

TREATMENT**First trimester**

- heparin, IV, 5 000 units as a bolus, followed by 1 000–1 200 units/hour as an infusion
OR
heparin, SC, 10 000 units twice daily
Control dose with APTT to keep it 1.5–2.5 times normal.
- OR**
Low molecular weight heparin (LMWH), e.g:
enoxaparin, SC, 1 mg/kg twice daily

**Women with prosthetic valves should receive LMWH ONLY if antifactor Xa levels can be monitored weekly.
Pre-dosing level 0.6 units/mL and a 4-hour peak level of 1–1.2 units/mL.**

Second trimester

- warfarin, oral, 5 mg daily
Control with INR to keep within the therapeutic range (2–3).

After 36 weeks

- heparin, IV, 5 000 units as a bolus, followed by 1 000–1 200 units/hour as an infusion
OR
heparin, SC, 10 000 units twice daily
Control dose with APTT to keep it 1.5–2.5 times normal.
Stop heparin on the morning of elective Caesarean section or when in established labour, and re-start after delivery.

PROPHYLAXIS**First and third trimester**

- heparin, SC, 5 000 units twice daily

Antibiotics

Endocarditis prophylaxis is not indicated following uncomplicated vaginal delivery or Caesarean section.

Procedures for which endocarditis prophylaxis is not recommended:

- if infection is not suspected
- Caesarean section or vaginal hysterectomy
- dilatation and curettage
- uncomplicated vaginal delivery
- therapeutic abortion
- sterilisation procedures
- insertion or removal of intrauterine devices

Procedures for which endocarditis prophylaxis is indicated include:

- vaginal delivery in the presence of suspected infection such as with prolonged rupture of membranes or manipulative vaginal deliveries

Refer Section 3.4: Endocarditis, Infective.

CARDIAC FAILURE

As for non-pregnant women, except that **ACE-inhibitors** are contra-indicated.

If a vasodilator is needed:

- hydralazine, oral, 25 mg 4 times daily
Maximum dose: 200 mg/day.

PLUS

- isosorbide dinitrate, oral, 20 mg, 3–4 times daily
Maximum dose : 160 mg/day.

DELIVERY

Contraction and retraction of the uterus after delivery increases the total peripheral resistance, and causes a relative increase in circulating volume. This may precipitate pulmonary oedema.

In women with NYHA grade II dyspnoea or more:

- furosemide, IV, 20 mg with delivery of the baby
Monitor for 48 hours thereafter for pulmonary oedema.

6.5 HYPEREMESIS GRAVIDARUM

O21.9

DESCRIPTION

Recurrent vomiting leading to ketosis, generally in the first trimester.

Exclude:

- medical causes, e.g. thyrotoxicosis
- molar pregnancy

NON-DRUG TREATMENT

Counselling.

Frequent small, dry meals.

Avoid fatty and spicy foods.

Restrict oral intake for 24–48 hours, but ensure adequate intravenous hydration.

Baked fresh ginger root, 250 mg four times daily may have benefit.

DRUG TREATMENT

Correct electrolyte imbalance with IV fluids.

- pyridoxine, oral, 25 mg 8 hourly
- metoclopramide, oral/IV, 10–20 mg 6 hourly as needed
- vitamin B complex, IV, 10 mL

In refractory cases:

- prednisone, oral, 20–40 mg daily

OR

If oral route unsuitable:

- dexamethasone, IM/IV, 4–8 mg daily

6.6 PRE-ECLAMPSIA/ECLAMPSIA

O15.9

DESCRIPTION

DBP > 90 mmHg on two occasions or > 110 mmHg on one occasion, after 20 weeks' gestation

PLUS

proteinuria > 300 mg/24 hours, or 500 mg/L, or
urinary **protein-creatinine ratio** > 0.034 g/mmol,
in a woman who is not hypertensive outside pregnancy.

The main pathology is widespread endothelial damage from a placental endotheliotoxin. This affects all systems, particularly arterioles, coagulation, kidneys, liver and CNS.

NON-DRUG TREATMENT

Prevention

Advise adequate dietary calcium (1 200 mg daily).

Bed rest, preferably in hospital.

Lifestyle adjustment and diet.

Monitor BP, urine output, renal and liver function tests, platelet count, proteinuria and foetal condition.

Consider delivery when risks to mother outweigh risks of prematurity to baby.

DRUG TREATMENT

- oxytocin, IV/IM, 10 units as a single bolus after delivery of the baby

Ergot-containing drugs are contraindicated in hypertensive women, including pre-eclampsia, following delivery of the baby.

