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

LoE:IVb[3]

» Limit total daily salt intake (including salt in food). Consult with dietician 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.
» 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/g or > 0.015 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: Appendix IV.
  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.
» All children. *LoE:IIIb*[4]
» 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
- » acute tubular necrosis
- » acute glomerulonephritis
- » sepsis

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: Appendix IV.
  - 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:

If fluid overloaded/respiratory distress:

- 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.

LoE:IIIb[5]

REFERRAL

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,
  - hyperlipidaemia.
» hypoalbuminaemia,

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.

LoE:IVb[6]

Features of urinary tract infections in children
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. A
  - **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. W

LoE:IIb[8]

If fosfomycin is unavailable:

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

LoE:IIb[9]

Complicated cystitis

Adults

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

For pregnant women: O23.4

- Fosfomycin, oral, 3 g as a single dose. W

LoE:IIb[10]

OR

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

LoE:IIb[11]

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

- Amoxicillin/clavulanic acid, oral, 45 mg/kg/dose of amoxicillin component, 12 hourly (amoxicillin/clavulanic acid in a ratio of 14:1) for 7 days. A
  - Maximum dose of amoxicillin component: 1.5 g 12 hourly. See dosing table: Appendix IV

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. W
  - 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.

Patients awaiting transfer

Children

» Ensure adequate hydration with intravenous fluids.

- Ceftriaxone, IM, 80 mg/kg/dose immediately as a single dose up to a maximum dose of 1 g. W See dosing table: Appendix IV.

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.

Adults

- Ceftriaxone, IM or IV, 1 g immediately as a single dose.
  - Ensure adequate hydration with intravenous fluids where indicated.
  - Include the dose, route and time of administration 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. W

AND

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

LoE:IIIb[13]

If there are no features of associated urethritis:

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

LoE:IIIb[14]

REFERRAL

» No response to treatment.

» Urinary retention.
» High fever.
» Chronic/relapsing prostatitis.Urology disorder

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, 5–10 mg, (Doctor prescribed)
  - May be repeated after 4–6 hours if needed or until patient is referred. *LoE:IVb*

OR

- Morphine, IV, (Doctor prescribed).
  - Dilute 10 mg up to 10 mL with sodium chloride, 0.9%.

» Administer morphine, IV, 3–5 mg as a single dose, then further boluses of 1–2 mg/minute and monitor closely.
  - Total maximum as a single dose: 10 mg.
  - Repeat after 4 hours if needed or until the patient is referred.
  - Monitor response to pain and effects on respiration and BP.

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.

