

Chronic kidney disease for VTS doctors

Dr Charlotte Bebb and team
Renal Unit, City Campus
Nottingham University Hospitals

Overview of the day

- Chronic kidney disease
 - Introduction and management
 - End of life care and conservative management
 - Anaemia and iron
 - Case discussions
- Management of established renal failure
 - Peritoneal dialysis
 - Haemodialysis
 - Transplantation
- Overview of acute kidney injury
- Summary and Q&A

Management of Chronic Kidney Disease - NICE guidelines



Dr Charlotte Bebb
Consultant Nephrologist

March 2010

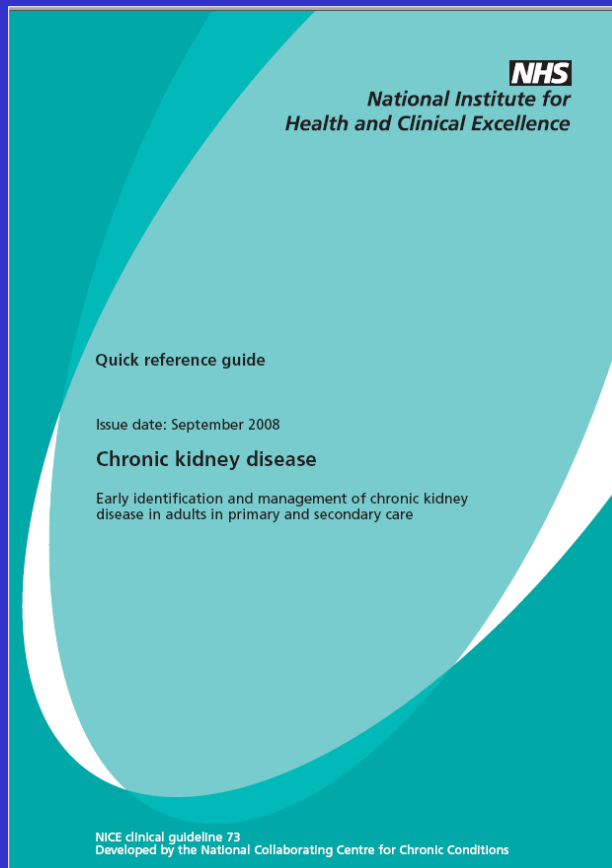
Outline

- Epidemiology of CKD
- Classification of CKD and eGFR
- Management of CKD
- When to refer to secondary care
- On line resources

Aims of the CKD guidelines

- Identify patients with CKD especially those at risk of progression
- Improve management of CKD
- Reduce cardiovascular risk
- Refer when appropriate

NICE guidelines 2009



- Testing at risk groups
- Identify progression
- Sub-classify stage 3
- Use ACR not PCR
- Emphasis on proteinuria
- Blood pressure targets

Epidemiology of CKD

The Problem

Chronic Kidney Disease is an epidemic worldwide

- Growth 6-8% per annum in dialysis patients

Progression of kidney disease can be delayed by drugs and behavioural interventions

Under-recognition at earlier stages of kidney dysfunction persists

- Late referral
- Lost opportunities for improved patient outcomes
- High cost - 2% NHS budget spent on ERF

Some Facts

One million dialysis patients worldwide and this will double in next decade

Renal disease the 9th most common cause of death in USA

Mortality of dialysis patients is similar to metastatic cancer

Mortality from CVD is falling

Mortality from renal failure is not falling

Up to a third of patients present with ERF

Some More Facts

A patient with CKD is more likely to die from CVD than reach dialysis

CKD is an independent risk factor for CVD

Adverse outcomes of CKD (ESRD, CVD, premature death) can be delayed / prevented

Treatment of CKD reduces progression

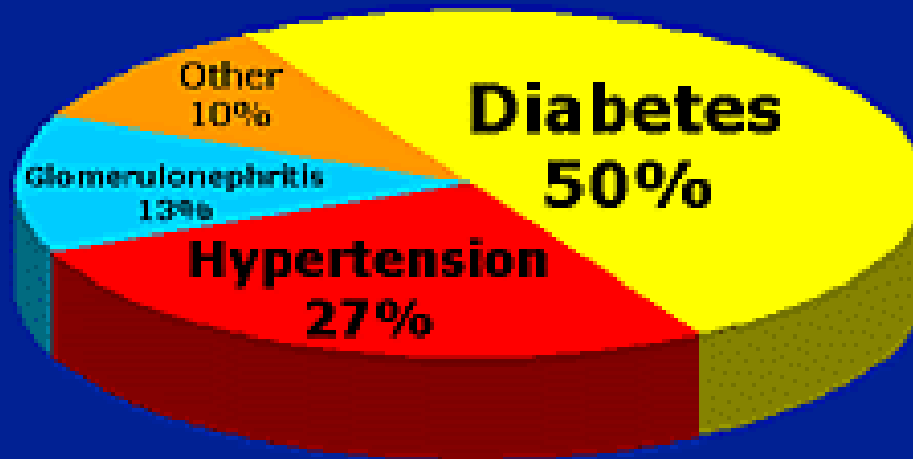
Treatment of cardiovascular risk factors (anaemia, dyslipidaemia, BP, Ca, PO₄ & PTH) reduces the leading cause of mortality

Who Gets Chronic Kidney Disease?