Pre-eclamptic and eclamptic women are hypovolaemic, particularly when the haematocrit exceeds 40%, but also susceptible to pulmonary oedema. Consequently, hypotension is a risk during anaesthesia. Careful infusion of IV fluids is important. Blood-loss at Caesarean section should be limited.

Both epidural and spinal anaesthesia may be used for operative delivery in hypertensive women, including pre-eclampsia. This should be administered by an experienced person, with meticulous attention to IV fluid management and haemodynamic monitoring.

Epidural analgesia is ideal for labour and delivery, but should only be undertaken by experienced practitioners in a unit properly equipped for resuscitation and with facilities available for urgent operative delivery. Excessive IV fluids should be avoided; there is no need for IV fluid loading in labour.

Assisted delivery is advocated to prevent the woman from bearing down.

PRE-ECLAMPSIA**Prevention**

For women at high risk of pre-eclampsia, e.g. pre-eclampsia in a previous pregnancy, chronic hypertension or severe hypertension:

- aspirin, soluble, oral, 75 mg daily

Calcium supplementation

There is clear evidence from randomised trials that calcium supplementation for women with inadequate dietary calcium reduces the risk of pre-eclampsia.

1 g elemental calcium/day, e.g.:

- calcium carbonate 168 mg tablets, oral, 6 tablets daily with food
Administer at least 4 hours before or after iron supplementation.

Treatment

Drug treatment will be dictated by blood pressure response.

Monitor progress until a stable result is achieved.

In general, diuretics are contra-indicated for hypertension in pregnant women.

When needed, combine drugs using lower doses of the three agents before increasing the doses to a maximum.

- methyldopa, oral, 250 mg twice daily, increase to 500 mg 4 times daily
Maximum dose: 2 g/day

AND/OR

- nifedipine, extended release, oral, 30 mg daily, increase to 60 mg daily

AND/OR

- hydralazine, oral, 25 mg 3 times daily, increase to 50 mg 4 times daily

In women with pre-eclampsia in a previous pregnancy, in chronic hypertension or severe hypertension, once blood pressure is controlled:

ADD

- aspirin, soluble, oral, 75 mg daily

ECLAMPSIA

This treatment is recommended for:

- imminent eclampsia
- eclampsia
- severe pre-eclampsia, particularly in the presence of complications

PLUS

- magnesium sulphate, IM, 2 doses of 5 g with 1 mL lidocaine 1% followed by 5 g, 4 hourly
Continue until 24 hours after delivery.

In high-care setting:

- magnesium sulphate, IV, 4 g in 20 mL sodium chloride 0.9% over 20 minutes

Follow with:

- magnesium sulphate, IV infusion, 1 g/hour

Check knee reflexes, and if absent or respiratory rate < 16/minute, stop magnesium sulphate and consider calcium gluconate:

- calcium gluconate 10%, IV, 10 mL given slowly at a rate not exceeding 5 mL/minute

If urine output < 100 mL/ 4 hours, stop magnesium sulphate.

ECLAMPTIC SEIZURE IN PROGRESS

- clonazepam, slow IV, 1 mg

Notify the person who will resuscitate the child that a benzodiazepine has been given to the mother.

REFERRAL

- all cases of eclampsia to a high or intensive care facility

6.7 HYPERTENSION IN PREGNANCY

O10.9

NON-DRUG TREATMENT**Lifestyle modification**

The average weight gain during the last 2 trimesters is 2 kg/month. If the prepregnancy BMI is > 25%, weight gain of less than this should be attempted.

Salt restriction, e.g. remove the salt from the table, avoid processed foods and gradually reduce added salt in food preparation. Increase potassium intake from fresh fruits and vegetables.

No alcohol should be taken.

Follow a prudent eating plan, i.e. low fat, high fibre and unrefined carbohydrates, with adequate fresh fruit and vegetables.

Regular moderate exercise, e.g. 30 minutes brisk walking 3–5 times/week.

Stop smoking.

Fetal surveillance by symphysis-fundus height (SFH) growth carefully monitored and antepartum fetal heart monitoring at least weekly after 28 weeks.

Induction of labour should be considered in:

- cases with BP persistently $\geq 160/110$ mmHg,
- pregnancy of 37 weeks duration or more, or
- in the presence of maternal or fetal compromise, e.g. poor SFH growth and oligohydramnios, etc.

DRUG TREATMENT

See treatment of pre-eclampsia.