References

[1] 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.
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.
[2] Stevens PE, Ahmed SB, Carrero JJ, Foster B, Francis A, Hall RK, Herrington WG, Hill G, Inker LA, Kazancıoğlu R, Lamb E. KDIGO 2024 clinical practice guideline for the evaluation and management of chronic kidney disease. Kidney international. 2024 Apr 1;105(4):S117-314.
[3] Kidney Disease: Improving Global Outcomes (KDIGO) CKD Work Group. KDIGO 2024 Clinical Practice Guideline for the Evaluation and Management of Chronic Kidney Disease. Kidney Int. 2024 Apr;105(4S):S117-S314. doi: 10.1016/j.kint.2023.10.018. PMID: 38490803.
5 ways to 5 grams | Heart & Stroke Foundation | South Africa [Internet]. Heart & Stroke Foundation | South Africa. 2018 [cited 2024 Aug 1]. Available from: https://heartfoundation.co.za/topical_articles/5-ways-to-5-grams/
Why should I limit the salt in my food? - MyDynamics [Internet]. MyDynamics. 2021 [cited 2024 Aug 1]. Available from: https://www.mydynamics.co.za/nutrition/why-should-i-limit-the-salt-in-my-food/
[4] Rehabilitation support for severe CKD: 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/
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/
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/
[5] Furosemide, oral (eGFR cut-off): 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
Furosemide, oral (eGFR cut-off): South African Medicines Formulary, 14th Edition. Division of Clinical Pharmacology. University of Cape Town, 2022.
[6] Urinary tract infection definitions: Johansen TE, Botto H, Cek M, Grabe M, Tenke P, Wagenlehner FM, Naber KG. Critical review of current definitions of urinary tract infections and proposal of an EAU/ESIU classification system. Int J Antimicrob Agents. 2011 Dec;38 Suppl:64-70. https://pubmed.ncbi.nlm.nih.gov/22018988/
[7] Gentamicin, parenteral: National Department of Health: Affordable Medicines, EDP-Adult Hospital level. Medicine Review: Gentamicin for uncomplicated UTI, November 2019. https://www.knowledgehub.org.za/content/standard-treatment-guidelines-and-essential-medicines-list
Gentamicin, parenteral: Goodlet KJ, Benhalima FZ, Nailor MD. A Systematic Review of Single-Dose Aminoglycoside Therapy for Urinary Tract Infection: Is It Time To Resurrect an Old Strategy? Antimicrob Agents Chemother. 2018 Dec 21;63(1). pii: e02165-18. https://www.ncbi.nlm.nih.gov/pubmed/30397061
Gentamicin, parenteral: National Department of Health: Affordable Medicines, EDP-PHC/Adult Hospital level. Summary Review: Antimicrobials for uncomplicated UTI in adults, October 2020. https://www.knowledgehub.org.za/content/standard-treatment-guidelines-and-essential-medicines-list
Gentamicin, parenteral: National Department of Health: Affordable Medicines, EDP-PHC/Adult Hospital level. Summary Review: Gentamicin dosing for uncomplicated UTI in adults, October 2020. https://www.knowledgehub.org.za/content/standard-treatment-guidelines-and-essential-medicines-list
Gentamicin, parenteral: Stamey, T. A., D. E. Govani and J. M. Palmer. 1965. The localization and treatment of urinary tract infections: the role of bactericidal urine levels as opposed to serum levels. Medicine (Baltimore). 1965 Jan;44:1-36. https://pubmed.ncbi.nlm.nih.gov/14264351/
Gentamicin, parenteral: Sandoz Canada Inc. Product monograph: PrGentamicin Injection USP, 29 August 2017. https://www.sandoz.ca/sites/www.sandoz.ca/files/Gentamicin%20Inj%20Product%20Monograph.pdf
[8] Fosfomycin, oral: Falagas ME, Vouloumanou EK, Togias AG, Karadima M, Kapaskelis AM, Rafailidis PI, Athanasiou S. Fosfomycin versus other antibiotics for the treatment of cystitis: a meta-analysis of randomized controlled trials. J Antimicrob Chemother. 2010 Sep;65(9):1862-77. http://www.ncbi.nlm.nih.gov/pubmed/20587612
Fosfomycin, oral: Lewis DA, Gumede LY, van der Hoven LA, de Gita GN, de Kock EJ, de Lange T, Maseko V, Kekana V, Smuts FP, Perovic O. Antimicrobial susceptibility of organisms causing community-acquired urinary tract infections in Gauteng Province, South Africa. S Afr Med J. 2013 Mar 15;103(6):377-81. http://www.ncbi.nlm.nih.gov/pubmed/23725955
[9] Huttner A, Verhaegh EM, Harbarth S, Muller AE, Theuretzbacher U, Mouton JW. Nitrofurantoin revisited: a systematic review and meta-analysis of controlled trials. J Antimicrob Chemother. 2015 Sep;70(9):2456-64. https://www.ncbi.nlm.nih.gov/pubmed/26066581
Nitrofurantoin, oral: Zalmanovici Trestioreanu A, Green H, Paul M, Yaphe J, Leibovici L. Antimicrobial agents for treating uncomplicated urinary tract infection in women. Cochrane Database Syst Rev. 2010 Oct 6;(10):CD007182. https://www.ncbi.nlm.nih.gov/pubmed/20927755
Nitrofurantoin, oral: Lewis DA, Gumede LY, van der Hoven LA, de Gita GN, de Kock EJ, de Lange T, Maseko V, Kekana V, Smuts FP, Perovic O. Antimicrobial susceptibility of organisms causing community-acquired urinary tract infections in Gauteng Province, South Africa. S Afr Med J. 2013 Mar 15;103(6):377-81. http://www.ncbi.nlm.nih.gov/pubmed/23725955
Nitrofurantoin, oral: Nordeng H, Lupattelli A, Romøren M, Koren G. Neonatal outcomes after gestational exposure to nitrofurantoin. Obstet Gynecol. 2013 Feb;121(2 Pt 1):306-13. http://www.ncbi.nlm.nih.gov/pubmed/23344280
[10] Fosfomycin, oral: Falagas ME, Vouloumanou EK, Togias AG, Karadima M, Kapaskelis AM, Rafailidis PI, Athanasiou S. Fosfomycin versus other antibiotics for the treatment of cystitis: a meta-analysis of randomized controlled trials. J Antimicrob Chemother. 2010 Sep;65(9):1862-77. http://www.ncbi.nlm.nih.gov/pubmed/20587612

