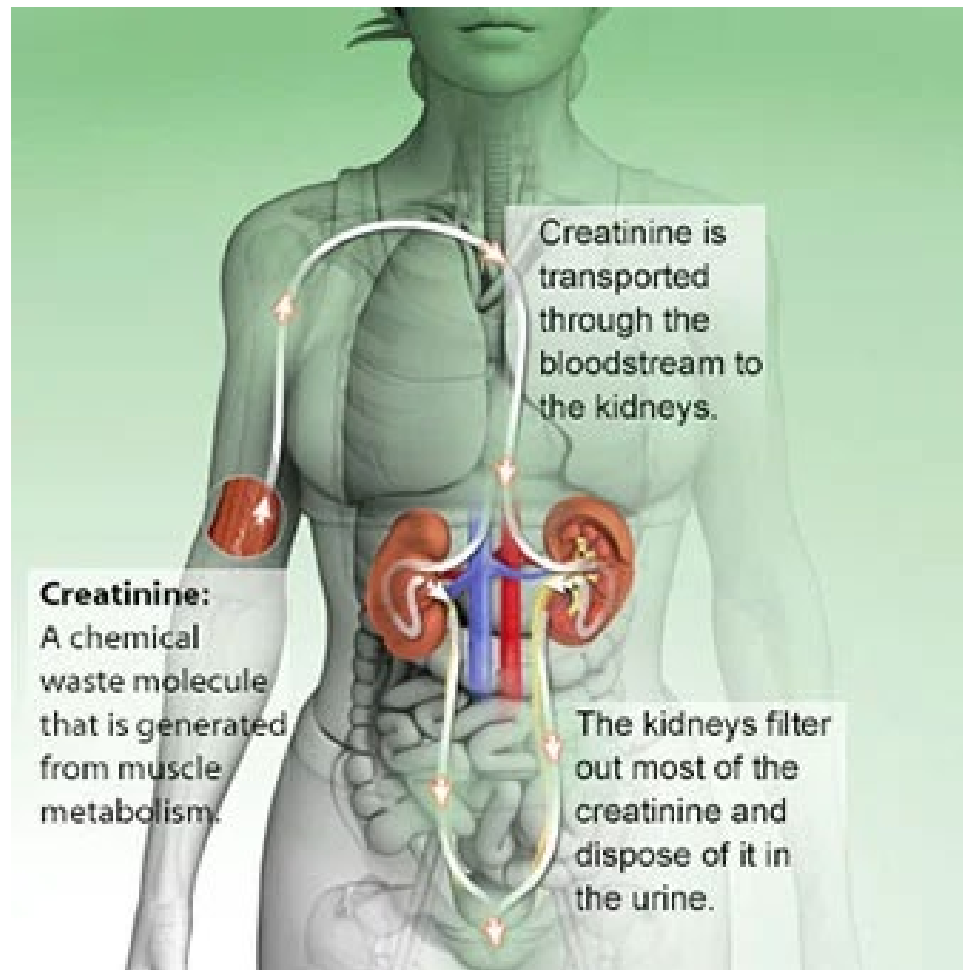
- Hypertension
- Pruritis
- Nocturia
- Restless Legs
- Dyspnoea +/- peripheral oedema
- Lethargy
- Nausea/vomiting
- General malaise

# Kidney Health Check

- Serum Creatinine - eGFR
  - Testing the blood – gives an indication of excretory function of the kidney
- Urinary Albumin Level – ACR
  - Testing the urine – gives an indication of endothelial damage and not just kidney damage
- BP check
  - Maintain consistently below BP goals

**Done at least annually on patients with T1 or T2DM or high risk of CKD e.g hypertension**

# Kidney function - serum creatinine









- Waste breakdown product of creatine phosphate in muscles
- Produced at fairly constant rate
- Completely filtered by healthy glomerulus
- Used to estimate creatinine clearance, or glomerular filtration rate