6.7.1 HYPERTENSIVE EMERGENCY

Preload with:

- sodium chloride 0.9%, IV infusion, 300 mL
 - nifedipine, oral, 5–10 mg, half-hourly if needed until SBP < 170 mmHg and DBP < 110 mmHg
Swallow whole.
Do not chew, bite or give sublingually.
- OR**
- hydralazine, oral, 25 mg every half-hour if needed until SBP < 170 mmHg and DBP < 110 mmHg

If unable to take oral:

- labetalol, IV infusion, 2 mg/minute to a total of 1–2 mg/kg

6.8 JAUNDICE IN PREGNANCY

O26.6

DESCRIPTION

Jaundice associated with pregnancy may be due to one of the following:

- intrahepatic cholestasis of pregnancy,
- acute fatty liver of pregnancy (acute yellow atrophy of the liver),
- as a result of severe pre-eclampsia or eclampsia,
- as a result of hyperemesis gravidarum.

Consider non-pregnancy related causes of jaundice, e.g. hepatitis.

REFERRAL

- all, as certain causes of jaundice in pregnancy have a high mortality

6.9 LABOUR INDUCTION

O80

If induction is medically indicated.

NON-DRUG TREATMENT

Reassurance.

Cervix favourable and confirmed HIV negative mother

Artificial rupture of the membranes.

Cervix unfavourable

Extra-amniotic saline infusion: recommended if attempts at ripening the cervix with prostaglandins fail.

Pass a Foley catheter with 30 mL bulb through cervix with sterile technique.

Inflate bulb with 50 mL water or sodium chloride 0.9%.

Tape catheter to thigh with light traction.

Attach sodium chloride 0.9% 1 L with giving set to catheter.

Infuse sodium chloride 0.9% at 50 mL/ hour.

Remove after 24 hours if catheter has not fallen out.

DRUG TREATMENT

Cervix favourable

- oxytocin, IV, 2 milliunits/minute
Titrate dose to achieve desired response.
Dilute 2 units oxytocin in 1 L Ringer–Lactate solution to make a solution of 2 milliunits/mL.

Cervix unfavourable

Prostaglandins, e.g.:

- dinoprostone gel, intravaginally, 1–2 mg
OR
dinoprostone tablets, intravaginally, 0.5–1 mg
OR

misoprostol, vaginal, 25 mcg,
after 4 hours follow with:
misoprostol, oral, 25 mcg 2-hourly until in labour.

In nulliparous women, if no response to first 2 doses:
increase to 50 mcg 2 hourly. Vaginal dose may be omitted.

Oral misoprostol may be given as freshly made-up solution of one 200 mcg tablet
in 200 mL water, i.e. 1 mcg/mL solution. Give 25 mL 2 hourly.

Stop misoprostol administration when in established labour.

Maximum 24 hours.

If no response, consider extra-amniotic saline infusion.

Never use oxytocin and misoprostol simultaneously.

Misoprostol and other prostaglandins are contraindicated in women with previous
Caesarean section and relatively contraindicated in grand multiparous women.

Note:

Misoprostol is not registered for this indication in South Africa.

**Misoprostol in larger doses than indicated here for labour induction at
term, may cause uterine rupture.**

Only to be prescribed by a doctor experienced in Maternal Health.

6.10 LABOUR PAIN, SEVERE**NON-DRUG TREATMENT**

Antenatal counselling.

Psychological support from family member, friend or volunteer 'doula'.

Keeping women informed about the progress of labour, and reassurance with careful
explanation of the procedures performed, may reduce the need for analgesic drugs.

Anticipate the need for analgesia rather than waiting for severe distress.

DRUG TREATMENT

- morphine, slow IV, 10 mg, at the onset of a uterine contraction
OR
pethidine, slow IV, 100 mg at the onset of a uterine contraction
- promethazine, slow IV/IM, 25 mg
OR
morphine, IM, 10 mg 4 hourly
OR
pethidine, IM, 100 mg 4 hourly
Titrate dose and dose frequency according to pain.
Supplement with premixed nitrous oxide 50%/ oxygen 50% in late first stage.

Absorption from intramuscular injections during labour is poor.
The preferable route is IV.

For intrauterine death

Use analgesia as frequently as requested.

- morphine, IV/IM, 10–15 mg 3–4 hourly
Titrate dose and dose frequency according to pain.

Regional anaesthetic, epidural anaesthesia or caudal block

- bupivacaine without adrenaline
Do not exceed 2 mg/kg (maximum 150 mg) in any 4-hour period, or 400 mg in 24 hours.

Perineal analgesia:

- lidocaine, 1 or 2%, infiltration, locally or by a pudendal block

Postpartum and post-episiotomy pain

- morphine or pethidine, as appropriate.
- ibuprofen, oral, 400 mg three times daily with meals

6.11 POSTPARTUM FEVER

O75.2

DESCRIPTION

During delivery the woman's protective barrier against infections is temporarily reduced and this may lead to infections.