Fosfomycin, oral: Lewis DA, Gumede LY, van der Hoven LA, de Gita GN, de Kock EJ, de Lange T, Maseko V, Kekana V, Smuts FP, Perovic O. Antimicrobial susceptibility of organisms causing community-acquired urinary tract infections in Gauteng Province, South Africa. S Afr Med J. 2013 Mar 15;103(6):377-81. http://www.ncbi.nlm.nih.gov/pubmed/23725955

[11] Huttner A, Verhaegh EM, Harbarth S, Muller AE, Theuretzbacher U, Mouton JW. Nitrofurantoin revisited: a systematic review and meta-analysis of controlled trials. J Antimicrob Chemother. 2015 Sep;70(9):2456-64. https://www.ncbi.nlm.nih.gov/pubmed/26066581

Nitrofurantoin, oral: Zalmanovici Trestioreanu A, Green H, Paul M, Yaphe J, Leibovici L. Antimicrobial agents for treating uncomplicated urinary tract infection in women. Cochrane Database Syst Rev. 2010 Oct 6;(10):CD007182. https://www.ncbi.nlm.nih.gov/pubmed/20927755

Nitrofurantoin, oral: Lewis DA, Gumede LY, van der Hoven LA, de Gita GN, de Kock EJ, de Lange T, Maseko V, Kekana V, Smuts FP, Perovic O. Antimicrobial susceptibility of organisms causing community-acquired urinary tract infections in Gauteng Province, South Africa. S Afr Med J. 2013 Mar 15;103(6):377-81. http://www.ncbi.nlm.nih.gov/pubmed/23725955

Nitrofurantoin, oral: Nordeng H, Lupattelli A, Romøren M, Koren G. Neonatal outcomes after gestational exposure to nitrofurantoin. Obstet Gynecol. 2013 Feb;121(2 Pt 1):306-13. http://www.ncbi.nlm.nih.gov/pubmed/23344280

[12] Amoxicillin/clavulanic acid – Children ≤ 35 kg: Bosch FJ, van Vuuren C, Joubert G. Antimicrobial resistance patterns in outpatient urinary tract infections--the constant need to revise prescribing habits. S Afr Med J. 2011 May;101(5):328-31. http://www.ncbi.nlm.nih.gov/pubmed/21837876

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Zorc JJ, Kiddoo DA, Shaw KN. Diagnosis and management of pediatric urinary tract infections. ClinMicrobiol Rev. 2005 Apr;18(2):417-22. http://www.ncbi.nlm.nih.gov/pubmed/15831830

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Bamford C, Bonorchis K, Ryan A, Hoffmann R, Naicker P, Maloba M, Nana T, Zietsman I, Govind C. Antimicrobial susceptibility patterns of Escherichia coli strains isolated from urine samples in South Africa from 2007-2011. South Afr J Epidemiol Infect 2012;27(2):46-52. http://www.sajei.co.za/index.php/SAJEI/article/view/483

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Lewis DA, Gumede LY, van der Hoven LA, de Gita GN, de Kock EJ, de Lange T, Maseko V, Kekana V, Smuts FP, Perovic O. Antimicrobial susceptibility of organisms causing community-acquired urinary tract infections in Gauteng Province, South Africa. S Afr Med J. 2013 Mar 15;103(6):377-81. http://www.ncbi.nlm.nih.gov/pubmed/23725955 Amoxicillin/clavulanic acid – Children ≤ 35 kg: Fitzgerald A, Mori R, Lakhanpaul M, Tullus K. Antibiotics for treating lower urinary tract infection in children. Cochrane Database Syst Rev. 2012 Aug 15;8:CD006857. http://www.ncbi.nlm.nih.gov/pubmed/22895956