**“Everyone knows what a bad cholesterol is, but they don’t know that an abnormal creatinine means abnormal kidney function. Yet the likelihood of dying or having an adverse event is more strongly associated with an abnormal creatinine than it is with an abnormal cholesterol level”**

Dr Berns MD, Prof. of med and paediatrics at Uni of Pennsylvania School of Med



STAGES OF CHRONIC KIDNEY DISEASE		GFR*	% OF KIDNEY FUNCTION
<b>Stage 1</b>	Kidney damage with <b>normal</b> kidney function	90 or higher	 90-100%
<b>Stage 2</b>	Kidney damage with <b>mild loss</b> of kidney function	89 to 60	 89-60%
<b>Stage 3a</b>	<b>Mild to moderate</b> loss of kidney function	59 to 45	 59-45%
<b>Stage 3b</b>	<b>Moderate to severe</b> loss of kidney function	44 to 30	 44-30%
<b>Stage 4</b>	<b>Severe</b> loss of kidney function	29 to 15	 29-15%
<b>Stage 5</b>	Kidney <b>failure</b>	Less than 15	 Less than 15%

\* Your GFR number tells you how much kidney function you have. As kidney disease gets worse, the GFR number goes down.

# Expected CKD Prevalence in Northland

Stage	Description	GFR (ml/min/1.73m <sup>2</sup> )	Prevalence (%)	<u>Predicted</u> Prevalence Northland
1	Kidney damage with normal GFR	>90	4.2	7371
2	Mild Kidney damage	60-89	5.3	9302
3	Moderate	30-59	8.9	15,620
4	Severe	15-29	0.5	878
5	Kidney Failure	<15 (or dialysis)	0.1	176




# Albumin:Creatinine Ratio

- Gives an indication of endothelial, not just renal, damage
- Dipsticks not sensitive enough
- Greater sensitivity than PCR
- 1<sup>st</sup> void sample preferred – can use random
- Beware of false positives
- **Only look at ACR on results**
- ACR > 2.5mg/mmol men; > 3.5mg/mmol women diagnostic of microalbuminuria
- Confirm over 3 months – 2 out of 3 positives
- Annual screening if negative

# Albuminuria





**In Type 2 diabetes, the 4 year mortality risk for microalbuminuric (ACR 2.5 – 30) patients is 32% and for macroalbuminuric (ACR > 30) patients is 50%!!!**

