PHC Chapter 8: Kidney and urological disorders

Kidney disorders

Urology disorders

KIDNEY DISORDERS

8.1 CHRONIC KIDNEY DISEASE (CKD)

N18.1-5/N18.9

CAUTION
Check all medicines for possible dose adjustment based on eGFR

The doses of many medicines need to be adjusted when there is impairment of kidney function. Close attention for dose adjustments should be made once the estimated glomerular filtration rate (eGFR) falls <60 ml/min/1.73m^2, and especially when eGFR<15 ml/min/1.73m^2 or when the patient is on dialysis.
Recommendations for medicines that require dose adjustment in renal impairment can be found in the South African Medicines formulary (SAMF), package insert, and from many online resources e.g.: https://globalrph.com/renal/

DESCRIPTION

Structural or functional kidney damage present for > 3 months, with or without a decreased glomerular filtration rate (eGFR).
Markers of kidney damage include:
» abnormalities in urine e.g. proteinuria or haematuria,
» abnormalities in blood e.g. serum creatinine or low eGFR,
» abnormalities in imaging tests e.g. small kidneys or cysts on ultrasound,
» or abnormalities on pathological specimens, e.g. glomerular disease on kidney biopsy.

Common causes of chronic kidney disease (CKD) include:
» hypertension
» diabetes mellitus
» glomerular diseases
» polycystic kidney disease
» HIV/AIDS

Chronic kidney disease can be entirely asymptomatic, BUT early detection and management can improve the outcome of this condition.

Treatment and prevention strategies according to prognostic category
Estimation of the degree of kidney damage is important to guide management to prevent adverse outcomes of CKD.
Use eGFR and albumin:creatinine ratio to put patient into prognostic category - see Table 8.1 below.
The calculation eGFR using the CKD-EPI equation is currently the formula of choice for calculation of the eGFR.

LoE:IVb[1]

Note:
» Adults with mild to moderate decline in eGFR (G3a) and no albuminuria can be managed at primary care level once the cause and plan for care has been established.
» All children should be referred for investigation and initial management.

Table 8.1: Prognosis of CKD by GFR and albuminuria categories: KDIGO 2024

				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				ACR* <30 mg/g <3mg/mmol	ACR* 30–300 mg/g 3–30 mg/mmol	ACR* >300 mg/g >30 mg/mmol
eGFR categories (ml/min per 1.73m2) description and range	G1	Normal or high	≥90		Refer	Refer
	G2	Mildly decreased	60–89		Refer	Refer
	G3a	Mildly to moderately decreased	45–59		Refer	Refer
	G3b	Moderately to severely decreased	30–44	Refer	Refer	Refer
	G4	Severely decreased	15–29	Refer	Refer	Refer
	G5	Kidney failure	<15	Refer	Refer	Refer

*ACR: albumin to creatinine ratio in urine specimen.

Green: low risk (if no other markers of kidney disease, no CKD); yellow: moderately increased risk; orange: high risk; red: very high risk; A1, A2, A3 = categories of albuminuria; G1, G2, G3a, G3b, G4, G5 = categories of eGFR

LoE:IVb[2]

Send blood annually for measurement of creatinine in all patients at increased risk (eGFR will be calculated by the laboratory, based on the serum creatinine).

GENERAL MEASURES

» Limit total daily salt intake (including salt in food) to < 5000 mg per day of sodium chloride (a level teaspoon). Consult with dietician as required.

LoE:IVb[3]

» Reduce cardiovascular disease risk factors. See Section 4.1: Prevention of ischaemic heart disease and atherosclerosis.
» Avoid nephrotoxic drugs, e.g. NSAIDs, tenofovir and aminoglycosides.
» Screen for proteinuria.
  - If urine dipstick 1+ or greater, repeat on a properly collected midstream urine specimen on another occasion. If proteinuria persists, quantify protein with a spot urine protein-creatinine ratio. Significant proteinuria = spot urine protein-creatinine ratio (PCR) of > 0.15 g/mmol. This is equivalent to 1 g per 24 hours.
  - **Note:** Proteinuria is screened for differently in diabetics. See Section 9.4.3: Diabetic nephropathy.

MEDICINE TREATMENT

Treat underlying conditions.

Proteinuria
Measure serum potassium at baseline.

Adults:
- ACE-inhibitor, e.g.:
- Enalapril, oral, start with 5 mg 12 hourly.
  - Titrate up to 10 mg 12 hourly, if tolerated.
  - Start with low dose of ACE-inhibitor and titrate up to the maximum dose, or until the proteinuria disappears – whichever comes first. Ensure BP remains in normal range and that no side effects are present.

ACE-inhibitors can be used in renal impairment (eGFR < 30 mL/min/1.73m^2) if potassium can be monitored safely.

  - Monitor creatinine and potassium:
    - 1–2 weeks after treatment initiation if eGFR < 60 mL/min, and after 4 weeks if eGFR > 60 mL/min.
    - If creatinine increases by > 20% from the baseline, stop ACE-inhibitor and refer.
    - If stable, monitor thereafter at regular clinic visits. *LoE:IVb*

ACE-inhibitors are contraindicated in, amongst others:

» hyperkalaemia
» known hypersensitivity to an ACE-inhibitor or an ARB
» bilateral renal artery stenosis
» pregnancy

Hyperlipidaemia
If hyperlipidaemia is a co-existent risk factor, manage according to Section 4.1: Prevention of ischaemic heart disease and atherosclerosis.