The cause of fever may be a serious complication and is often preventable by attention to aseptic techniques.

NON-DRUG TREATMENT

Prevent deep vein thrombosis.

Complete evacuation of uterine contents.

Hysterectomy may be indicated in severe uterine sepsis.

Attention to breast engorgement.

DRUG TREATMENT

Antibiotic treatment, where appropriate, should be guided by the presumed source of infection.

Empiric antibiotic therapy

- ampicillin, IV, 1 g 6 hourly

PLUS

- metronidazole, IV, 500 mg 8 hourly

OR

- metronidazole, oral, 400 mg 8 hourly

PLUS

- gentamicin, IV, 5 mg/kg/day in a single daily dose

After defervescence, intravenous ampicillin can be changed to:

- amoxicillin, oral, 500 mg 8 hourly

6.12 POSTPARTUM HAEMORRHAGE

072

DESCRIPTION

Blood loss > 500 mL after birth of the baby or any blood loss which is regarded as excessive.

NON-DRUG TREATMENT

Massage uterus.

Ensure delivery of placenta.

Check for local causes of bleeding

Compress the abdominal aorta in situations where bleeding is not responsive to above measures when transferring or waiting for definitive treatment.

DRUG TREATMENT

Prevention

Active management of the 3rd stage of labour:

- oxytocin, IM, 10 units

AND

controlled cord traction.

TREATMENT

Resuscitate.

- oxytocin, IV, 20–40 units in 1 L sodium chloride 0.9% at 60 drops/minute

If necessary:

ADD

- ergometrine, IM/IV, 0.2–0.5 mg

OR

- oxytocin 5 units **plus** ergometrine 0.5 mg, IM/IV
Avoid ergometrine in women with hypertension or cardiac disease, except in severe cases where the benefit is considered to outweigh the risk.
Ergometrine may be repeated as needed up to a maximum of 1 mg in 24 hours.

For non-repsonsive cases

- dinoprost 5 mg/mL, intramyometrial
Dilute 1 mL to 10 mL.
Give 2 doses of 1 mL of dilute solution at different sites.

6.13 PRETERM LABOUR AND PRETERM RUPTURE OF MEMBRANES**DESCRIPTION**

Preterm: < 37 weeks gestation.

Most problems occur at < 34 weeks' gestation.

Confirm ruptured membranes by sterile vaginal speculum examination if not clinically obvious.

Preterm labour confirmed by regular uterine contractions with progressive cervical changes.

NON-DRUG TREATMENT

Assess fetal wellbeing.

Estimate fetal weight.

Deliver if amniocinitis suspected.

DRUG TREATMENT

Pre-hydrate before administration of nifedipine:

- sodium chloride 0.9%, IV, 500 mL
Continue with 125 mL/hour during treatment.

- nifedipine, oral, 20 mg

If contractions persist, follow with 10 mg after 30 minutes then 10 mg 4 hourly for up to 24 hours.

OR

If gestation below 30 weeks:

- indomethacin, oral, 50 mg

If contractions persist, follow with 25 mg 4 hourly for 24–48 hours.

To improve fetal lung maturity at 26–34 weeks:

- betamethasone, IM, 12 mg, 2 doses 24 hours apart

OR

dexamethasone, IM, 12 mg, 2 doses 24 hours apart

A single dose of steroid may be repeated weekly if the mother remains at risk of imminent preterm birth and the gestation is < 32 weeks.

Antibiotics

Indicated routinely for ruptured membranes and selectively for preterm labour with intact membranes if high risk for infection.

- amoxicillin, oral, 500 mg 8 hourly

PLUS

- metronidazole, oral, 400 mg 8 hourly for 10 days

OR

- erythromycin, oral, 250 mg 6 hourly for 10 days
- PLUS**
- metronidazole, oral, 400 mg 8 hourly for 10 days

Prepare for appropriate care of preterm infant.

REFERRAL

- a fetus requiring neonatal intensive care: weight <1 500 g or gestation less than 34 weeks
- a fetus requiring specialised treatment after birth, e.g. surgery
- severely ill mother

6.14 RHESUS INCOMPATIBILITY

O36.0

NON-DRUG TREATMENT

Amniocentesis (after 22 weeks) is indicated if atypical antibodies are found in the mother's serum.

Test for maternal serum antibodies at 'booking', 28 and 34 weeks' gestation.

DRUG TREATMENT

Maternal serum antibodies absent

During pregnancy, give prophylactic anti-D immunoglobulin to the mother within 72 hours of a potentially sensitising event.