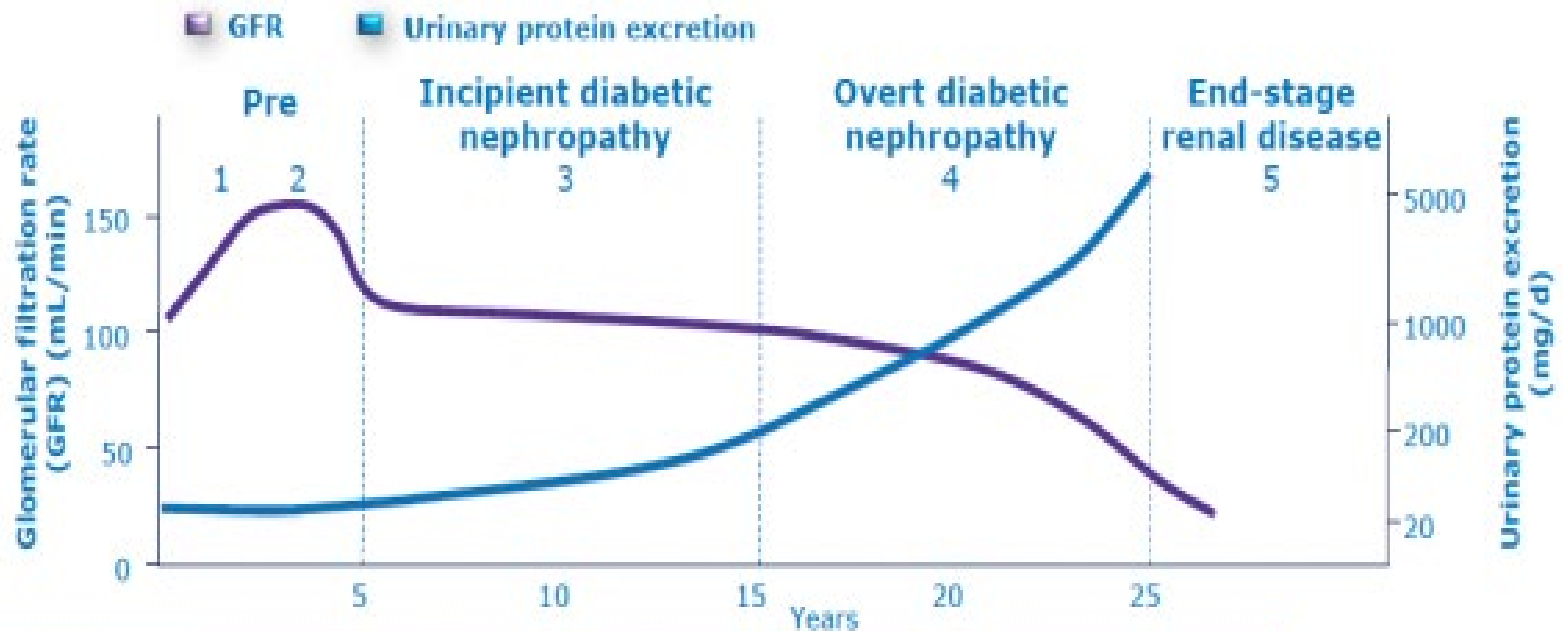
# Staging CKD

Kidney Function Stage	GFR (mL/min/1.73m <sup>2</sup> )	Albuminuria Stage		
		Normal (urine ACR mg/mmol) Male: < 2.5 Female: < 3.5	Microalbuminuria (urine ACR mg/mmol) Male: 2.5-25 Female: 3.5-35	Macroalbuminuria (urine ACR mg/mmol) Male: > 25 Female: > 35
1	≥90	Not CKD unless haematuria, structural or pathological abnormalities present	Yellow	Red
2	60-89		Yellow	Red
3a	45-59	Yellow	Orange	Red
3b	30-44	Orange	Orange	Red
4	15-29	Red	Red	Red
5	<15 or on dialysis	Red	Red	Red



# Diabetic Nephropathy

- Initially, hyperfiltration due to glomerular hypertrophy (due to high sugars) – eGFR  $>120\text{ml}/\text{min}/1.73\text{m}^2$ . No manifestations in patient
- Changes in the Glomerular Basement Membrane. Protein in urine becomes evident now
- eGFR starts to fall
- Thickening of the GBM, mesangial expansion and finally glomerular sclerosis (can be seen on renal biopsy)
- The structural damage leads to functional damage, i.e. reduced filtration resulting in hypertension (due to the Na retention) and proteinuria
- Reduced kidney function – ESRD
- Tend to have widespread microvascular disease e.g. retinopathy