Diabetes mellitus
» In diabetics, optimise control according to Section 9.2.2: Type 2 diabetes mellitus, adults.
» Replace oral sulphonylureas with insulin when eGFR < 60 mL/min, because of an increased risk of hypoglycaemia.
» Replace metformin with insulin when eGFR < 30 mL/min, because of the potential risk of lactic acidosis.
» Insulin is preferred to control blood glucose in patients with eGFR < 30 mL/min.

Hypertension
Treat if present. See Section 4.7: Hypertension.

Target BP: Systolic < 140 mmHg and diastolic < 90 mmHg (See Sections 4.7 Hypertension; 9.1.2: Type 1 diabetes mellitus, in adults; and 9.2.2: Type 2 diabetes mellitus, adults).

Fluid overload
Treat fluid overload if present and refer.

Adults

- Furosemide, oral or IV, 20 mg to 80 mg daily, as a single or in divided doses, initiating at the lowest effective dose and titrating upwards.
    - Dose may be increased to 160mg IV or oral daily, in divided doses.
    - First establish an effective dose and ascertain if urination occurs within 1-2 hours of intake. If urination does not occur within 1-2 hours, the dose should be increased further until urination ensues.
    - Do not give IV fluids – use heparin lock or similar IV access.

Children

- Furosemide, IV, 1 mg/kg, over 5 minutes. See dosing table, PHC Chapter 23. Use the smallest volume possible to administer medication. Do not administer any resuscitation or maintenance fluids intravenously.**Note:** Exclude heart failure in patients with persistent pedal oedema.

REFERRAL

» All cases of suspected chronic kidney disease stages 3–5 for assessment and planning.
» In addition, patients with chronic kidney disease stages 3–5 may also require rehabilitation support for optimisation of function outcomes e.g., improved muscle strength and cardiovascular fitness, reduced blood pressure, weight management.
LoE:IIIb[4]
» All children.
» All cases of CKD with:
- haematuria.
- significant proteinuria with urine protein-creatinine ratio > 0.1 g/mmol.
- eGFR < 60 mL/min for initial assessment and planning
- eGFR < 30 mL/min

» Uncontrolled hypertension/fluid overload.
» CKD associated with hyperlipidaemia.
» No reduction of proteinuria despite ACE-inhibitor therapy.
» If ACE-inhibitors are contraindicated or are not tolerated.

Patients who might qualify for dialysis and transplantation or who have complications should be referred early to ensure improved outcome and survival on dialysis, i.e. as soon as eGFR drops < 30 mL/min, or as soon as diagnosis is made/suspected.

8.2 ACUTE KIDNEY INJURY

N17.9

DESCRIPTION

This is (potentially) reversible kidney failure, commonly as a result of:

» hypovolaemia and fluid loss
» medicines/toxins
» urinary tract obstruction
» Sepsis
» acute tubular necrosis
» acute glomerulonephritis

It is often recognised by:
» fluid overload (e.g. pulmonary oedema),
» decreased or no urine output,
» abnormalities of serum urea, creatinine and/or electrolytes,
» or convulsions in children.

GENERAL MEASURES

» Give oxygen, and nurse in Semi-Fowlers position if patient has respiratory distress. Early referral is essential.
» If fluid overloaded: stop all IV fluids.
» If dehydrated or shocked:
  - treat immediately as shock. See Section 21.2.9: Shock.
» Stop and avoid any nephrotoxic medicines, e.g. NSAIDs, aminoglycosides.

MEDICINE TREATMENT

» Review all prescribed medications regularly in the setting of kidney failure to ensure that they are safe and at the correct dose for the eGFR.
» Currently, the most reliable measure of eGFR is CKD-EPI in adults and Schwartz equation for children. Nephrotoxic drugs should be avoided in the setting of any kidney dysfunction. Prior to starting any medication review for previous drug allergies and adverse events. Monitoring of drug toxicity and levels is important where available (e.g. aminoglycoside).
» In acute kidney injury (AKI) the once-off eGFR is not reliable as kidney function changes rapidly. Therefore, it is essential to monitor eGFR and doses of medications regularly.

Children:

<u>If fluid overloaded (rapid respiration, chest indrawing):</u>

- Furosemide, IV, 1 mg/kg, over 5 minutes. See dosing table, PHC chapter 23.
  - Do not put up a drip or run in any IV fluids.

<u>If hypertension present:</u>

< 6 years of age:	> 120 mmHg systolic BP **or** > 90 mmHg diastolic BP
6–15 years:	> 130 mmHg systolic BP **or** > 95 mmHg diastolic BP

- Nifedipine, oral, 0.25–0.5 mg/kg squirted into mouth.
  - Withdraw contents of 5 mg capsule with a 1 mL syringe:

10–25 kg:	2.5 mg
25–50 kg:	5 mg
>50 kg:	10 mg

Adults:

<u>If fluid overloaded/respiratory distress:</u>

- Furosemide, oral or IV, 20 to 80 mg daily, as a single or divided doses, initiating at the lowest effective dose and titrating upwards.

- Dose may be increased to 160 mg, IV or oral, daily in divided doses.
- First establish an effective dose and ascertain if urination occurs within 1-2 hours of intake. If urination does not occur, increase the dose further until urination occurs.

If blood pressure is elevated hypertension is present (Diastolic BP > 100 mmHg or systolic BP > 150 mmHg):

- Amlodipine, oral, 5 mg as a pre-referral dose.