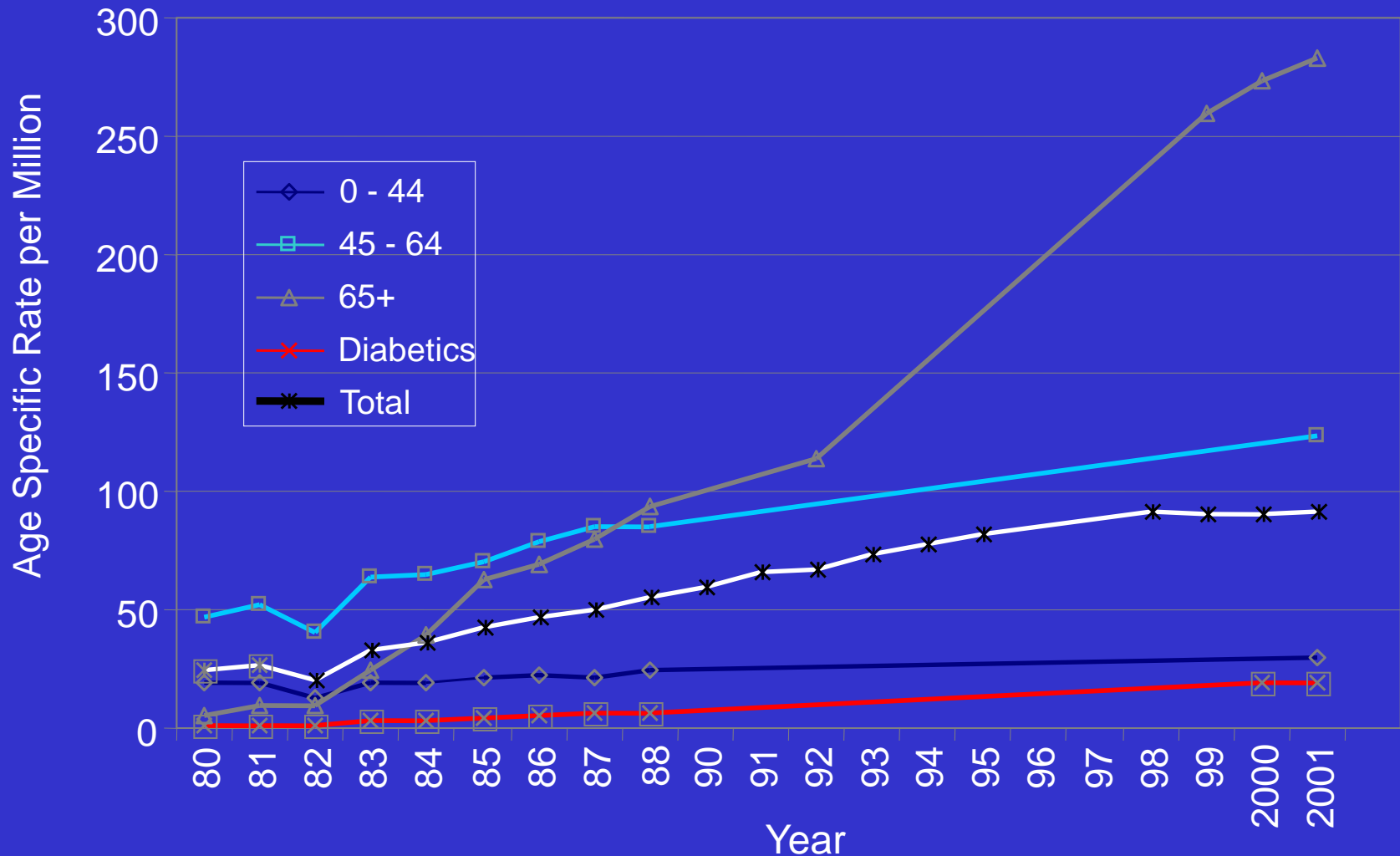
- Patients with diabetes
 - The elderly
 - Ethnic minorities
 - Those with other co-morbidities (CVD, hypertension etc)
 - Socially disadvantaged
-
- 95% of patients with CKD 3 are already on hypertension, diabetes or CHD registers
 - 1 in 10 people in UK have CKD

Causes of Established Renal Failure

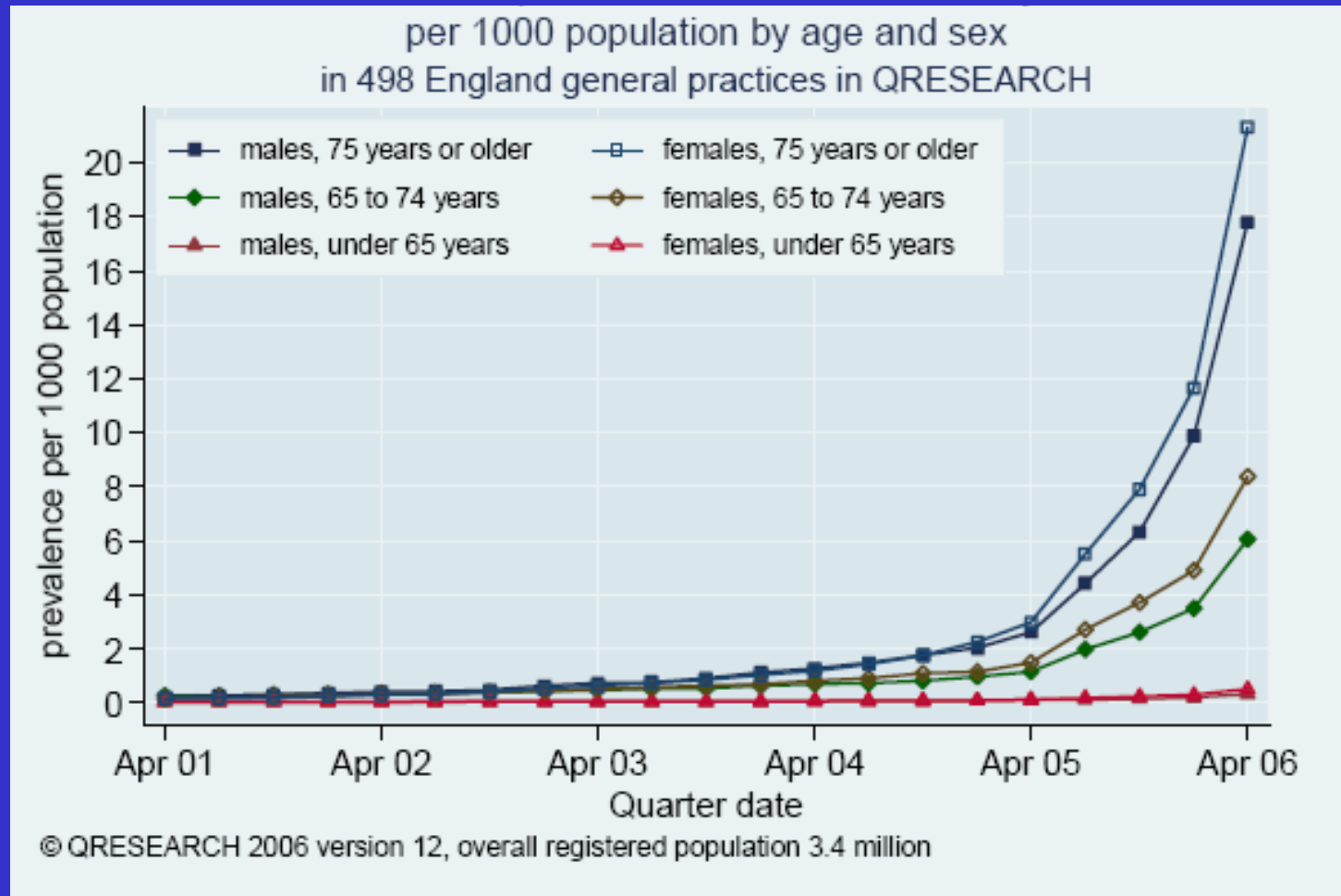
Primary Diagnoses for Patients Who Start Dialysis