After an abortion, threatened miscarriage or amniocentesis:

- anti-D immunoglobulin, IM, 50 mcg

After external cephalic version:

- anti-D immunoglobulin, IM, 100 mcg

At birth, determine the Rh status of the cord blood and request a Coombs' test:

Cord blood Rh negative - no treatment.

Cord blood Rh positive, Coombs negative:

- anti-D immunoglobulin, IM, 100 mcg

If a large fetomaternal transfusion is suspected:

- anti-D immunoglobulin, IM, 300 mcg for every 25 mL transfusion

Maximum dose: 1 200 mcg

PLUS

Do a maternal blood Kleihauer test.

Rh positive, Coombs positive. In these cases the mother will also have antibodies.

No anti-D immunoglobulin.



CHAPTER 6

OBSTETRICS

Maternal serum antibodies present

A titre less than 1:16 - repeat in 4 weeks' time.

A titre of 1:16 or more - refer to a specialist for further management.

In units where middle cerebral artery Doppler studies are available, cordocentesis for Hb estimation and packed cell transfusion should be performed once the Doppler indicates fetal anaemia.

6.15 SUPPRESSION OF LABOUR, ACUTE (TOCOLYSIS)

O62.9

DESCRIPTION

Tocolysis is useful to treat fetal distress in labour and to suppress labour in women needing transfer or awaiting Caesarean section. Also used prior to external cephalic version.

DRUG TREATMENT

β_2 -stimulant, e.g.:

- hexoprenaline, slow IV, 5–10 mcg over 10 minutes
Stop the injection if the maternal pulse > 120/minute.

6.16 SYPHILIS

A53.9

DIAGNOSTIC CRITERIA

Positive syphilis serology (RPR).

NON-DRUG TREATMENT

Inform contact(s).

DRUG TREATMENT

- benzathine benzylpenicillin (depot formulation), IM, 2.4 million units weekly for 3 doses

Penicillin allergy:

- erythromycin, oral, 500 mg 6 hourly for 28 days

Note:

Erythromycin for syphilis is not sufficient to prevent congenital syphilis. For penicillin sensitive patients, the penicillin desensitisation regimen is an option. If penicillin is not used, the baby must be regarded as inadequately treated and given penicillin after delivery.



CHAPTER 7 NEPHROLOGICAL/UROLOGICAL DISORDERS

7.1 NEPHROLOGY SECTION

7.1.1 CHRONIC KIDNEY DISEASE (CKD)

D64.9

DESCRIPTION

Kidney damage for > 3 months defined by structural or functional abnormalities of the kidney, with or without a decreased GFR (see below). It manifests by:

- pathological abnormalities, e.g. biopsy proven glomerular disease, or
- markers of kidney damage, including:
 - abnormalities in the composition of blood or urine e.g. proteinuria or haematuria, or
 - abnormalities in imaging tests e.g. small kidneys on ultrasound.

GFR < 60 mL/minute for > 3 months with or without kidney damage. GFR calculated using the Cockcroft and Gault formula:

$$\text{CrCl (mL/minute)} = \frac{(140 - \text{age}) \times \text{weight (kg)}}{0.82 \times \text{plasma Cr (micromol/L)}}$$

*in males

*In females, multiply plasma Cr by 0.85 instead of 0.82.

Common causes of CKD include:

- hypertension
- diabetes
- glomerular disease (idiopathic, HIV, Hepatitis B and C and systemic lupus erythematosus)
- polycystic kidney disease

Chronic kidney disease can be entirely asymptomatic.

TREATMENT AND PREVENTION STRATEGIES ACCORDING TO STAGES

Adverse outcomes of chronic kidney disease can often be prevented or delayed through early detection and treatment of risk factors and CKD. Earlier stages of chronic kidney disease can be detected through routine laboratory measurements. The presence of chronic kidney disease should be established, based on presence of kidney damage e.g. sonar or renal biopsy; and level of kidney function e.g. estimating GFR (see staging below). The diagnosis of CKD is made irrespective of diagnosis i.e. Glomerulonephritis or Diabetic Nephropathy

CHAPTER 7 NEPHROLOGICAL/UROLOGICAL DISORDERS

In patients with CKD, the stage of disease should be assigned based on the level of kidney function according to the classification below, irrespective of diagnosis.