If eGFR is currently unknown or < 30 ml/min, **ADD**:

- Furosemide, oral, 40–80 mg as a pre-referral dose.

REFERRAL *LoE:IIIb*[5]

All cases.

8.3 GLOMERULAR DISEASES (GN)

DESCRIPTION

Glomerular disease may be a result of a primary condition of the kidney, or may be secondary to a systemic disorder. Can present with any, or a combination of the following:

» proteinuria
» reduced eGFR
» haematuria
» hypertension and oedema

Approach to care is outlined under the syndromes which follow.

Diabetic nephropathy

See Section 9.4.3: Diabetic nephropathy.

REFERRAL

» Unexplained haematuria on two to three consecutive visits.
» Proteinuria > 1 g/24 hours or PCR > 0.1 g/mmol
» Elevated or rising creatinine
» Nephritic syndrome
» Nephrotic syndrome
» Chronic kidney disease

Note: Where facilities are available, investigation should be done, e.g. serum creatinine to calculate the eGFR, or PCR.

8.3.1 NEPHRITIC SYNDROME

N05.9

DESCRIPTION

Presents with a varied combination of:

» painless, turbid, brownish, or macroscopically bloody urine
» peripheral and periorbital oedema

» pulmonary oedema (circulatory overload)
» hypertension or hypertensive encephalopathy with impaired level of consciousness or convulsions
» little or no urine excretion

In children, this is commonly due to acute post streptococcal glomerulonephritis.

GENERAL MEASURES

» Give oxygen, and nurse in Semi-Fowlers position if patient has respiratory distress.
» Early referral is essential, especially if patient had a hypertensive episode or fluid overload.
» If dehydrated or shocked: Treat immediately. (See Section 21.2.9: Shock).
» The definitive treatment of nephritis depends on the cause – an assumption of acute post streptococcal nephritis or any other disease cannot be made without specific investigation which may include renal biopsy.
»

MEDICINE TREATMENT

For management, see Section 8.2: Acute kidney injury.

REFERRAL

» All cases.

8.3.2 NEPHROTIC SYNDROME

N04.9

DESCRIPTION

Glomerular disease is characterised by:

» severe proteinuria, defined as:
  - children: ≥ 3+ proteinuria on dipstick test, or urine protein-creatinine ratio (PCR) ≥ 0.2 g/mmol on spot urine sample.
  - adults: ≥ 2.5 g/day, as determined by a spot urine protein-creatinine ratio measurement, i.e. PCR > 0.25 g/mmol.
» and resultant 'classic' clinical picture (not always present) which includes:
  - oedema,
  - hypoalbuminaemia,
  - hyperlipidaemia.

Accurate diagnosis requires a kidney biopsy.

MEDICINE TREATMENT

The management of glomerular disease depends on the type/cause of the disease and is individualised, guided by a specialist according to the biopsy result.

REFERRAL

All cases.

8.4 URINARY TRACT INFECTION (UTI)

N10/N30.9/N39.0/O23.4

DESCRIPTION

Urinary tract infections may involve the upper or lower urinary tract. Infections may be complicated or uncomplicated. Uncomplicated UTI is a lower UTI, where there are no functional or anatomical anomalies in the urinary tract, no kidney impairment, or no concomitant disease that would promote the UTI.
Complicated UTIs exist in patients with an increased chance of a complicated course, i.e. all men, pregnant women, patients with relevant anatomical or functional abnormalities of the urinary tract, indwelling urinary catheters, kidney diseases, and/or other concomitant immunocompromising diseases for example, diabetes.

Differentiation of upper from lower urinary tract infection in young children is not possible on clinical grounds.
Upper UTI is a more serious condition and requires longer, and sometimes intravenous, treatment.

Features of upper UTI (pyelonephritis) that may be detected in adults and adolescents include:
» flank pain/tenderness
» temperature 38°C or higher
» other features of sepsis, i.e.: tachypnoea, tachycardia, confusion, hypotension
» vomiting

In complicated, recurrent, or upper UTIs, urine should be sent for microscopy, culture and sensitivity.

Features of urinary tract infections in children *LoE:IVb*[6]

Signs and symptoms are related to the age of the child and are often non-specific.
Uncomplicated urinary tract infections may cause very few signs and symptoms, while complicated infections may present with a wide range of signs and symptoms.

Neonates may present with:
» fever
» poor feeding
» vomiting
» failure to thrive
» hypothermia
» sepsis
» prolonged jaundice
» renal failure

Infants and children may present with:
» failure to thrive
» persisting fever
» abdominal pain
» diarrhoea
» frequency
» dysuria
» enuresis or urgency

In any child with fever of unknown origin, the urine must be examined to assess whether a urinary tract infection is present.

Perform a urine dipstick test on a fresh bag urine specimen.

DIPSTIX RESULT	ACTION
No leukocytes/nitrites	UTI unlikely
Leukocytes only	Repeat dipstix on a second specimen. If leucocytes on second specimen, suspect UTI and treat empirically. Collect urine aseptically if possible for urine MC&S.
Leukocytes or nitrites with symptoms of UTI	Treat empirically for UTI. Collect urine aseptically if possible for urine MC&S.
Leukocytes and nitrites	Collect urine aseptically if possible for urine MC&S. Treat empirically for UTI.

GENERAL MEASURES

» Women with recurrent UTIs should be advised to:
  - void bladder after intercourse and before retiring at night
  - not postpone voiding when urge to micturate occurs
  - change from use of diaphragm to an alternative type of contraception

MEDICINE TREATMENT

Empirical treatment is indicated only if:
» positive leukocytes and nitrites on freshly passed urine, or
» leucocytes or nitrites with symptoms of UTI, or
» systemic signs and symptoms.