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Keren R, Chan E. A meta-analysis of randomized, controlled trials comparing short- and long-course antibiotic therapy for urinary tract infections in children. Pediatrics. 2002 May;109(5):E70-0. http://www.ncbi.nlm.nih.gov/pubmed/11986476

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Downs SM. Technical report: urinary tract infections in febrile infants and young children. The Urinary Tract Subcommittee of the American Academy of Pediatrics Committee on Quality Improvement. Pediatrics. 1999 Apr;103(4):e54. http://www.ncbi.nlm.nih.gov/pubmed/10103346

Amoxicillin/clavulanic acid – Children ≤ 35 kg: American Academy of Pediatrics. Committee on Quality Improvement. Subcommittee on Urinary Tract Infection. Pediatrics. 1999 Apr;103(4 Pt 1):843-52. Erratum in: Pediatrics1999 May;103(5 Pt 1):1052, 1999 Jul;104(1 Pt 1):118. 2000 Jan;105(1 Pt 1):141. http://www.ncbi.nlm.nih.gov/pubmed/10103321

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Kennedy KM, Glynn LG, Dineen B. A survey of the management of urinary tract infection in children in primary care and comparison with the NICE guidelines. BMC Fam Pract. 2010 Jan 26;11:6. http://www.ncbi.nlm.nih.gov/pubmed/20102638

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Shann F. Drug doses, 15th edition, 2010. Intensive Care Unit,Royal Children's Hospital, Parkville, Victoria 3052, Australia.

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Triomed, RSA. Package insert for Augmaxcil®S, SF (Powder for suspension, suspension forte). 1997.

Amoxicillin/clavulanic acid – Children ≤ 35 kg: Montini G, Toffolo A, Zucchetta P, Dall'Amico R, Gobber D, Calderan A, Maschio F, Pavanello L, Molinari PP, Scorrano D, Zanchetta S, Cassar W, Brisotto P, Corsini A, Sartori S, Da Dalt L, Murer L, Zacchello G. Antibiotic treatment for pyelonephritis in children: multicentre randomised controlled non-inferiority trial. BMJ. 2007 Aug 25;335(7616):386. http://www.ncbi.nlm.nih.gov/pubmed/17611232

[13] Azithromycin, oral: National Department of Health, Essential Drugs Programme: Primary Health Care STGs and EML, 2018. http://www.health.gov.za/

Azithromycin, oral: Azithromycin: Lau CY, Qureshi AK. Azithromycin versus doxycycline for genital chlamydial infections: a meta-analysis of randomized clinical trials. Sex Transm Dis. 2002 Sep;29(9):497-502. http://www.ncbi.nlm.nih.gov/pubmed/12218839

[14] Ciprofloxacin – cystitis associated with prostatitis: Lewis DA, Gumede LY, van der Hoven LA, de Gita GN, de Kock EJ, de Lange T, Maseko V, Kekana V, Smuts FP, Perovic O. Antimicrobial susceptibility of organisms causing community-acquired urinary tract infections in Gauteng Province, South Africa. S Afr Med J. 2013 Mar 15;103(6):377-81. http://www.ncbi.nlm.nih.gov/pubmed/23725955

SOUTH AFRICAN NATIONAL DEPARTMENT OF HEALTH
NEMLC SUMMARY REPORT ON UPDATES MADE TO THE
THE STANDARD TREATMENT GUIDELINES AND ESSENTIAL MEDICINE LIST GUIDANCE PRODUCTS

PRIMARY HEALTHCARE LEVEL

PHC CHAPTER 8: KIDNEY AND UROLOGICAL DISORDERS

Report Version	**Date**	**Detail**
V1.0	18 August 2026	**General measures- proteinuria screening** The urine Protein Creatinine Ratio (PCR) units used to quantify protein levels been corrected. **Acute pyelonephritis** • Adults: Acute Pyelonephritis (Patients awaiting transfer) Ceftriaxone, IV/IM added • Children: Acute Pyelonephritis (Patients awaiting transfer) Ceftriaxone IM,80/kg/ dose amended to a limit of up to 1 g. **Renal Calculi** • Morphine IM/IV dose aligned with PHC Chp 20: Pain **Urinary Tract Infections** • Amoxicillin/clavulanic acid, oral dose amended