STAGING OF KIDNEY DISEASE

Stage/ glomerular filtration rate (mL/minute/1.73)	Description	Action Includes actions from preceding stages
Stage 0 or GFR > 90	<ul style="list-style-type: none">at increased risk CKD (with CKD or CVD risk factors)	<ul style="list-style-type: none">screeningCKD risk reductionCVD risk reduction
Stage 1 or GFR > 90	<ul style="list-style-type: none">kidney damage with normal or ↑ GFR	<ul style="list-style-type: none">diagnose and treat comorbid conditionsslow progressionCVD risk reduction
Stage 2 or GFR 60–89	<ul style="list-style-type: none">kidney damage with mild ↓ GFR	<ul style="list-style-type: none">estimate progression
Stage 3 or GFR 30–59	<ul style="list-style-type: none">moderate ↓ GFR	<ul style="list-style-type: none">evaluate and treat complications
Stage 4 or GFR 15–29	<ul style="list-style-type: none">severe ↓ GFR	<ul style="list-style-type: none">prepare for kidney replacement therapy
Stage 5 or ESRD or GFR < 15 or on dialysis	<ul style="list-style-type: none">kidney failure requiring renal replacement therapyEnd Stage Renal Disease (ESRD)	<ul style="list-style-type: none">renal replacement therapy, i.e. dialysis or transplant if uraemia present

NON-DRUG TREATMENT

Limit salt intake.

Low protein diet until CKD stage 4.

Reduce CVD risk factors – See Section 3.5: Hypertension

See Sections:

7.1.3: Glomerular Disease and Nephritic Syndrome

7.1.4: Glomerular Disease and Nephrotic Syndrome

7.1.6: End Stage Renal Disease (ESRD) - CKD Stage 5

DRUG TREATMENT

The following interventions may delay progression of renal disease.

PROTEINURIA REDUCTION

Determine the amount of proteinuria and assess the risk for deterioration with a 24-hour urinary protein excretion rate (PER) or spot albumin creatinine ratio (mACR), (i.e. mg/mmol is done if urine dipsticks is negative for protein otherwise use protein creatinine ratio (PCR), i.e g/mmol if urine dipsticks positive for protein). The ideal target is: proteinuria < 300 mg/24 hours or albumin creatinine ratio < 100 mg/mol or PCR < 0.10 g/mmol.

Aim for a stable or increasing GFR and declining proteinuria.



CHAPTER 7

NEPHROLOGICAL/UROLOGICAL DISORDERS

Note:

A normal decline in GFR is observed with ageing at a rate of 1 mL/minute/year after 45 years.

Changes in renal structural should be stable or improve as evidenced by imaging tests or kidney biopsy.

ACE inhibitor

Start an ACE-inhibitor and up titrate to the maximum dose, if tolerated.

A decline in function may occur but observe patient every 1–2 weekly to allow GFR to settle. There is no level of GFR/creatinine or at which an ACE-inhibitor is contraindicated, but use with caution in advanced CKD.

However, if GFR/creatinine continues to decline after 4–6 weeks of treatment, consider stopping the ACE-inhibitor. Consult a specialist if necessary.

Check serum potassium when:

- using higher doses of ACE-inhibitor and
- CKD stage 3 or greater is present.

If ACE-inhibitor cannot be used, use other antiproteinuric drugs, i.e. β -blocker and/or nondihydropyridine CCBs, e.g. verapamil.

Note:

These drugs are not as good as ACE-inhibitors for proteinuria reduction.

Optimise blood pressure control with additional antihypertensive agents, BP control results in a lowering of proteinuria and slower decline in GFR.

Target BP < $^{130}/_{80}$ mmHg.

HYPERLIPIDAEMIA

When hyperlipidaemia is a co-existent risk factor, add an HMGC_oA reductase inhibitor (statin), e.g.:

- simvastatin, oral, 10 mg daily

DIABETES MELLITUS

In diabetics, optimise control.

Avoid oral hypoglycaemics if GFR is < 60 because of the risk of lactic acidosis with metformin and prolonged hypoglycaemia with long acting sulphonylureas.

As CKD stages progress the following problems may become difficult to treat:

HYPERTENSION

See Section 3.5: Hypertension

Note:

BP control results in a lowering of proteinuria and slower decline in GFR.

Mortality increases when SBP < 100 mmHg in dialysis patients.

FLUID OVERLOAD AND OEDEMA

- furosemide, oral

When GFR < 60 mL/minute, titrate to a maximum of 500 mg twice daily.



CHAPTER 7 NEPHROLOGICAL/UROLOGICAL DISORDERS

Furosemide is no longer indicated when the patient is anuric.
Furosemide is ineffective when patient is on dialysis and anuric.
Beware of over diuresis at lower stages of CKD i.e. Stages 4 or lower.

HYPOCALCAEMIA AND HYPERPHOSPHATAEMIA

The aim is to lower phosphate levels and maintain normal calcium levels to ensure calcium phosphate product < 4.4 i.e. $\text{Ca} \times \text{PO}_4$ in mmol/L to prevent calcium deposition in vessels and tissue which aggravates vascular disease.