Functional

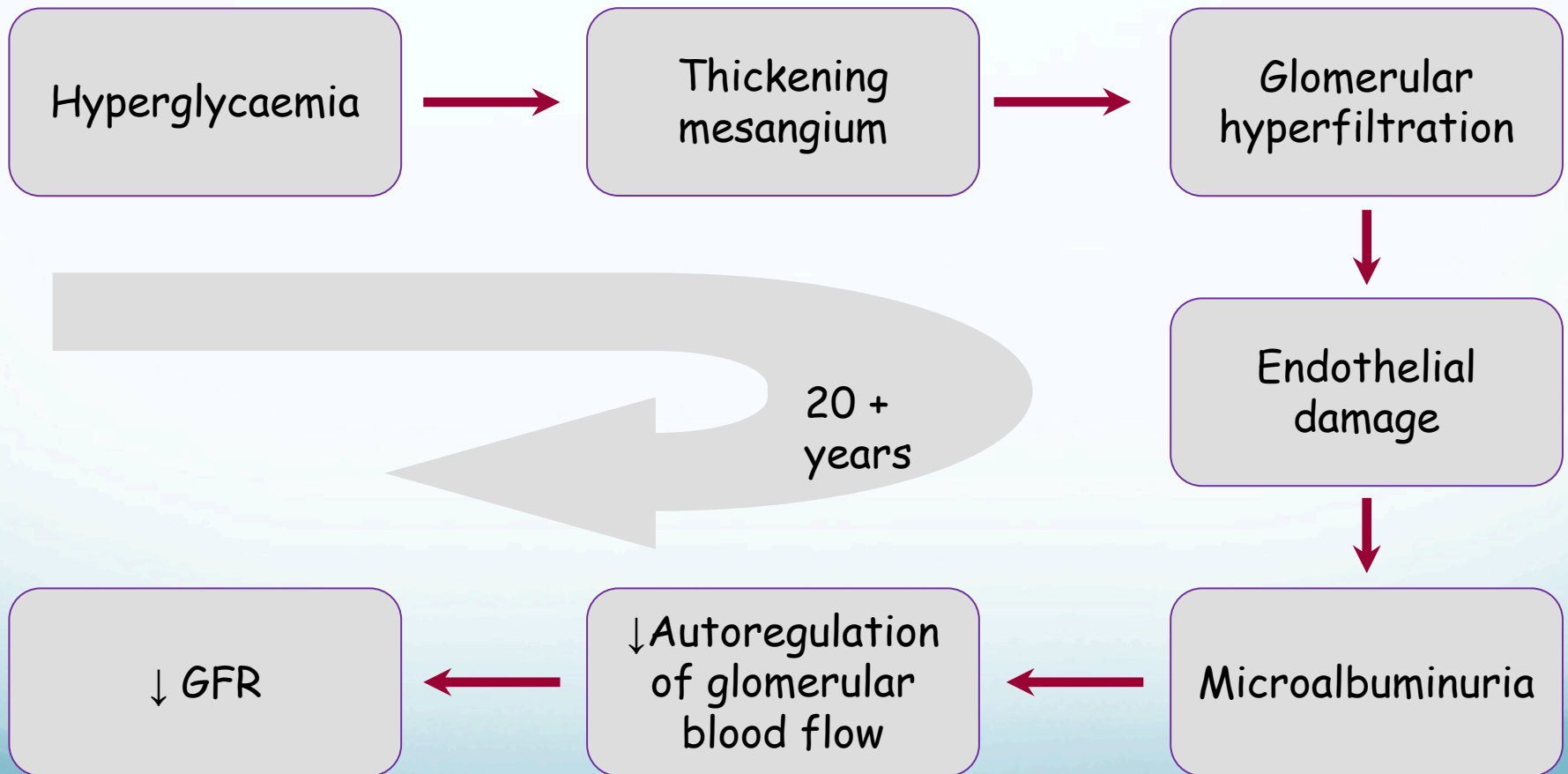
Hyperfiltration

Microalbuminuria, hypertension

Albuminuria, declining GFR



# Trajectory of Diabetic Nephropathy



# Acute Kidney Injury (AKI)

“Triple whammy” – worse if volume depleted or CKD

Drugs to be **avoided** on a sick day:-

**S** - sulphonylurea

**A** – ACEi

**D** – Diuretics

**M** – Metformin

**A** – ARBs

**N** – NSAIDs

**S** – SGLT2i

**Remember if diabetic:**

➤ **May need more insulin**  
*and*

➤ **NEVER withhold Lantus in  
someone with Type 1 DM**



# Diabetes Medications in CKD

- **Metformin** - excreted by kidneys - potential to cause lactic acidosis, particularly during acute illness.
  - Maximum 2g if eGFR 30 – 45
  - Maximum 500mg if eGFR 15-29
  - Stop if eGFR below 15.
  - Stop temporarily if acutely unwell/septic/shock
- **Sulphonylureas** – hypo risk as renal function falls
- **Pioglitazone** does not require dose reduction in mild/mod CKD
- **Vildagliptin** 50mg daily can be used if eGFR < 50
- **Insulin** – 30% is excreted by kidneys.
  - CKD 3-4 reduce insulin by 25%
  - CKD 5 reduce by 50%

# What's new in CKD?

- Empagliflozin – Feb 2021 – can be used down to an eGFR 30; has a renoprotective and cardiovascular protective element. **THE BIGGEST POTENTIAL POSITIVE IMPACT FOR PATIENTS WITH CKD**



# Important Points in Management of CKD

- **Managing CKD is reducing cardiovascular risk.**
  - Moderate or severe CKD (ACR>30mg/mmol or eGFR<45ml/min/1.73m<sup>2</sup>) are considered the highest risk of a CV event
- **Elevated urine ACR can be an earlier sign of CKD than a decreased eGFR (esp in patients with diabetes).**
  - The amount of albuminuria can be reduced by using ACEi or ARBs
- **Address lifestyle factors**
  - Salt intake, sugary drinks, weight, smoking
  - CKD 4-5 only drink to satisfy thirst – do not need to ‘flush out their kidneys’
- **Stop nephrotoxic medications**
  - NSAIDs use with caution (but should be on low dose aspirin)