Alkalinising agents are not advised.

Uncomplicated cystitis

Adults

- Gentamicin, IM, 160 mg, as a single dose.
  - **Note:** Gentamicin should not be used in patients with known chronic kidney disease or pregnancy. *LoE:IIb*[7]

If gentamicin is unavailable/contraindicated:

- Fosfomycin, oral, 3 g as a single dose. *LoE:IIb*[8]

If fosfomycin is unavailable:

- Nitrofurantoin, oral, 100 mg 6 hourly for 5 days. *LoE:IIb*[9]

Complicated cystitis

Adults

- Ciprofloxacin, oral, 500 mg 12 hourly for 7 days.

For pregnant women: O23.4

- Fosfomycin, oral, 3 g as a single dose. *LoE:IIb*[10]

OR

- Nitrofurantoin, oral, 100 mg 6 hourly for 5 days. *LoE:IIb*[11]

Children ≤ 35 kg who do not meet criteria for urgent referral:

- Amoxicillin/clavulanic acid oral, 15–25 mg/kg/dose of amoxicillin component, 8 hourly for 7 days.

Weight	Dose	Use one of the following			Age
kg	mg	Susp	Susp	Tablet	months/years

	(amoxicillin component)	125/31.5 mg/5 mL	250/62.5 mg/5 mL	500/125 mg/tab	
>5–7 kg	100 mg	4 mL	2mL	–	>3–6 months
>7–9 kg	150 mg	6 mL	3 mL	–	>6–12 months
>9–11 kg	200 mg	8 mL	4 mL	–	>12–18 months
>11–14 kg	250 mg	10 mL	5 mL	–	>18 months–3 years
>14–17.5 kg	300 mg	12 mL	6 mL	–	>3–5 years
>17.5–25	375 mg	15 mL	7.5 mL	–	>5–7 years
>25–35 kg	500 mg	20 mL	10 mL	1 tablet	>7–11 years

LoE:IIIb[12]

Acute pyelonephritis

N10

Outpatient therapy is only indicated for women of reproductive age, who do not have any of the manifestations requiring referral (see referral criteria below). All other patients should be referred.

- Ciprofloxacin, oral, 500 mg 12 hourly for 7–10 days.
  - It is essential to give at least a 7-day course of therapy.

REFERRAL

Urgent

» Acute pyelonephritis with:
- vomiting
- sepsis
- diabetes mellitus

» Acute pyelonephritis in:
- pregnant women
- women beyond reproductive age
- men

» Children ≥3 months of age who appear ill.

» Children ≤3 months of age with any UTI.

Ill patients awaiting transfer

» Ensure adequate hydration with intravenous fluids.

- Ceftriaxone, IM, 80 mg/kg/dose immediately as a single dose. See dosing tables, PHC Chapter 23.
  - Do not inject more than 1 g at one injection site.

CAUTION: USE OF CEFTRIAXONE IN NEONATES AND CHILDREN

» If SUSPECTING SERIOUS BACTERIAL INFECTION in neonate, give ceftriaxone, even if jaundiced.

» Avoid giving calcium-containing IV fluids (e.g. Ringer Lactate) together with ceftriaxone:
- If ≤ 28 days old, avoid calcium-containing IV fluids for 48 hours after ceftriaxone administered.
- If > 28 days old, ceftriaxone and calcium-containing IV fluids may be given sequentially provided the giving set is flushed thoroughly with sodium chloride 0.9% before and after.
- Preferably administer IV fluids without calcium contents.

» Always include the dose and route of administration of ceftriaxone in the referral letter.

Non-urgent

» All proven UTIs (positive culture) in children after completion of treatment.

» No response to treatment.
» UTI > 3 times within a one-year period in women, and more than once (at any point in time) in men.
» Recurrent UTI in children for assessment and consideration of prophylaxis.

8.5 PROSTATITIS

N41.0/N41.9 + (N34.2)

DESCRIPTION

Infection of the prostate caused by urinary or STI pathogens.
Clinical features include:
» perineal, sacral or suprapubic pain
» dysuria and frequency
» varying degrees of obstructive symptoms which may lead to urinary retention
» sometimes fever
» acutely tender prostate on rectal examination
The condition may be chronic, bacterial or non-bacterial, the latter usually being assessed when there is failure to respond to antibiotics.

MEDICINE TREATMENT

Acute bacterial prostatitis

If there are features of associated urethritis (STI regimen):

- Ceftriaxone, IM, 250 mg as a single dose.

AND

- Azithromycin, oral, 1 g as a single dose.

LoE:IIIb[13]

If there are no features of associated urethritis:

- Ciprofloxacin, oral, 500 mg 12 hourly for 14 days. *LoE:IIIb*[14]

REFERRAL

» No response to treatment.
» Urinary retention.
» High fever.
» Chronic/relapsing prostatitis.

UROLOGY DISORDERS

8.6 HAEMATURIA

R31

DESCRIPTION

Bleeding from the urinary tract, which can be from the kidneys, collecting system, bladder, prostate and urethra.

Glomerular disease is suggested if proteinuria, red blood cell casts and/or dysmorphic red blood cells are present on microscopy.

Exclude schistosomiasis (bilharzia), a common cause of haematuria, as well as haematuria which could be the result of anticoagulant therapy.