Specific guidance products

No	Guidance Product	*Tick*	*Number*
1.	Primary Healthcare Level STGs – Chp 8: Kidney and Urological Disorders	✓	*8*

Summary Tables

Medicine Amendments

STG/SECTION	**GUIDANCE PRODUCTS (Tick relevant)**				**MEDICINE / MANAGEMENT**	**ADDED / DELETED / AMENDED**	**TI* CONSIDERATIONS (if applicable)**
	PHC STGs & EML	AH STG & EML	PaedH STG & EML	TQ EML			
Report Version v1.0							
8.1 Chronic Kidney Disease (General measures)	✓	✓			• Screening for proteinuria	• The urine Protein Creatinine Ratio (PCR) units used to quantify protein	N/a

						levels been corrected	
Section 8.4: Acute Pyelonephritis (Patients awaiting transfer)	✓			✓	• Ceftriaxone, IV/IM	• **Adults**- Empiric dose of 1g IM/IV added. • **Children**- IM dose capped at 1g.	N/a
Section 8.4 Urinary Tract Infections	✓				• Amoxicillin/clavulanic acid oral suspension	• Dose amended	
8.11: Renal calculi	✓			✓	• Morphine IV/IM	• Dose corrected to align with source chapter PHC Chp20: Pain	N/a
Report Version v2.0							
xxx							

*Therapeutic Interchange

8.1 Chronic Kidney Disease

- The urine Protein Ratio (PCR) units used to quantify protein levels in cases of persistent proteinuria have been corrected to align with the thresholds outlined in the general measures section. The STG has been amended accordingly as follows:

Previous STG	Updated STG
» 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.	» 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/g or > 0.015 g/mmol. This is equivalent to 1 g per 24 hours.

8.4 Acute Pyelonephritis

- For adult patients with acute pyelonephritis awaiting referral, a single empiric dose of ceftriaxone 1 g IV has been added to the STG as a pragmatic recommendation, aligned with PHC Chapter 6 (Obstetrics and Gynaecology), which also recommends a fixed initial dose of 1 g for patients awaiting referral. Additional guidance has been added for addition of this dose. The STG has been amended as follows:

Adults

- Ceftriaxone, IM or IV, 1 g immediately as a single dose.
  - Ensure adequate hydration with intravenous fluids where indicated.
  - Include the dose, route and time of administration in the referral letter.

- In children, the Ceftriaxone, IM, 80 mg/kg/dose recommended has been capped at a maximum dose of up to 1g (See dosing table: Appendix IV), to align with the empiric adult dosing recommended above. The STG has been amended as follows:

Children

» Ensure adequate hydration with intravenous fluids.

- Ceftriaxone, IM, 80 mg/kg/dose immediately as a single dose up to a maximum dose of 1g. See dosing table: Appendix IV.
  - ~~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.

8.4 Urinary Tract Infection

Update and Rationale

It is recommended that the amoxicillin/clavulanic acid oral suspension dosing, frequency and product ratio be aligned across indications in both the Primary Healthcare (PHC) and Paediatric Hospital Level (PaedHL) STGs and EML.

The update would be to amended amoxicillin/clavulanic acid dosing in children to:

- approximately 45 mg/kg/dose twice daily with weight band dosing;
- using the 14:1 ratio (600/42.9 mg/5 ml) oral solution.

Specialist ID Paediatricians are unaware of twice daily amoxicillin/clavulanic acid dosing studied (PK/PD/clinical comparisons with more frequent dosing) outside acute otitis media (persistent/recurrent).Amoxicillin has a short half-life of 1-1.3 hours, however the higher dose of in combination with clavulanate may mitigate in favour of the now 12 hourly dosing regimen as far as Gram-negative & anaerobic infections are concerned. *Also noting that increased concentrations of antibiotics are often achieved in the urinary tract which is an advantage (assuming the pathogens (usually Gram-negatives) causing a UTI are susceptible which is quite often not the case and calls into question the use of co-amoxiclav as first-line empiric treatment of UTIs in children as compared to adults).*

The higher 90 mg/kg/day dose of amoxicillin component of the combination overcomes potential or confirmed low level penicillin-resistant pneumococcal infections.