The following drug treatment should be initiated by a specialist as patients may require parathyroid surgery to control calcium and phosphate:

For low serum phosphate and calcium:

- calcium carbonate, oral, 500–1 500 mg/day in divided doses with meals or between meals. Specialist initiated.

For hyperphosphataemia uncontrolled on calcium carbonate:

- aluminium hydroxide, oral, 20 mL three times daily. Specialist initiated.
To prevent dementia-associated aluminium toxicity, do not use for longer than 3 months.

For hyperparathyroidism, initiate when when PTH levels > 2 –3 times normal:

- calcitriol, oral, 0.25–4 mcg in divided doses. Specialist initiated.
Monitor Ca^{++} and PO_2 and PTH levels regularly.

ANAEMIA ASSOCIATED WITH CKD IN HOSPITALS WITH DIALYSIS UNITS

Patients on chronic haemodialysis or peritoneal dialysis are often anaemic due to iron deficiency and deficiency of erythropoietin.

In CKD, especially CKD stage 4–5:

- iron, IV. Specialist initiated.
The use of oral iron is insufficient to correct iron stores.

AND

- erythropoietin, SC/IV. Specialist nephrologist initiated.

Definitive treatment, e.g. transplantation, usually improves this condition. It is important to identify factors likely to aggravate the condition, e.g. iron deficiency and infection.

ACIDOSIS AND HYPERKALAEMIA

See Section 7.1.5: Acute Renal Failure.

REFERRAL

- CKD Stage 4 – $\text{GFR} < 30$ mL/minute
- CKD Stage 3 – $\text{GFR} < 60$ mL/minute where complications exist which require drugs not available at secondary hospital e.g. hyperparathyroidism and anaemia
- unknown cause of kidney failure or as per glomerular disease below
- uncontrolled hypertension with CKD stage 3 or more

CHAPTER 7 NEPHROLOGICAL/UROLOGICAL DISORDERS

Patients who qualify for dialysis or who have complications should be referred early to ensure improved outcome and survival on dialysis. i.e. GFR < 30.
Dialysis should ideally be started when the patient is mildly symptomatic and before nutritional status begins to deteriorate.

7.1.2 GLOMERULAR DISEASES (GN)

N00–N08

DESCRIPTION

Many different diseases act on the glomeruli and may be a result of a primary insult to the kidney, or may be secondary to a systemic disorder. The effects of glomerular damage are relatively similar whatever the cause and can present with:

- reduced GFR
- proteinuria
- haematuria
- hypertension and oedema.

Nephrotic syndrome is the advanced clinical syndrome associated with severe protein leakage and fluid overload.

Nephritic syndrome is the advanced clinical syndrome of haematuria associated with glomerular injury, sodium and water retention or hypoalbuminaemia.

REFERRAL

All patients with:

- unexplained haematuria on two consecutive visits
- nephritic syndrome, i.e. acute glomerulonephritis
- proteinuria > 1 g/24 hours or equivalent on spot protein urine test and/or nephrotic syndrome for possible kidney biopsy
 - Spot protein urine test: protein creatinine ratio (PCR). Test urine in the morning. Discard 1st waking specimen.
 - Not accurate in presence of heart failure, urinary tract infection, menstruation or sepsis.
- uncontrolled hypertension with CKD
- severe kidney dysfunction, i.e. reduced GFR – CKD Stage 4 < 30 mL/minute
- progressive decline in kidney function
- nephrotic syndrome associated with:
 - thrombo-embolic complications
 - complications of longstanding hyperlipidaemia
 - gross fluid retention
- all new patients with nephrotic and nephritic syndrome for biopsy and blood investigations depending on type of glomerular disease suspected or found

Where facilities are available investigation and management is usually done with guidance or referral to a nephrologist.

CHAPTER 7

NEPHROLOGICAL/UROLOGICAL DISORDERS

7.1.3 GLOMERULAR DISEASE AND NEPHRITIC SYNDROME

N01/N03

DESCRIPTION

Presents clinically as an acute glomerulonephritis with haematuria and an acute fall in glomerular filtration rate (GFR), sodium retention and water retention with hypertension.

NON-DRUG TREATMENT

Regulate fluid and electrolyte balance. Monitor weight closely.

Dietary modification if severe kidney dysfunction e.g.: restrict protein, potassium and phosphorus intake.

Avoid nephrotoxins: e.g. drugs excreted by the kidney and NSAIDs.

Treat severe hypotension and hypertension adequately to prevent renal failure or worsening of renal failure

See Section 7.1.1: Chronic Kidney Disease (CKD).