When haematuria is accompanied by colicky pain, a kidney stone should be excluded.

Note: The presence of blood on the urine test strips does not indicate infection and should be investigated as above.

MEDICINE TREATMENT

If evidence of schistosomiasis, treat as in Section 10.12: Schistosomiasis (bilharzia).

If symptoms of UTI; leucocytes and/or nitrite test positive in urine, treat as UTI.

If haematuria does not resolve rapidly after treatment, refer for formal investigation, i.e. next 48 hours.

REFERRAL

» All cases not associated with schistosomiasis or UTI.
» All cases not responding to specific medicine treatment.
» When glomerular disease is suspected.

8.7 BENIGN PROSTATIC HYPERPLASIA (BPH)

N40

DESCRIPTION

BPH is a noncancerous (benign) growth of the prostate gland.

May be associated with both obstructive (weak, intermittent stream and urinary hesitancy) and irritative (frequency, nocturia and urgency) voiding symptoms.

Digital rectal examination reveals a uniform enlargement of the prostate.

Urinary retention with a distended bladder may be present in the absence of severe symptoms, therefore it is important to palpate for an enlarged bladder during examination.

GENERAL MEASURES

Annual follow-up with digital rectal examination.

For patients presenting with urinary retention, insert a urethral catheter as a temporary measure while patient is transferred to hospital.

Remove medicines that prevent urinary outflow e.g. tricyclic antidepressants, neuroleptics.

REFERRAL

All patients with suspected BPH.

8.8 PROSTATE CANCER

C61/D07.5/D29.1/D40.0

DESCRIPTION

Usually occurs in men >50 years of age and is most often asymptomatic.
Systemic symptoms, i.e. weight loss, bone pain, etc. occur in 20% of patients.
Obstructive voiding symptoms and urinary retention are uncommon.
The prostate gland is hard and may be nodular on digital rectal examination.
As the axial skeleton is the most common site of metastases, patients may present with back pain or pathological spinal fractures.
Lymph node metastases can lead to lower limb lymphoedema.

REFERRAL

All patients with suspected cancer.

8.9 ENURESIS

F98.0

DESCRIPTION

Enuresis is bedwetting that occurs in children > 5 years of age.
It is a benign condition which mostly resolves spontaneously.
It is important, however, to differentiate between nocturnal enuresis and daytime wetting with associated bladder dysfunction.
Secondary causes of enuresis include:

» diabetes mellitus
» urinary tract infection
» physical or emotional trauma

Note:

» Clinical evaluation should attempt to exclude the above conditions.
» Urine examination should be done on all patients.

GENERAL MEASURES

» Motivate, counsel and reassure child and parents.
» Advise against punishment and scolding.
» Spread fluid intake throughout the day.
» Diapers are not advised, as this will lower the child's self-esteem.

REFERRAL

» Suspected underlying systemic illness or chronic kidney disease.
» Persistent enuresis in a child.
» Diurnal enuresis.

8.10 IMPOTENCE/ERECTILE DYSFUNCTION

F52.2/N48.4

DESCRIPTION
The inability to attain and maintain an erect penis with sufficient rigidity for penetration. Organic causes include neurogenic, vasculogenic, endocrinological (e.g. diabetes mellitus) as well as many systemic diseases and medications.

GENERAL MEASURES
» Thorough medical and psychosexual history.
» Physical examination should rule out gynaecomastia, testicular atrophy or penile abnormalities.
» Consider the removal of medicines (e.g. beta-blockers) possibly associated with the problem.
» A change in lifestyle or medications may resolve the problem, e.g. advise cessation of smoking and alcohol use.

TREATMENT
Treat the underlying condition, if present.

8.11 RENAL CALCULI
N20.0-2/N20.9/N21.0/N21.8/N21.9

DESCRIPTION
This is a kidney stone or calculus which has formed in the renal tract i.e. pelvis, ureters or bladder as a result of urine which is supersaturated with respect to a stone-forming salt.
Clinical features of obstructing urinary stones may include:
» sudden onset of acute colic, localised to the flank, causing the patient to move constantly,
» nausea and vomiting,
» referred pain to the scrotum or labium on the same side as the stone moves down the ureter.
Urinalysis usually reveals microscopic or macroscopic haematuria.

GENERAL MEASURES
Ensure adequate hydration.

MEDICINE TREATMENT
Adults:
Analgesia for pain, if needed:
- Morphine, IM, 0.1 mg/kg 30 minutes , to a maximum of 10 mg (Doctor initiated). *LoE:IVb*

REFERRAL
» Referral, even with a single first stone episode:
  - All patients < 19 years of age.
  - Pregnant woman (refer postpartum).
  - Morbidly obese patients.
  - Patients known to have polycystic kidney disease.

- Patients with inherited metabolic disorders of kidney function.(e.g. Fanconi syndrome, and inherited conditions resulting in renal tubular acidosis or nephrolithiasis.)

» Referral (for metabolic work-up to identify the cause and provide treatment in order to limit future episodes) to a nephrologist is indicated as follows:
- Patients with first episode of multiple stones in both kidneys.
- Patients with three or more kidney stone episodes within 2-3 years.

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SOUTH AFRICAN PRIMARY HEALTHCAREESSENTIAL MEDICINES LIST
PHC CHAPTER 8: KIDNEY AND UROLOGICAL DISORDERS
NEMLC RECOMMEDATIONS FOR MEDICINE AMENDMENTS (2020-2024 REVIEW CYCLE)

Medicine amendment recommendations, with supporting evidence and rationale are listed below.
Kindly review the medicine amendments in the context of the respective standard treatment guideline (STG).