Patients Accepted in the UK for Renal Replacement Therapy

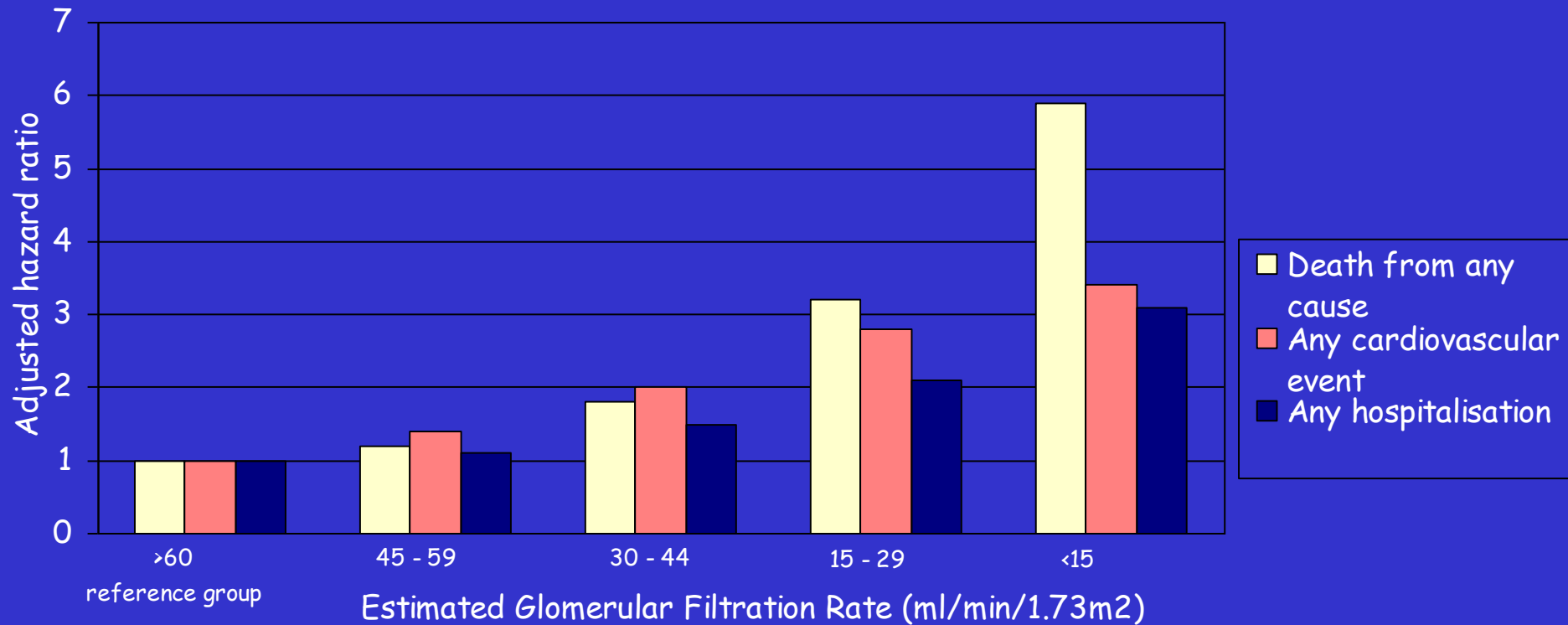


Growth in recognition of CKD



CKD as a marker of CVD

*Adjusted Hazard Ratio of death, CV event and hospitalisation among 1,120,295 Kaiser Permanente members according to estimated GFR



*Adjusted for age, sex, income, education, dialysis, prior CHD, CHF, stroke, TIA, PVD, DM, HT, dyslipidaemia, cancer, albumin <35, dementia, chronic liver disease, chronic lung disease, proteinuria, prior hospitalisations.

Outcome for patients with CKD

Patients with CKD are more likely to die than require dialysis

Stage	GFR (ml/min)	RRT	Death
2	60-89	1.1%	19.5%
3	30-59	1.3%	24.3%
4	15-29	19.9%	45.7%

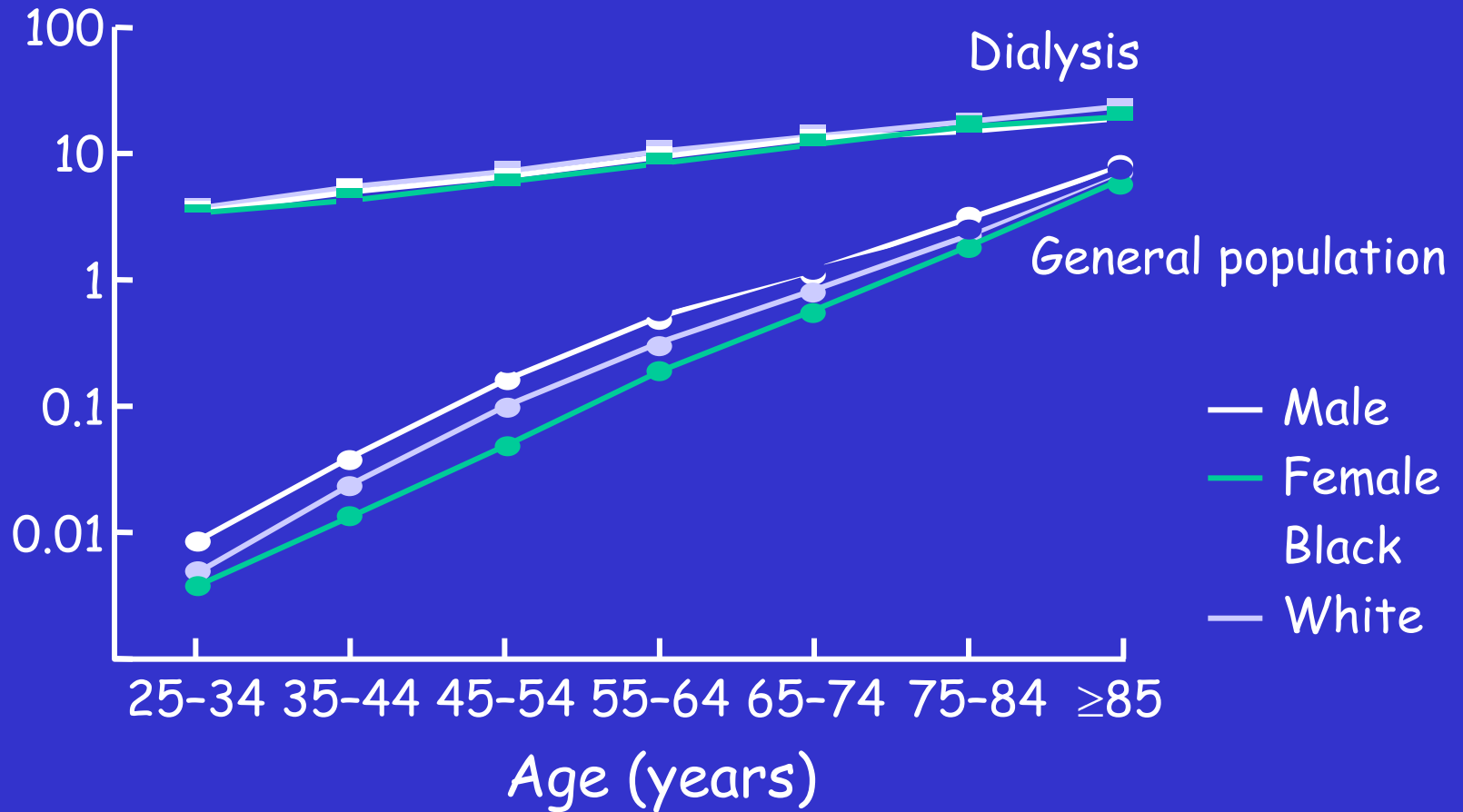
27,998 CKD patients followed for 5 years

