Chronic Kidney Disease (CKD) Algorithm

People with the following risk factors should have their kidney function checked

- Diabetes (See local Diabetes pathway/algorithm)
- Hypertension
- Cardiovascular disease (ischaemic heart disease, chronic heart failure, peripheral vascular and cerebrovascular disease)
- Structural renal tract disease, renal calculi or prostatic hypertrophy
- Multisystem diseases with potential kidney involvement – for example, systemic lupus erythematosus
- Family history of stage 5 CKD or hereditary kidney disease
- Opportunistic detection of haematuria or proteinuria
- If none of the above, do not use age, gender or ethnicity as risk markers
- Monitor eGFR in people prescribed drugs known to be nephrotoxic such as calcineurin inhibitors (Cyclosporin, Tacrolimus) and Lithium
- Check eGFR at least annually in people receiving long-term systemic NSAIDs

Do not rely on reagent strips to identify proteinuria. **To confirm proteinuria send urine for ACR (albumin:creatinine ratio)**

How to check kidney function
Measure eGFR

If eGFR in the first test <60ml/min/1.73m² repeat within 14 days
- To identify progression take at least 3 eGFRs over at least 90 days
- If blood sample taken fasting advise patient to drink water normally
- Advise patient not to eat meat for 12 hours prior to eGFR blood test

Send urine for albumin creatinine ratio (ACR). If first result is abnormal repeat on an early morning urine sample (in patients with diabetes 2 out of 3 abnormal results confirms microalbuminuria)

eGFR > 60 and ACR < 30	eGFR > 30 and ACR 30 - 69 No haematuria	eGFR > 30 and ACR 30 - 69 With haematuria	eGFR < 30	ACR > 70 Irrespective of eGFR
If no other risk factors for CKD, consider normal. No further action required If risk factors for CKD repeat eGFR in 12 months	See Management of CKD in Primary Care box	See Haematuria box Consider referral for renal specialist opinion	Consider referral for renal specialist opinion	Consider referral for renal specialist opinion unless diabetic on appropriate treatment

Reduce cardiovascular disease risk

- Offer statins for the primary prevention of cardiovascular disease in the same way as in people without CKD
- Use statins for the secondary prevention of cardiovascular disease irrespective of baseline lipids. Use statins in people with diabetes (following NICE/local guidelines)
- Use antiplatelet drugs for the secondary prevention of cardiovascular disease

Progressive CKD

- Define progressive as a decline in eGFR of >5ml/min per year, or >10ml/min in 5 years
  - For a new finding of reduced eGFR, repeat test within 2 weeks to exclude acute renal failure
  - To identify progression take at least 3 eGFRs over at least 90 days
  - Consider whether progression at the observed rate would lead to renal replacement therapy within the person's lifetime
- Chronic use of NSAIDs may be associated with progression; exercise caution and monitor GFR annually in those taking them long-term

In people aged > 70 years, an eGFR in the range 45–59 ml/min, if stable over time and without any other evidence of kidney damage, is unlikely to be associated with CKD-related complications.

Anaemia

- Check haemoglobin in people with eGFR < 45 ml/min
- Exclude and treat other causes of anaemia before attributing to CKD
- If the patient is likely to benefit in quality of life, consider referral when Hb < 10.5g/dl

Renal Ultrasound

Offer a renal ultrasound to all people with CKD who:
- have progressive CKD
- have visible or persistent invisible haematuria
- have lower urinary tract symptoms
- have a family history of polycystic kidney disease and are aged over 20yrs
- have stage 4 or 5 CKD

- Advise people with a family history of inherited kidney disease about the implications of an abnormal result before arranging the scan

Manage bone conditions

- *Measure serum calcium and phosphate if eGFR < 30ml/min*
- Offer bisphosphonates for the prevention and treatment of osteoporosis in people with eGFR > 30 ml/min on the same indications as for all other patients
- When vitamin D supplementation is indicated offer:
  - colecalciferol to people with eGFR > 30 ml/min
  - obtain specialist advice before using alfacalcidol or calcitriol in patients with GFR < 30 m/min

Management of CKD in Primary Care

- Optimum blood pressure control
- Use of ACEI/ARBs where indicated
- Reduce cardiovascular disease risk
- Identify progressive CKD
- Offer lifestyle advice – encourage the person to take exercise, achieve a healthy weight and stop smoking
- Refer to community renal dietitian if advice needed for salt, potassium, phosphate, protein and calorie intake
- Medication review – avoid NSAIDs and other nephrotoxic agents

Blood pressure control

- Aim to keep blood pressure below 140/90 mmHg in all patients with CKD (target systolic 120-139)
- Aim to keep BP below 130/80 in people with CKD and diabetes or when the ACR is > 70mg/mmol (target systolic 120-129)

Treatment of Proteinuria

No diabetes
- ACR < 30 mg/mmol and hypertension: offer a choice of antihypertensive treatment (in line with NICE or local guidelines)
- ACR > 30 mg/mmol and hypertension: offer ACEI
- ACR > 70 mg/mmol with or without hypertension: offer ACEI

Diabetes
- ACR > 2.5 (men) with or without hypertension: offer ACEI
- ACR > 3.5 (women) with or without hypertension: offer ACEI