PROPOSED AMENDMENTS

SECTION	MEDICINE/ MANAGEMENT	ADDED/DELETED/AMENDED/NOT ADDED/ RETAINED
8.1 CHRONIC KIDNEY DISEASE (CKD)	Adjustment of medicine doses in renal impairment	Guidance amended
	Treatment and prevention strategies according to prognostic category	Guidance amended
	General measures	Editorial amendments to section made and guidance on low protein diet removed
	BP targets	Amended
	ACE-inhibitors, oral	Retained, indications for therapeutic class amended
	Furosemide, oral/IV	Dosing guidance amended
	Rehabilitation support	Added for referred stage 3-5 patients
8.2 ACUTE KIDNEY INJURY (AKI)	Medicine treatment	Guidance added on the principles of dosing medication in patients with AKI
8.4 URINARY TRACT INFECTION (UTI) *- Pregnant women*	Fosfomycin, oral	Added
	Nitrofurantoin, oral	Added
-Children	Acute pyelonephritis	Referral criteria for children amended
8.5 PROSTATITIS	Acute bacterial prostatitis	Guidance for treatment based on age thresholds removed
8.11 RENAL CALCULI	Referral criteria	Amended
PHC ESSENTIAL LABORATORY LIST (ELL)	Prostate specific antigen test	Not added

8.1. CHRONIC KIDNEY DISEASE

<u>Adjustment of medicine doses in renal impairment:</u> New guidance added

The principles of dosing medication in patients with chronic kidney disease (CKD) and acute kidney injury (AKI) have been added to the STG for clarity. The updated nomenclature includes "kidney disease" which encompasses both acute kidney injury and chronic kidney disease. The word “chronic renal disease” has been replaced with the word “chronic kidney disease” throughout the chapter.

The STG has been amended as follows:

CAUTION
Check all medicines for possible dose adjustment based on eGFR

The doses of many medicines need to be adjusted in renal impairment when there is impairment of kidney function. Close attention for dose adjustments should be made once the eGFR falls below 60ml/min/1.73m^2 and especially when <15mls/min/1.73m^2 or when the patient is on dialysis. ~~The doses of many medicines need to be adjusted in renal impairment.~~
Recommendations for medicines that require dose adjustment in renal impairment can be found in the South African Medicines formulary (SAMF), package insert, and from many online resources e.g.: http://www.globalrph.com/index_renal.htm

Treatment and prevention strategies according to prognostic category: Amended

The CKD Epidemiology Collaboration (CKD-EPI) equation has been included in the STG as the formula of choice in line with current practice[1,2]. The CKD-EPI measure of eGFR has acceptable performance characteristics and potential consequences that do not disproportionately affect any one group of individuals.

The STG has been amended as follows:

Treatment and prevention strategies according to prognostic category
Estimation of the degree of kidney damage is important to guide management to prevent adverse outcomes of ~~chronic kidney disease~~. CKD.
Use eGFR and albumin creatinine ratio to put patient into prognostic category - see table below.
The eGFR using the CKD-EPI (race neutral) equation is currently the formula of choice.

				Persistent albuminuria categories Description and range		
				A1	A2	A3
				Normal to mildly increased	Moderately increased	Severely increased
				ACR* <30 mg/g <3mg/mmol	ACR* 30–300 mg/g 3–30 mg/mmol	ACR* >300 mg/g >30 mg/mmol
eGFR categories (ml/min per 1.73m2) description and range	G1	Normal or high	≥90		Refer	Refer
	G2	Mildly decreased	60–89		Refer	Refer
	G3a	Mildly to moderately decreased	45–59		Refer	Refer
	G3b	Moderately to severely decreased	30–44	Refer	Refer	Refer
	G4	Severely decreased	15–29	Refer	Refer	Refer
	G5	Kidney failure	<15	Refer	Refer	Refer

*ACR: albumin to creatinine ratio in urine specimen.
Green: low risk (if no other markers of kidney disease, no CKD); yellow: moderately increased risk; orange: high risk; red: very high risk; A1, A2, A3 = categories of albuminuria; G1, G2, G3a, G3b, G4, G5 = categories of eGFR
Adapted from: Levin A, Stevens PE. Summary of KDIGO 2012 CKD Guideline: behind the scenes, need for guidance, and a framework for moving forward. Kidney Int. 2014 Jan;85(1):49-61. https://www.ncbi.nlm.nih.gov/pubmed/24284513

General measures: Amended
Dietary Protein limit: Guidance removed

[1] Delgado C, Baweja M, Crews DC, Eneanya ND, Gadegbeku CA, Inker LA, Mendu ML, Miller WG, Moxey-Mims MM, Roberts GV, St Peter WL, Warfield C, Powe NR. A Unifying Approach for GFR Estimation: Recommendations of the NKF-ASN Task Force on Reassessing the Inclusion of Race in Diagnosing Kidney Disease. Am J Kidney Dis. 2022 Feb;79(2):268-288.e1. doi: 10.1053/j.ajkd.2021.08.003. Epub 2021 Sep 23. PMID: 34563581.

[2] Inker LA, Eneanya ND, Coresh J, et al., for the Chronic Kidney Disease Epidemiology Collaboration
New Creatinine- and Cystatin C-Based Equations to Estimate GFR without Race.N Engl J Med. 2021 November 4, 385 (19):1737-1749.