Keith DS, AIM 2004;164:659-663

CKD is an independent and major risk factor for cardiovascular disease

Cardiovascular Mortality in ESRD

Annual mortality (%)



Classification and diagnosis of CKD

Serum creatinine 200umols/l

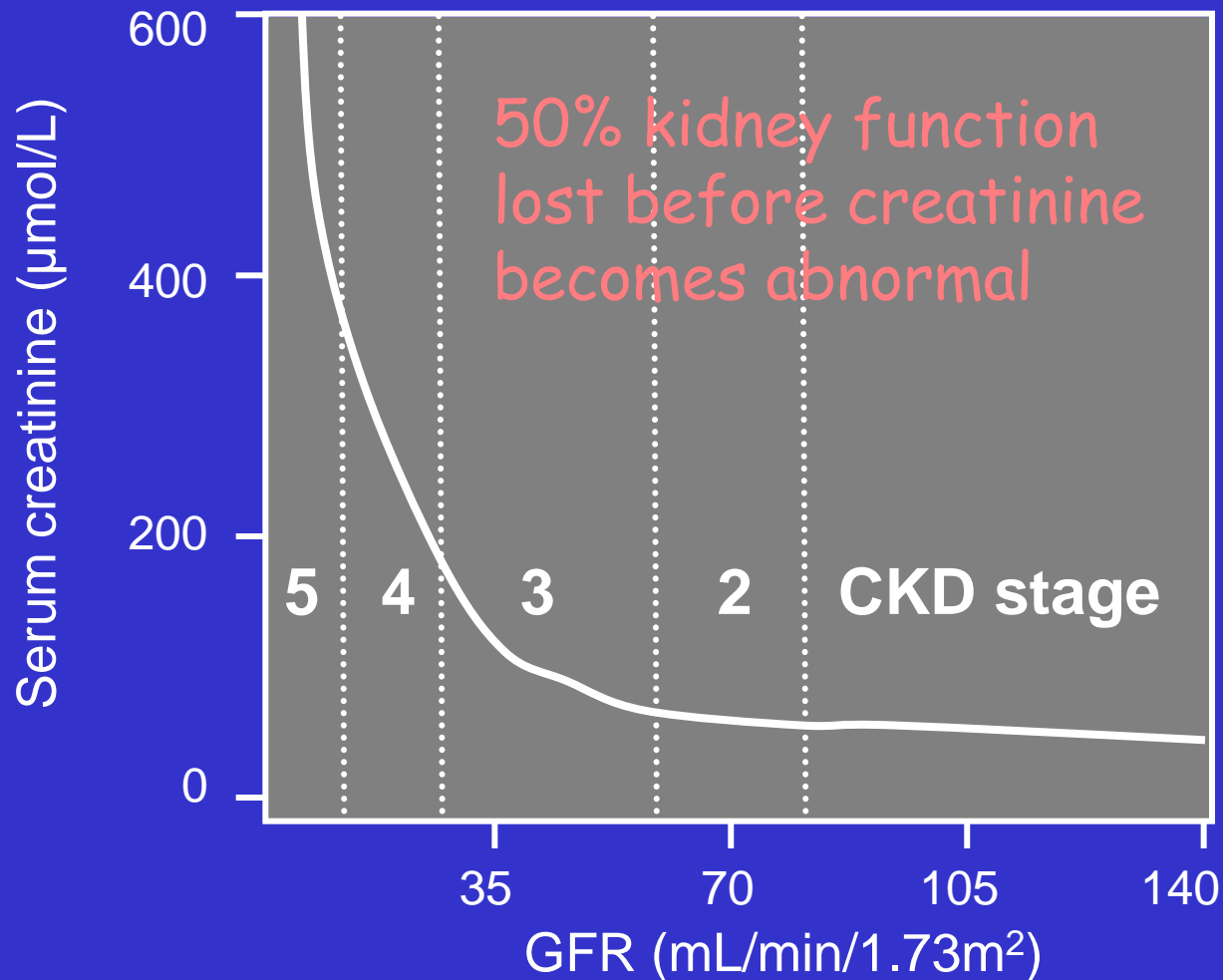


GFR 55mls/min



GFR 9 mls/min

Serum Creatinine Hides Early Renal Damage



Glomerular Filtration Rate

- Best index of kidney overall function
- Reduction implies a problem
- Equates to percentage kidney function
- Difficult to measure

Estimated GFR (Modified MDRD)

$$\text{GFR (mL/min/1.73m}^2\text{)} = 186 \times \left\{ \left[\frac{\text{serum creatinine } (\mu\text{mol/L})}{88.4} \right]^{-1.154} \right\} \times \text{age (years)}^{-0.203} \times 0.742 \text{ if female}$$

Limitations of eGFR measurements

eGFR is an ESTIMATE!!