# Continued....

- **Aim for BP  $\leq$  130/80 if diabetes and/or proteinuria (individualised)**
  - ACEi/ARBs 1<sup>st</sup> line – check K<sup>+</sup> and creatinine 7-10 days after commencing
- **Good diabetes control – HbA1c  $\leq$  55 (individualised)**
  - Likely to need reduction of diabetes meds
- **Cholesterol reduction**
  - Guidelines state statin should be used irrespective of cholesterol level (if CKD 3b or ACR  $>$  30) and no need to keep monitoring cholesterol levels



# Patient Example....

David age 42, diagnosed with Type 2 diabetes for past 6 years, attends the GP practice for an annual review of his diabetes. No significant PMH

- HbA1c 113 mmol/mol
- eGFR 87; ACR 650 mg/mmol; chol 6.7
- BP 180/112 mmHg

Prescribed Medications:

- Metformin 850mg BD
- Gliclazide 80mg BD
- Atorvastatin 40mg OD
- Cilazapril 2.5mg OD
- Ibuprofen 400mg TDS



- Find out what meds he is actually taking and does he know why he's on them
- Stop nephrotoxics i.e. regular ibuprofen
- Lifestyle factors – eating habits, exercise, work pattern, smoking, alcohol, etc
- Slowly titrate the Metformin – re-start with 500mg BD and increase at weekly intervals – take with food
- Re-start the gliclazide at 80mg BD – take 15 mins before food
- Titrate the ACE inhibitor to maximum tolerated dose – blood tests for creatinine and potassium 7-10 days later
- Likely to need another antihypertensive agent - thiazide diuretic e.g chlorthalidone 12.5mg OD or calcium channel blocker e.g diltiazem
- Start on lower dose of Atorvastatin 10mg and aspirin





# Which category on the CVD risk assessment form would you tick?

1. Overt diabetic nephropathy
2. Confirmed microalbuminuria
3. Non-diabetic nephropathy
4. No nephropathy

# Questions....?

- Email me on:

[Tracey.Saweirs@Northlanddhb.org.nz](mailto:Tracey.Saweirs@Northlanddhb.org.nz)

# References

- Chronic Kidney Disease (CKD) Management in General Practice. Kidney Health New Zealand, 2017
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