The recommendation to Limit dietary protein intake has been removed from the STG, A Systematic Review of 17 RCT's (n=2996) where 10 studies compared a low protein (0.5 to 0.6 g/kg/day) diet with a normal protein(≥ 0.8 g/kg/day) diet in participants with CKD categories 3a and 3b (9 studies) or 4 (one study), found that there was little or no difference in the numbers of participants who died from all causes (5 studies 1680 participants: RR 0.77, 95% CI 0.51 to 1.18; 13 fewer deaths per 1000). In addition, a low protein diet was found to make little or no difference in the number of participants who reached End-Stage Kidney Disease (ESKD) compared with a normal protein diet (6 studies, 1814 participants: RR 1.05, 95% CI 0.73 to 1.53; 7 more per 1000 reached ESKD)[3]. In addition,aminoglycosides have been included as an example of nephrotoxic medicines to avoid in patients with CKD[4]

The STG has been amended as follows:

~~Reduce salt intake – dietician consultation as required.~~
~~Low protein diet is indicated in the presence of CKD stage 4 and 5, dietician consultation as required.~~
Reduce cardiovascular disease risk factors. See Section 4.1: Prevention of ischaemic heart disease and atherosclerosis.
Avoid nephrotoxic drugs e.g. NSAIDs, tenofovir and aminoglycosides.

Hypertension

BP targets: *Amended*

Blood Pressure targets were aligned with the PHC cardiovascular and endocrine chapters for consistency, as follows:

Treat if present. See Section 4.7: Hypertension.
Target BP: Systolic < 140 mmHg and diastolic < 90 mmHg (See Sections 4.7: Hypertension, 9.1.2: Type 1 diabetes mellitus, in adults and 9.2.2: Type 2 diabetes mellitus, adults).

MEDICINE TREATMENT

ACE-inhibitors: Class retained, guidance amended

ACE-inhibitors in patients with eGFR < 30 mL/min/1.73m^2 may be nephroprotective[5] therefore, the STG has been amended to extend ACE-inhibitors for the management of patients with severe renal impairment in line with guidelines. A caveat has been included to highlight potassium level monitoring which is available at the PHC level of care.

The STG has been amended as follows:

ACE inhibitors can be used with an impairment (eGFR < 30 mL/min/1.73m2) if potassium can be monitored safely.

Monitor creatinine and potassium:

- 1–2 weeks after treatment initiation, if eGFR < 60 mL/min and after 4 weeks, if eGFR > 60 mL/min.
- If creatinine increases by > 20% from the baseline, stop ACE-inhibitor and refer.
- If stable, monitor thereafter at regular clinic visits.

LoE:IVb

ACE-inhibitors are contraindicated in, amongst others:

- hyperkalaemia
- known hypersensitivity to an ACE-inhibitor or an ARB
- bilateral renal artery stenosis
- pregnancy
- ~~severe renal impairment (eGFR < 30 mL/min)~~

Level of Evidence: Low certainty

Furosemide, oral/IV: Dose and directions amended

[3] Hahn D, Hodson EM, Fouque D. Low protein diets for non-diabetic adults with chronic kidney disease. Cochrane Database Syst Rev. 2020 Oct 29;10(10):CD001892. doi: 10.1002/14651858.CD001892.pub5. PMID: 33118160; PMCID: PMC8095031.

[4] Patel JB, Sapra A. Nephrotoxic Medications. 2023 Jun 21. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2024 Jan–. PMID: 31985937.

[5] Eknoyan G, Lameire N. KDIGO 2012 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney Int Suppl. 2013;3(1):1-150.

For the management of fluid overload and oedema, the dose of furosemide, oral/IV has been amended to a dose of 20mg up to 160mg oral/IV in divided doses[6]. Additional guidance through an external comment has been added to first establish an effective dose of furosemide and ascertain that the prescribed dose results in urination within 1-2 hours of intake until urination ensues.

The STG has been amended as below:

•Furosemide, oral or IV, 20mg to 80mg daily, as a single or in divided doses, initiating at the lowest effective dose and titrating upwards. Dose may be increased to 160mg IV or oral daily in divided doses. •First establish an effective dose and ascertain if urination occurs within 1-2 hours of intake. If urination does not occur within 1-2 hours, the dose should be increased further until urination ensues. ~~•Furosemide, slow IV or oral, 40–80 mg, 12 hourly.~~

Level of Evidence: Low certainty

Referral

Rehabilitation support: *added for referred stage 3-5 patients*

Inspiratory muscle training shown to improve inspiratory and expiratory muscles and functional capacity.[7] Multidisciplinary care likely decreases rapid progression of renal disease[8] and exercise shown to improve sleep quality amongst adults and children with end-stage kidney disease.[9]

Level of Evidence: Low certainty evidence

The following text was added to the STG:

» In addition, patients with chronic kidney disease stages 3–5 may also require rehabilitation support for optimisation of function outcomes e.g., improved muscle strength and cardiovascular fitness, reduced blood pressure, weight management.

8.2. ACUTE KIDNEY INJURY

Medicine treatment: New guidance added

Additional guidance on the principles of dosing medication in patients with AKI has been added. Monitoring of the eGFR in AKI has been emphasized.