Increasing uncertainty at values $>60\text{ml/min}$

Based on serum creatinine

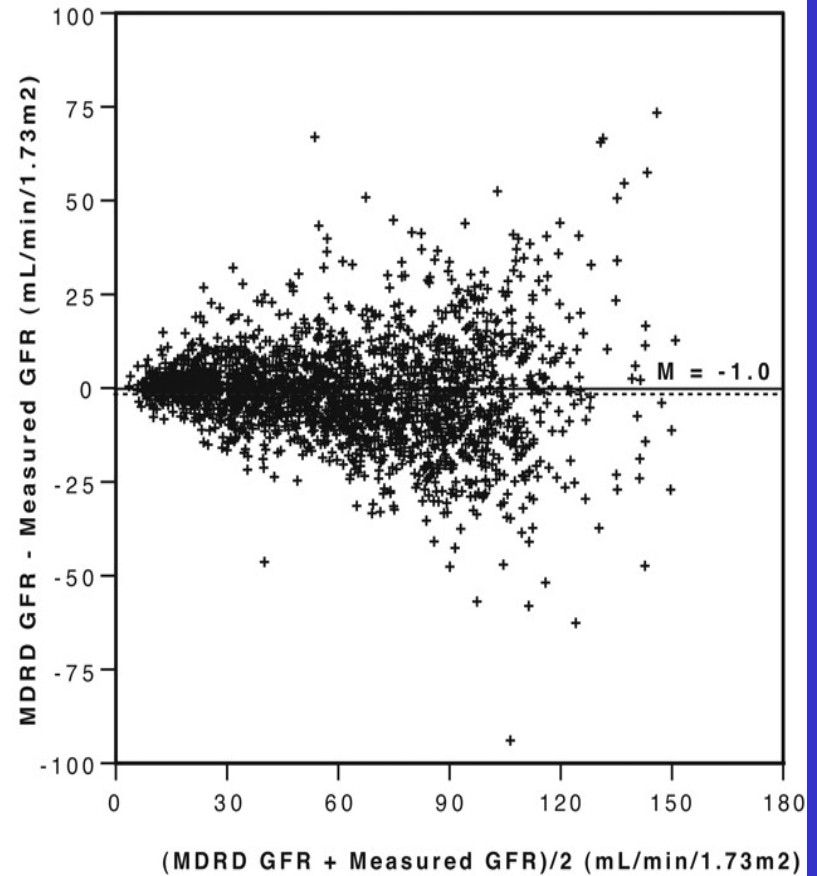
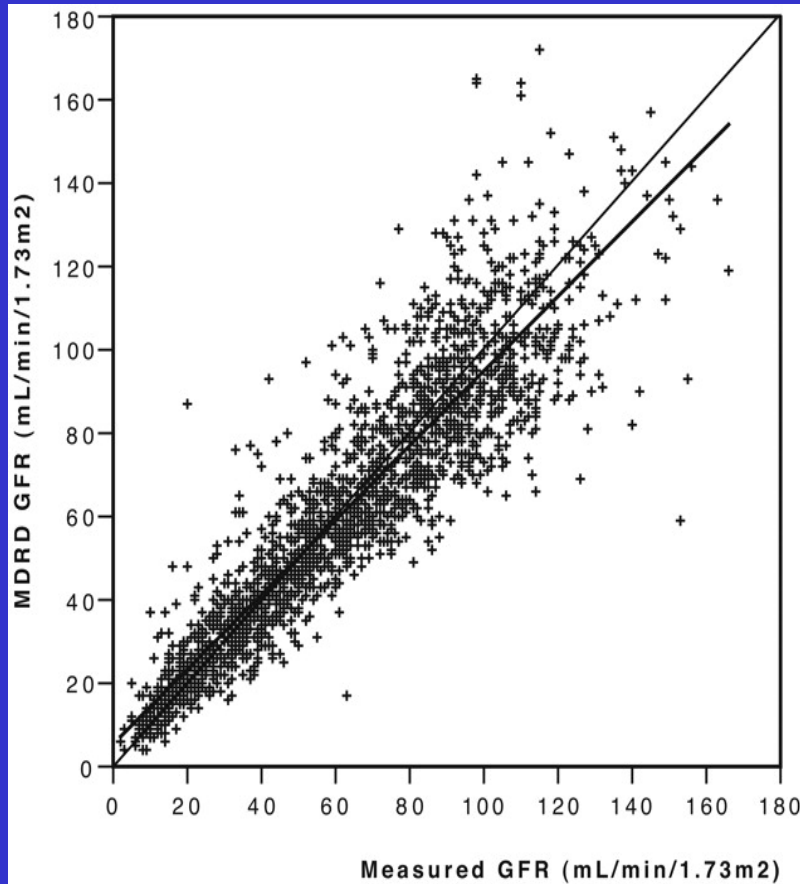
Measurements subject to variation

eg. recent vigorous exercise, large meat meal,
extremes of muscle mass, lab variation and delays

Not valid in ARF, children, pregnancy, dialysis

Always confirm with 2nd blood test

Scatter increases as GFR approaches physiological levels



- NKDEP/KHA - don't report if >60 mL/min/1.73 m²
- UK CKD - don't report if >90 mL/min/1.73 m²

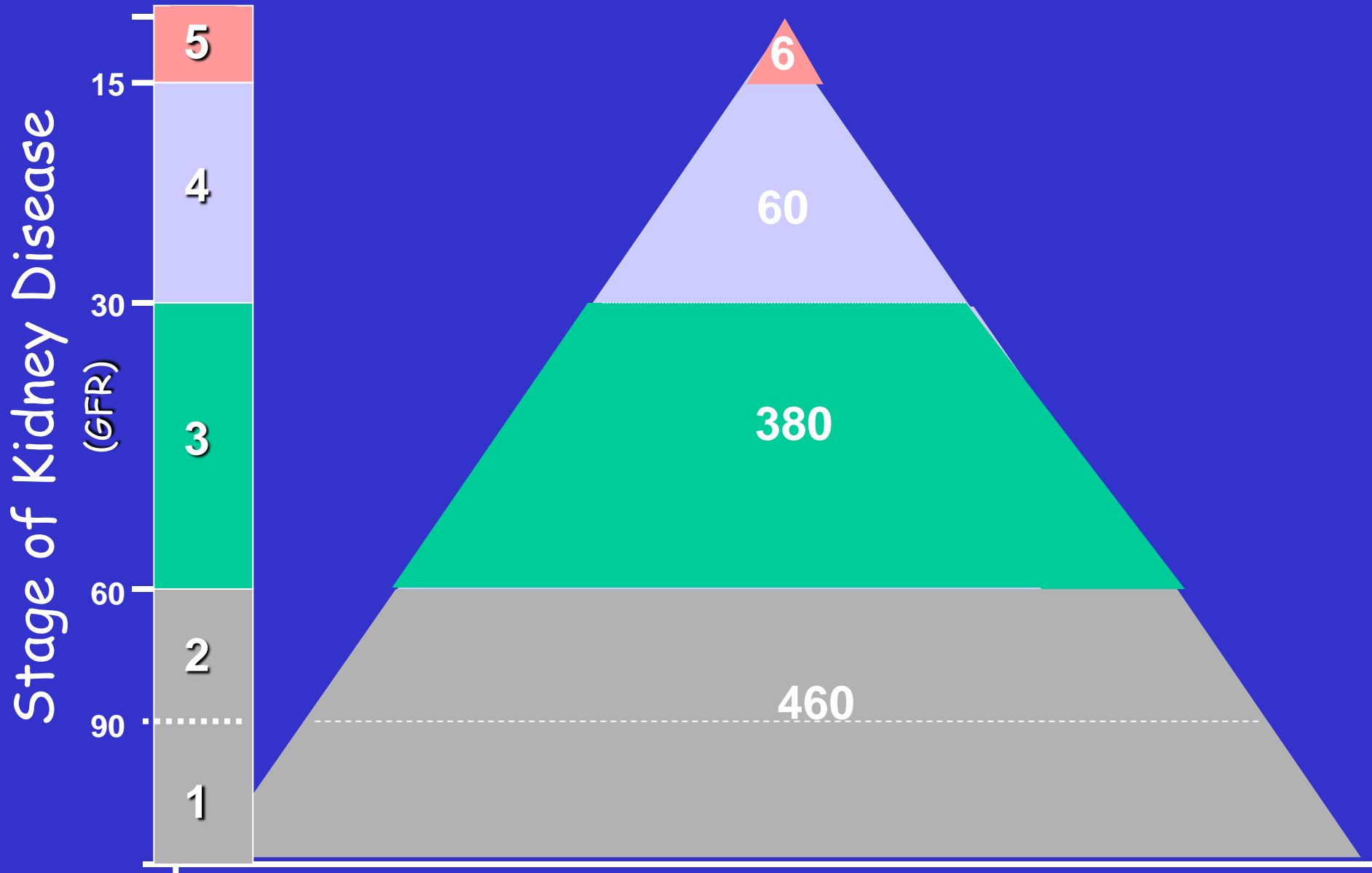
Froissart et al 2005

Classification of CKD by eGFR

<i>Stage</i>	<i>GFR (ml/min)</i>	<i>Prevalence</i>
1	> 90 *	3.3%
2	60 - 89 *	3.0%
3	30 - 59	4.3%
4	15 - 29	0.2%
5	< 15	0.1%