The 14:1 ratio formulation avoids overdosing of clavulanic acid (>10 mg/kg/day) which is thought to be the driver of clavulanate dose-dependent diarrhoea with amoxicillin/clavulanic acid when trying to achieve the higher doses using using lower ratio combinations of amoxicillin/clavulanic acid.

It has been reported that Red Cross Children's Hospital has implemented this standardised dosing strategy for amoxicillin/clavulanic acid oral suspension and have reported that it has simplified pharmacy ordering and storage, and resulted in less prescriber errors.

Weight based dosing table

The NEMLC approved weight-based dosing table (included in the PaedHL STGs and EML) will be retained for dosing guidance:

Amoxicillin/Clavulanic Acid (14:1 Ratio) 600mg/42.9mg/5 ml

- Amoxicillin/clavulanic acid, oral, 45 mg/kg/dose of amoxicillin component, 12 hourly.

Weight *kg*	Dose (amoxicillin component) *mg*	600mg/42.9/5ml Solution (14:1)		875mg/125mg Capsule	Age
>2–2.5 kg	96 mg	**0.8**	**mL**	–	>34–36 weeks
>2.5–3.5 kg	120 mg	**1**	**mL**	–	>36 weeks–1 month
>3.5–5 kg	180 mg	**1.5**	**mL**	–	>1–3 months
>5–7 kg	240 mg	**2**	**mL**	–	>3–6 months
>7–11 kg	360 mg	**3**	**mL**	–	>6–18 months
>11–14 kg	480 mg	**4**	**mL**	–	>18 months–3 years
>14-17.5 kg	720 mg	**6**	**mL**	**1**	>3–5 years
>17.5–25 kg	900 mg	**7.5**	**mL**	**1**	>5–7 years
>25	1200 mg	**10**	**mL**	**1**	>7 years

- **Amoxicillin/clavulanic acid recommendation for children: Dose, frequency and formulation amended.**

The text was amended as follows:

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~~ 45 mg/kg/dose of amoxicillin component, 12 hourly (amoxicillin/clavulanic acid in a ratio of 14:1) for 7 days.

- Maximum dose of amoxicillin component: 1.5 g 12 hourly. (See dosing table: Appendix IV)

~~**Weight**~~ ~~kg~~	~~**Dose**~~ ~~mg (amoxicillin component)~~	~~**Use one of the following**~~			~~**Age**~~ ~~months/years~~
		~~**Susp**~~ ~~125/31.5 mg/5 mL~~	~~**Susp**~~ ~~250/62.5 mg/5 mL~~	~~**Tablet**~~ ~~500/125 mg/tab~~	
~~>3.5–5kg~~	~~75 mg~~	~~3 mL~~	~~1.5 mL~~	~~–~~	~~>1–3 months~~
~~>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~~

8.11 Renal calculi

- The recommended IM/IV morphine dose for renal calculi has been revised to align with the dosing in PHC Chapter 2 (Gastro-intestinal Conditions) for renal and biliary colic, which is consistent with PHC Chapter 20 (Pain) as follows:

Previous STG	Updated STG

MEDICINE TREATMENT	**MEDICINE TREATMENT**
Adults: Analgesia for pain, if needed: *LoE:IVb* Morphine, IM, 0.1 mg/kg 30 minutes, to a maximum of 10 mg (doctor initiated).	Adults: Analgesia for pain, if needed: *LoE:IVb* • Morphine, IM, 5–10 mg, (Doctor prescribed) o May be repeated after 4–6 hours if needed or until patient is referred. **OR** • Morphine, IV, (Doctor prescribed). o Dilute 10 mg up to 10 mL with sodium chloride, 0.9%. » Administer morphine, IV, 3–5 mg as a single dose, then further boluses of 1– 2 mg/minute and monitor closely. o Total maximum as a single dose: 10 mg. o Repeat after 4 hours if needed or until the patient is o referred. o Monitor response to pain and effects on respiration and BP.