The STG has been amended as follows:

In the setting of kidney failure all prescribed medications should be reviewed regularly to ensure that they are safe and at the correct dose for the estimated glomerular filtration rate [eGFR]. Currently, the most reliable measure of eGFR is CKD-EPI (race neutral) in adults and Schwartz equation for children. Nephrotoxic drugs should be avoided in the setting of any kidney dysfunction. Prior to starting any medication review for previous drug allergies and adverse events. Monitoring of drug toxicity and levels is important where available (e.g. aminoglycoside). In acute kidney injury [AKI] the eGFR is not reliable as kidney function changes rapidly. Therefore, it is essential to monitor eGFR and doses of medications regularly.

8.4. URINARY TRACT INFECTION (UTI)

Pregnant women

[6] South African Medicines Formulary, 14th Edition. Division of Clinical Pharmacology. University of Cape Town, 2022.

[7] de Medeiros AIC, Fuzari HKB, Rattesa C, Brandão DC, de Melo Marinho PÉ. Inspiratory muscle training improves respiratory muscle strength, functional capacity and quality of life in patients with chronic kidney disease: a systematic review. J Physiother. 2017 Apr;63(2):76-83. https://pubmed.ncbi.nlm.nih.gov/28433237/

[8] Hsu HT, Chiang YC, Lai YH, Lin LY, Hsieh HF, Chen JL. Effectiveness of Multidisciplinary Care for Chronic Kidney Disease: A Systematic Review. Worldviews Evid Based Nurs. 2021 Feb;18(1):33-41. https://pubmed.ncbi.nlm.nih.gov/33247619/

[9] Natale P, Ruospo M, Saglimbene VM, Palmer SC, Strippoli GF. Interventions for improving sleep quality in people with chronic kidney disease. Cochrane Database Syst Rev. 2019 May 26;5(5):CD012625. https://pubmed.ncbi.nlm.nih.gov/31129916/

Fosfomycin, oral: *added*
Nitrofurantoin, oral: *added*

Management was delineated to specifically provide guidance for pregnant women to minimise confusion.
The STG was updated as follows:

Uncomplicated cystitis
Adults
- Gentamicin, IM, 160 mg, as a single dose.
  - **Note:** Gentamicin should not be used in patients with known chronic kidney disease or pregnancy.

If gentamicin is unavailable/ contra-indicated:
- Fosfomycin, oral, 3 g as a single dose.

If fosfomycin is unavailable:
- Nitrofurantoin, oral, 100 mg 6 hourly for 5 days.

Complicated cystitis
Adults
- Ciprofloxacin, oral, 500 mg 12 hourly for 7 days.

For pregnant women:
- Fosfomycin, oral, 3 g as a single dose.

OR
- Nitrofurantoin, oral, 100 mg 6 hourly for 5 days.

Children
Acute pyelonephritis: Referral criteria for children amended

The indications for referral for children have been amended to provide better clarity on the age thresholds.
The STG has been amended as follows:

FROM:
» Children >3 months of age who appear ill.
» Children <3 months of age with any UTI.
TO:
Children ≥3 months of age who appear ill.
Children ≤3 months of age with any UTI.

8.5 PROSTATITIS

Acute bacterial prostatitis: Treatment according to age removed

Guidance on the management of bacterial prostatitis based on an age threshold has been removed. The STG is now aligned with the guidance included in the Adult Hospital Level Chapter 7: Nephrology/urological disorders.

The STG has been amended as follows:

FROM:

Acute bacterial prostatitis

In men ≤ 35 years of age or if there are features of associated urethritis (STI regimen):
Ceftriaxone, IM, 250 mg as a single dose.
AND
Azithromycin, oral, 1 g as a single dose.

In men > 35 years of age or if there is associated cystitis:
Ciprofloxacin, oral, 500 mg 12 hourly for 14 days.

TO:

Acute bacterial prostatitis

If there are features of associated urethritis (STI regimen):

- Ceftriaxone, IM, 250 mg as a single dose.

AND

- Azithromycin, oral, 1 g as a single dose.

If there are no features of associated urethritis:

- Ciprofloxacin, oral, 500 mg 12 hourly for 14 days.

8.11 RENAL CALCULI

Referral criteria: Amended

On receipt of an external comment, the referral section was updated from "*all patients"* to provide specific detail on patients to be referred, as follows:

» Referral, even with a single first stone episode:
  - All patients < 19 years of age.
  - Pregnant woman (refer postpartum).
  - Morbidly obese patients.
  - Patients known to have polycystic kidney disease.
  - Patients with inherited metabolic disorders of kidney function (e.g., Fanconi syndrome, and inherited conditions resulting in renal tubular acidosis or nephrolithiasis).

» Referral (for metabolic work-up to identify the cause and provide treatment in order to limit future episodes) to a nephrologist or paediatric nephrologist is indicated as follows:
  - Patients with first episode of multiple stones in both kidneys.
  - Patients with three or more kidney stone episodes within 2-3 years.

PRIMARY HEALTH CARE AND ESSENTIAL LABORATORY LIST (ELL)

Prostate-specific antigen (PSA) test: *not added*

Screening for prostate cancer using PSA tests is not included in the PHC STGs and EML. The National Health Laboratory Services (NHLS) reported and recently published findings of irrational PSA testing in clinical practice.[10] PSA tests are therefore not included in the PHC Essential Laboratory List (ELL).

[10] Cassim N, Rebbeck TR, Glencross DK, George JA. Retrospective analysis to describe trends in first-ever prostate-specific antigen (PSA) testing for primary healthcare facilities in the Gauteng Province, South Africa, between 2006 and 2016. BMJ Open. 2022 Mar 21;12(3):e050646. https://pubmed.ncbi.nlm.nih.gov/35314469/