* Only if persistent urinary or structural abnormality

CKD: A Typical GP Practice of 10000



Proteinuria and urine A/PCR

- Urine dipstick semi-quantitative
 - Depends on concentration; sticks detect $>0.3\text{g/l}$ protein
- Spot urine albumin or protein: creatinine ratio
 - Good correlation with 24hr urine protein
 - ACR more sensitive than PCR at low levels
 - Use ACR in diabetes
 - If ACR 30-70mg/mmol confirm with early am sample

Urine Protein	Urine PCR (mg/mmol)	Urine ACR (mg/mmol)	
		$> 2.5 / 3.5$	Microalbuminuria
0.5g/day	> 45	> 30	Proteinuria
$> 1\text{g}$	> 100	> 70	Heavy proteinuria
$> 3\text{g}$	> 300		Nephrotic

Improving classification of early CKD

- 4% of population have stage 3 CKD
- 25% of people age >75 years
- Increased risk of progression if proteinuria (ACR >30mg/mmol)
- Sub-classify stage 3 CKD:
 - eGFR 30-45ml/min or 45-60ml/min
 - +/- proteinuria (ACR >30)

Updated classification of CKD

<i>Stage</i>	<i>GFR (ml/min)</i>	<i>Description</i>
1	> 90	Normal or increased glomerular filtration rate (GFR), with other evidence of kidney damage
2	60 - 89	Slight decrease in GFR, with other evidence of kidney damage
3A	45 - 59	Moderate decrease in GFR with or without other evidence of kidney damage
3B	30 - 44	
4	15 - 29	Severe decrease in GFR
5	< 15	Established renal failure

Use suffix p to denote presence of proteinuria (ACR>30)

Classification (cont'd)

Stage 3 CKD should be split into two subcategories:

- 3A: GFR 45-59 ml/min/1.73 m²
- 3B: GFR 30-44 ml/min/1.73 m²

At all stages add suffix p if ACR >30mg/mmol

Existing classification of five stages for CKD may not be sufficiently sophisticated for clinical needs

Diagnosis of CKD

- New finding of eGFR <60
 - Repeat within 1-2 weeks
 - Exclude acute kidney injury
 - Review drugs, UTI, obstruction etc
 - Urine dipstick
- Only label as CKD if at least 2 abnormal readings over 3 months
- Send urine for ACR

Diagnosis of progressive CKD

- Requires minimum of 3 eGFR readings over not less than 90 days
- Exclude causes of acute deterioration eg drugs (trimethoprim), infection
- CKD progression is decline of:
 - $>5\text{ml/min/1.73m}^2$ in 1 year
 - $>10\text{ml/min/1.73m}^2$ in 5 years
- Focus on those likely to reach RRT

Testing for CKD

Offer testing for CKD if:

- Diabetes
- Hypertension
- Cardiovascular disease
- Structural renal disease, stones or BPH
- Family history
 - Stage 5 CKD or hereditary renal disease
- Haematuria or proteinuria
- Multisystem disease with potential renal involvement
- Monitor GFR in people prescribed nephrotoxic drugs

Management of Patients with CKD

Aims of management

- Identify patients with CKD
- Reduce cardiovascular risk
- Delay progression

- Treat complications
- Dialysis preparation

Interventions to prevent or delay progression

- Potentially modifiable risks:-
 - Lifestyle
 - Smoking
 - Obesity
 - Lack of exercise
 - Treat diabetes - tight control
 - Treat high blood pressure
 - ACE inhibitors
 - Lipid lowering

Monitoring of CKD

Stage 1/2	Stage 3A/B	Stage 4
(>60ml/min)	(30-59ml/min)	(15-29ml/min)
Annual review	6 monthly review	3 monthly review

eGFR, ACR (annual) and blood pressure

Cardiovascular risk factor management

ACE-I if proteinuria or diabetes (any BP)