DRUG TREATMENT

The management of glomerular disease is individualised and dependent on the type of glomerular disease.

Management should be carried out or guided by a nephrologist according to the biopsy result.

General management:

See Section 7.1.1: Chronic Kidney Disease (CKD).

For streptococcal infection of the throat and skin to prevent acute post-streptococcal glomerulonephritis:

- phenoxymethylpenicillin, oral, 500 mg 12 hourly for 10 days

Penicillin has no role in established post-streptococcal glomerulonephritis.

7.1.4 GLOMERULAR DISEASE AND NEPHROTIC SYNDROME

N04

DESCRIPTION

Glomerular disease characterised by:

- severe proteinuria, i.e.:
 - 2.5 g/day, or greater
 - as determined by a spot urine protein measurement, i.e. protein creatinine ratio (PCR).

Note:

mACR is only used if urine dipsticks is negative for protein.

and

- resultant clinical picture which includes:
 - oedema
 - hypoproteinaemia and
 - hyperlipidaemia.

The cause cannot be determined accurately without a biopsy.



CHAPTER 7 **NEPHROLOGICAL/UROLOGICAL DISORDERS**

NON-DRUG TREATMENT

Regulate salt and fluid intake.

Weigh daily.

Postural BP for monitoring fluid loss and to prevent excessive diuresis.

Evaluate proteinuria with albumin creatinine ratio (ACR):

- initially – weekly
- when discharged – monthly, until stable
- every 3–6 months – 24 hour urine, if possible

Evaluate electrolytes frequently, especially in the early period of diuresis as patients may require potassium.

DRUG TREATMENT

The management of glomerular disease is individualised and dependent on the type of glomerular disease.

Management should be carried out or guided by a nephrologist according to the biopsy result.

Specialist therapy may include a variety of immunosuppressive agents.

General management to prevent deterioration of GFR:

See Section 7.1.1: Chronic Kidney Disease (CKD).

THROMBOTIC COMPLICATIONS

See Section 3.7: Venous Thrombo-Embolism.

Beware of renal and deep vein thromboses (RVT and DVT).

RVT is rarely symptomatic with flank pain, haematuria, raised LDH.

High risk patients:

- immobile patient
- those with membranous nephropathy diagnosed on renal biopsy
- albumin < 20 g/L or fibrinogen > 6 g/L

In patients with intractable nephrotic syndrome and serum albumin < 20 g/L despite therapy, consider anticoagulation with warfarin, until condition has improved.

DIALYSIS

May be indicated for worsening renal failure and pulmonary oedema – See indications for acute dialysis below.

7.1.5 ACUTE RENAL FAILURE (ARF)

N17

DESCRIPTION

This is reversible kidney failure, most commonly as a result of:

- pre-renal ARF, e.g. dehydration and fluid loss
- intra-renal kidney ARF, e.g. acute tubular necrosis or acute glomerulonephritis
- post-renal ARF, e.g. cervical cancer and ureteric obstruction.



CHAPTER 7 **NEPHROLOGICAL/UROLOGICAL DISORDERS**

Often combinations of above occur, i.e. dehydration with pre-renal ARF and resultant ischaemia causing intra-renal kidney ARF from acute tubular necrosis (ATN).

NON-DRUG TREATMENT

Establish cause of ARF with good history and clinical examination.
Treat all patients as if renal failure is potentially reversible.

DRUG TREATMENT

PRIMARY THERAPY- HOW TO AVOID DIALYSIS

1. Identify patients at risk

Risk factors include:

- volume depletion
- hypotension
- elderly
- contrast media
- myoglobinuria
- previous hypertension
- cirrhosis
- haemoglobinuria
- post op or post procedures
- previous renal dysfunction
- diabetes
- heart failure
- alcoholism
- HIV

Evaluate current drug treatment and stop all potential nephrotoxins e.g. certain antibiotics and NSAIDs.

2. Early referral and consultation with expert/experienced clinician

- hypotensive episode
- reduced urine output
- Cr > 180 micromol/L
- worsening creatinine e.g. doubling of serum creatinine over 24 hours

3. Aggressive fluid replacement and optimise volume status

- sodium chloride 0.9%

If associated acidosis, see fluid preference below.

Note:

No proven role for:

- mannitol
- calcium channel blockers
- theophylline
- dopamine

4. Short trial of furosemide only after adequate fluid replacement

If volume status and BP is satisfactory:

- furosemide, IV, 250 mg in 50 mL dextrose 5%, infused over 1–4 hours

OR

furosemide, IV, 250 mg 6 hourly for 24 hours administered over at least 20 minutes

Maximum dose: 1 g/24 hours.