Use of ACEI/ARBs

- Treat with ACEI first; move to ARBs if ACEIs are not tolerated
- Titrate to maximum tolerated dose in all diabetic and non-diabetic patients with proteinuria
- Test eGFR and serum potassium before treatment starts and repeat after 1- 2 weeks and each dose increase
- If eGFR remains stable or shows a small decrease (up to 15%)* continue to titrate dose to maximum
- If eGFR decreases 15 - 25%* following introduction or dose increase:
  - do not modify dose
  - repeat the test after 1 – 2 weeks. Continue to titrate dose if eGFR stable
- If eGFR decreases by more than 25% or plasma creatinine increases more than 30% following ACEI/ARB introduction or dose increase:
  - investigate for other causes of deterioration in renal function, for example volume depletion due to diuretics or NSAIDs
- If no other cause:
  - stop ACEI/ARB therapy or reduce dose to a previously tolerated lower dose
  - add alternative antihypertensive medication if required

Urinary protein concentration and approximate equivalent values

ACR mg/mmol (albumin: creatinine ratio)	PCR mg/mmol (protein: creatinine ration)	Urinary protein excretion (g/24hrs)
30	50	0.5
70	100	1

In established proteinuria (ACR > 30mg/mmol) PCR can be used as an alternative

Potassium

- If serum potassium is significantly increased above the normal reference range
  - do not start ACEI/ARB
  - exclude and treat other factors that promote hyperkalaemia and recheck potassium
- If taking drugs that promote hyperkalaemia, more frequent monitoring of serum potassium may be required
- If serum potassium rises to > 6.0 mmol/l (repeat as soon as possible and exclude haemolysis)* and other drugs that promote hyperkalaemia have been discontinued, stop ACEI/ARBs
- If serum potassium rises to > 7.0 mmol/l refer urgently to the nearest Medical Assessment Unit (MAU) for repeat test and treatment*

Haematuria

- Use reagent strips
- Evaluate further if there is a result of 1+ or more
- Confirm persistent invisible haematuria by two out of three positive sticks
- Check eGFR in all patients
- Do not use urine microscopy to confirm a positive result

Refer to Urology all Patients With
- Visible haematuria (any age)
- Invisible haematuria associated with lower urinary tract symptoms, if infection excluded (any age)
- Asymptomatic invisible haematuria aged > 40 years

Refer to Nephrology
- Patients with rapidly declining renal function (see progressive CKD box)
- Patients with CKD who have had a urological cause excluded
- Patients with ACR > 30

Monitor in Primary Care
- Persistent invisible haematuria without proteinuria follow up annually, repeat testing for haematuria, ACR, eGFR and blood pressure as long as the haematuria persists

Referral to a kidney specialist

- Take into account the individual's wishes and comorbidities when considering referral

Urgent

- Suspected Acute Renal Failure
- Newly detected eGFR < 15 ml/min
- Nephrotic Syndrome
- Accelerated Hypertension
- Severe hyperkalaemia (MAU)

Routine

- Stage 4 (eGFR < 30 ml/min) and stable stage 5 CKD (eGFR < 15 ml/min) (with or without diabetes)
- Proteinuria (ACR > 70 mg/mmol) unless known to have diabetes and already appropriately treated
- Proteinuria (ACR > 30 mg/mmol) together with haematuria
- Declining eGFR (> 5 ml/min in 1 year, or > 10 ml/min within 5 years)
- Poorly controlled hypertension despite four antihypertensive drugs at therapeutic doses
- Suspected rare or genetic causes of CKD
- Suspected renal artery stenosis
- Urologically unexplained visible haematuria
- Anaemia Hb < 10.5 g/dl after exclusion of other causes

- Test eGFR Annually in at risk groups. During intercurrent illness and perioperatively in all patients with CKD
- Exact frequency should depend on clinical situation. Frequency of testing may be reduced were GFR remains stable but will need to be increased if there is rapid decline

Stage	eGFR ml/min/1.73m²	Stages of CKD and frequency of eGFR testing	Typical testing frequency
1	>90	Normal or increased GFR, with other evidence of kidney disease	12 monthly
2	60-89	Slight decrease in GFR, with other evidence of kidney disease	12 monthly
3A	45-59	Moderate decrease in GFR, with or without other evidence of kidney disease	6 monthly
3B	30-44	Moderate decrease in GFR, with or without other evidence of kidney disease	6 monthly
4	15-29	Severe decrease in GFR, with or without other evidence of kidney damage	3 monthly
5	<15	Established renal failure	6 weekly

Immunisation

- Offer annual influenza vaccination to all patients with confirmed CKD stage 3 (eGFR < 60 ml/min)
- Pneumococcal vaccination and revaccinate according to DH Guidelines
- Hepatitis B vaccination if there is a possibility of renal replacement

Further advice is available via the renal extranet site - http://nww.lancashireteachinghospitals.nhs.uk/renal or from the Renal Unit, North Cumbria University Hospitals

References:
Joint Consensus Statement on the Initial Assessment of Haematuria (2008) Renal Association and British Association of Urological Surgeons.
Chronic Kidney Disease NICE clinical guideline 73 (2008) Early identification and management of chronic kidney disease in adults in primary and secondary care.
Anaemia management in people with chronic kidney disease NICE clinical guideline 39 (2006)
Immunisation against infectious disease "The Green Book" Department of Health (2006)

** local consensus as opposed to NICE*

Date Produced: June 09 **Review Date: June 2010**

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