Check Hb in CKD 3B, bone disease in CKD 4

Test eGRF annually in all at risk groups

Repeat eGFR during intercurrent illness and perioperatively if known CKD

Hypertension is common

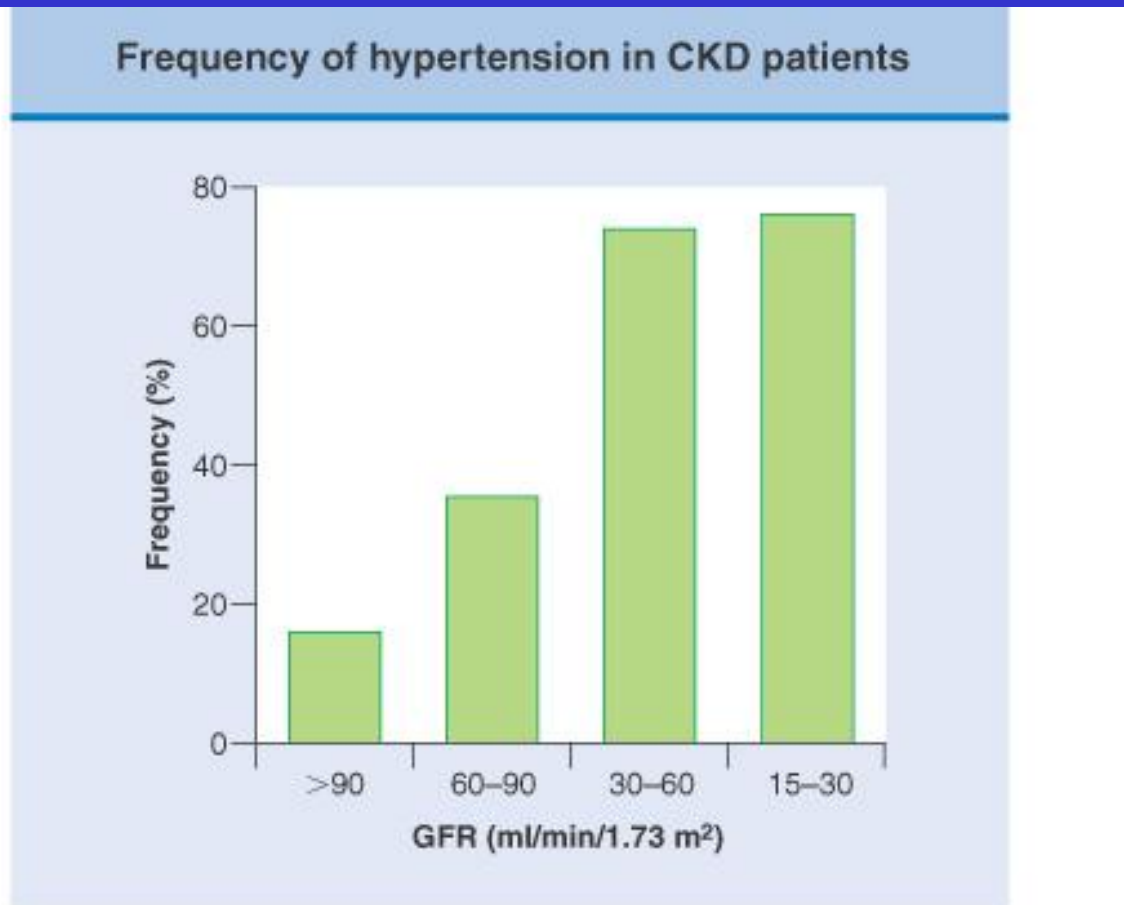
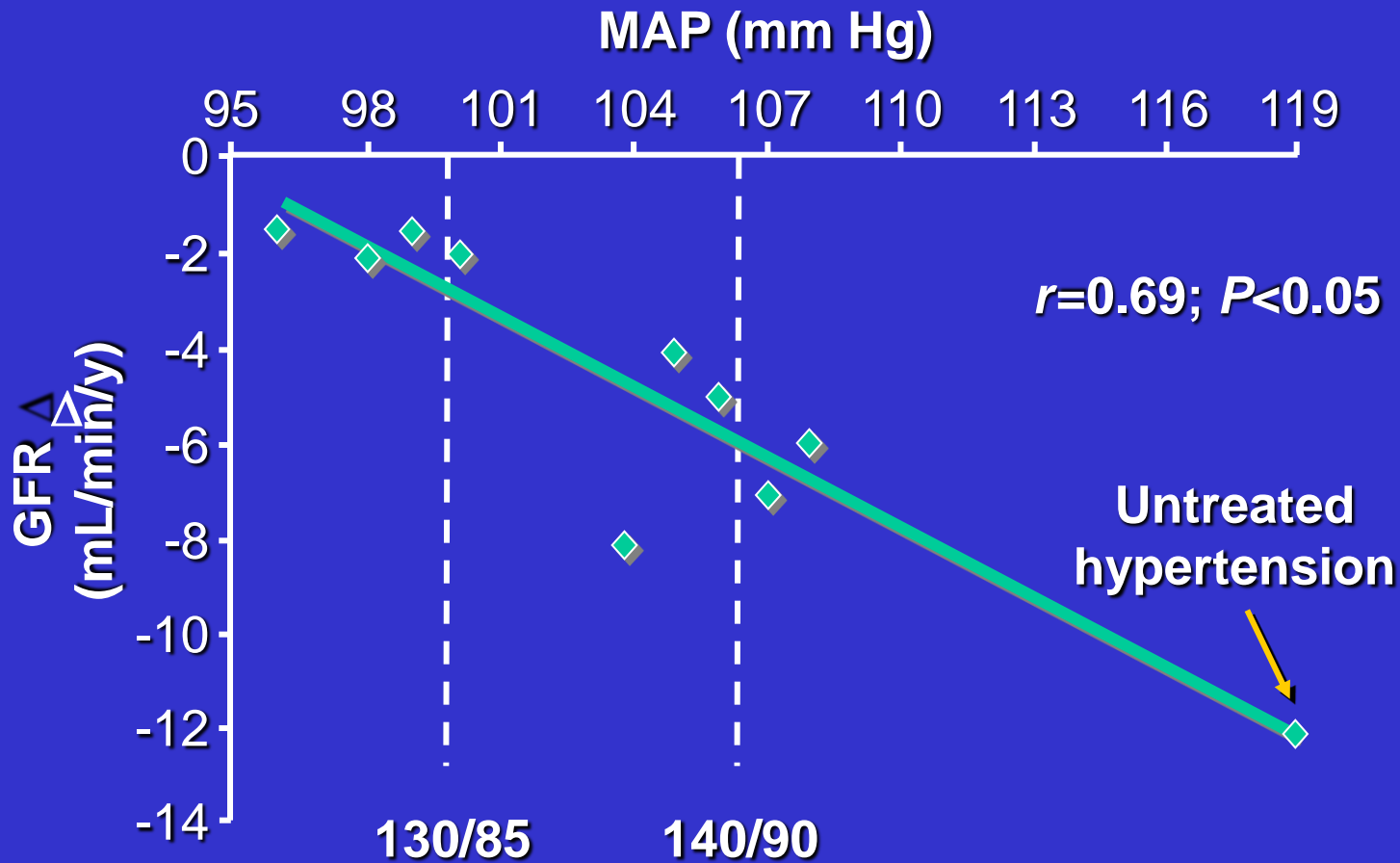
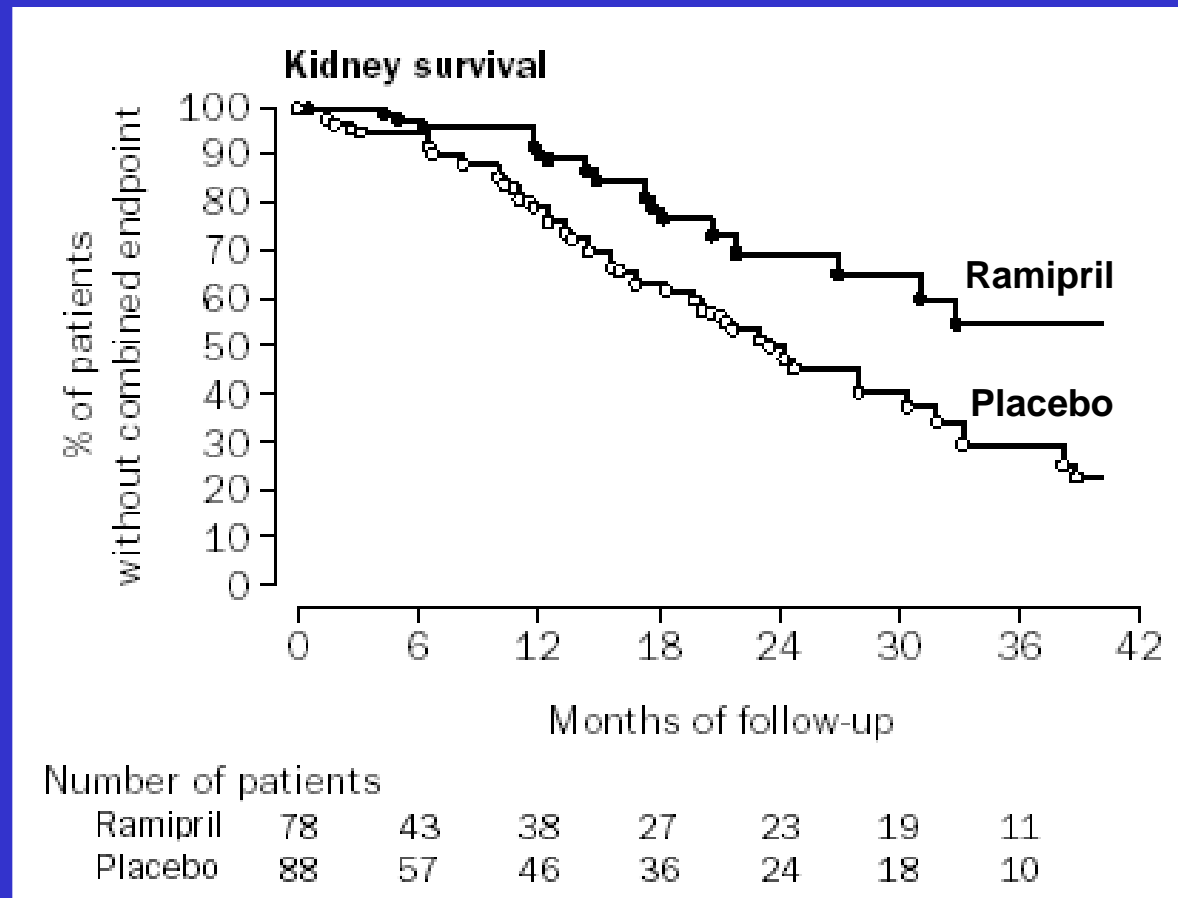


Figure 71.3 Frequency of hypertension in chronic kidney disease patients according to glomerular filtration rate (GFR). (Data from NHANES III.)

The importance of BP control



The importance of ACE inhibition



Management - hypertension

- Treatment target
 - $<140/90$ mmHg (SBP range 120-139)
- If CKD and diabetes or $ACR >70$ mg/mmol
 - $<130/80$ mmHg (SBP range 120-129)
- ACE inhibitors first line
 - Diabetes (microalbuminuria) or proteinuria
- Calcium channel antagonist or diuretic 2nd line
 - Thiazide if $eGFR >30$, loop if $eGFR <30$ (?high dose)

Prescribing ACE I and ARB safely

- Check baseline creatinine/eGFR and K⁺
- Avoid NSAIDs and other K⁺ drugs if possible
- Repeat creat/eGFR and K⁺ 2 weeks after initiation and after each increase in dose
- If creatinine/eGFR/K⁺ change excessive repeat and refer if appropriate (?RAS)
- Review other causes/drugs; consider stopping ACE
- Allow 30% ↑ creatinine / 25% ↓ in eGFR

Pharmacotherapy

ACE inhibitors/ARBs* should be offered to the following:

	Diabetic man	Diabetic woman	Non-diabetic	Non-diabetic
ACR (mg/mmol)	>2.5	>3.5	>30	>70
PCR (mg/mmol)			>50	>100
24hr urine protein			>0.5g	>1g
Need to confirm CKD	No	No	Yes	Yes
Need to confirm high BP	No	No	Yes	No

*ACE inhibitor first line treatment; move to ARB if ACE not tolerated

Cardiovascular risk reduction

- Treatment of hyperlipidaemia according to Joint British Society guidelines
- Aspirin if 10 year risk of CV disease > 20 %
- Smoking and weight advice
- Low salt diet (avoid "Lo-salt")
- Exercise

Adverse effect of smoking on renal function

- Increases the risk of microalbuminuria
- Shorter interval between onset of diabetes and albuminuria
- Accelerates rates of progression of microalbuminuria to proteinuria
- Accelerates rates of progression to end stage renal failure

Medicines management

- Review medications (eg NSAIDS)
- Trimethoprim may increase creatinine
- Metformin - stop if eGFR <30-40

- Consult BNF or SPC for new medications
- Use eGFR for dose adjustment except at extremes of weight

- Vaccinate - Hep B, pneumonia, influenza

Management - Bone disease

- Check calcium, phosphate and PTH if eGFR <30
- If PTH high check Vitamin D and treat deficiency (25OH Vit D <80nmol/l)
- Stage 3-4 CKD use parent vitamin D
- Stage 4-5 CKD use 1-alfacalcidol
- Dietary phosphate restriction

Management - Anaemia

- More common if GFR <45 or diabetes
- Rule out other causes eg iron deficiency
- Consider Rx if Hb <11g/dl
- Consider iron deficiency - Ferritin <100µg/l
- Trial of oral iron
- If no response refer for IV iron

When to do a renal ultrasound

- Progressive CKD
- Visible or persistent invisible haematuria
- Symptoms of urinary tract obstruction
- Family history of polycystic kidney disease and aged over 20
- Stage 4 or 5 CKD
- Considered by a nephrologist to require a renal biopsy

Recognising Acute Renal Failure

- Newly detected GFR $<60\text{ml/min}$
- Assume ARF until proven otherwise
- Review previous U&E results
- Exclude medication, enlarged bladder
- Urinalysis; clinical assessment
- Repeat within 5 days

Monitoring

	Newly diagnosed	Stable	What to measure
Stage 3	6/12	annual	Creat, Hb(B), BP, urine ACR (Ca, PO ₄)
Stage 4	3/12	6/12	Creat, Hb, Ca, PO ₄ , PTH, BP, urine ACR
Stage 5	6 weekly	3/12	Usually attending renal clinic

Test eGFR annually in all at risk groups

Repeat eGFR during intercurrent illness and perioperatively

Report
eGFR

Management of CKD

Early Detection of CKD

Delay progression & reduce CVS Risk ↓	Prevent uraemic complications ↓	Modify co morbidities ↓	Prepare for RRT ↓
ACE inhibitors	Malnutrition	Cardiac disease	Education
BP control	Anaemia	Vascular disease	Informed choice of RRT/conservative management
Glucose control	Calcium Phosphate PTH	Drug interactions	Timely access placement/ Transplant Listing
Smoking cessation	Acidosis	Neuropathy/ Retinopathy	Timely initiation of RRT

QoF indicators 2009-10

2009 CKD indicators	Points	Payment stages
CKD1: The practice can produce a register of patients aged 18 and over with CKD stages 3-5	6	
CKD 2: % on register with BP recording on past 15 months	6	40-90%
CKD 3: % on register with last BP recording 140/90 or less	11	40-79%
CKD 5: % on register with hypertension and proteinuria who are treated with ACEI or ARB unless CI or SE recorded	4+5	40-80%
CKD6: % on register with ACR (or PCR) value in past 15 months	6	40-80%

Referral Criteria

Immediate or Urgent Referral

- Suspected ARF or acute on CKD
- Accelerated hypertension
- Hyperkalaemia $>7\text{mmol/l}$
- Nephrotic syndrome
- Multisystem disease + ?renal involvement

Referral criteria

Stage 5	Urgent referral unless ...
Stage 4	Refer unless ...
Stage 3	progressive fall in GFR (>5mls/min/yr) microscopic haematuria urinary ACR >70 mg/mmol (unless due to DM) suspected multisystem disease BP > 150/90 on 4 agents
Irrespective of GFR	malignant BP, K ⁺ > 7.0 ACR >30 mg/mmol and haematuria macrohaematuria - urology negative suspected renal artery stenosis rare or genetic cause of CKD

Information Required for Referral

- All previous creatinine results
- Medical history - esp DM, vascular
(Exclude palpable bladder)
- Drug history
- Blood pressure
- Urine dipstick for blood and protein
- Urine albumin / protein creatinine ratio
(if > trace protein)

Further information

CKD Guideline - Renal Association: www.renal.org

Visit www.nice.org.uk/cg073 for CKD guideline

On line CKD education: www.ckdonline.org

Referral/Booking Guidelines [via Choose and Book](#)

www.kidneycare.nhs.uk Department of Health Kidney Care programme

www.dh.gov.uk/renal Department of Health renal policy programme

charlotte.bebb@nuh.nhs.uk

Questions?