PHC Chapter 21: Emergencies and injuries

The conditions described in this chapter are emergencies and must be treated as such. Medicines used for treatment must be properly secured and recorded (time, dosage, route of administration) on the patient's notes and on the referral letter.

Determine the priority of patients' treatments based on the severity of their condition, using a triage system appropriate to your level of care, available resources and staff at your facility.

21.1 CARDIAC ARREST

21.1.1 CARDIAC ARREST, ADULTS

I46.0/I46.9

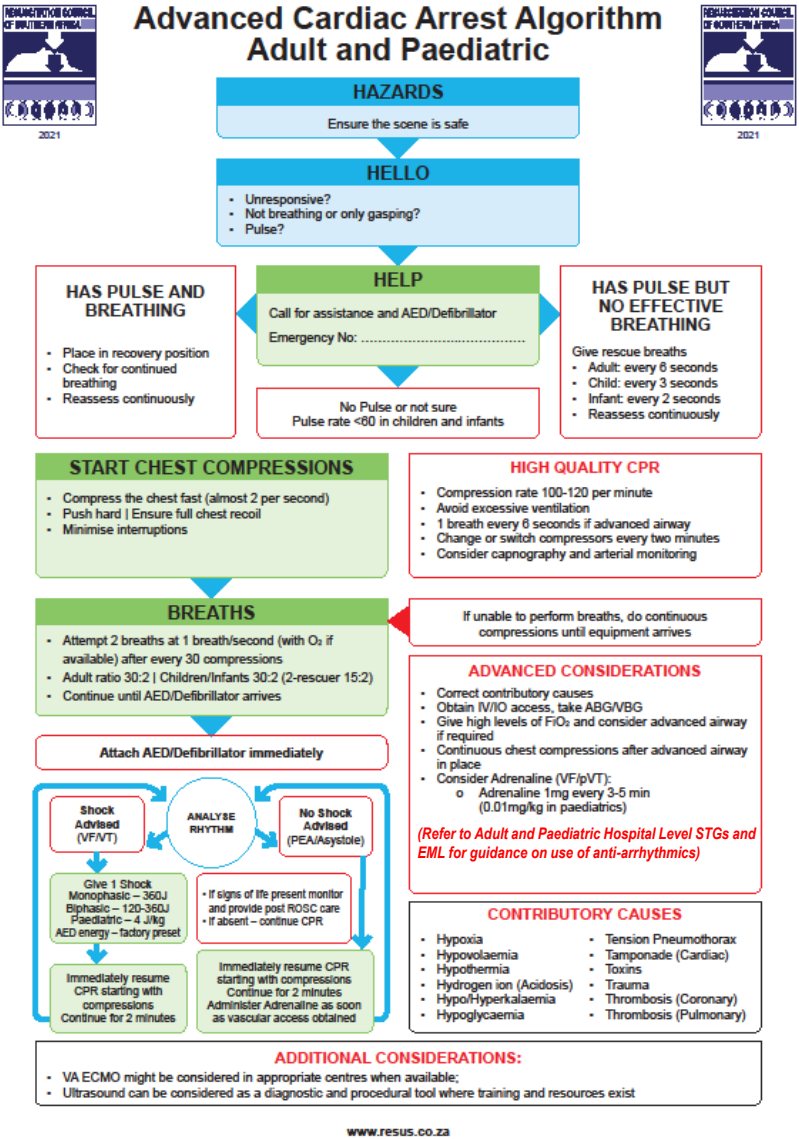


Figure 21.1: Advanced cardiac arrest algorithm *(adapted with permission from the Resuscitation Council of South Africa)*

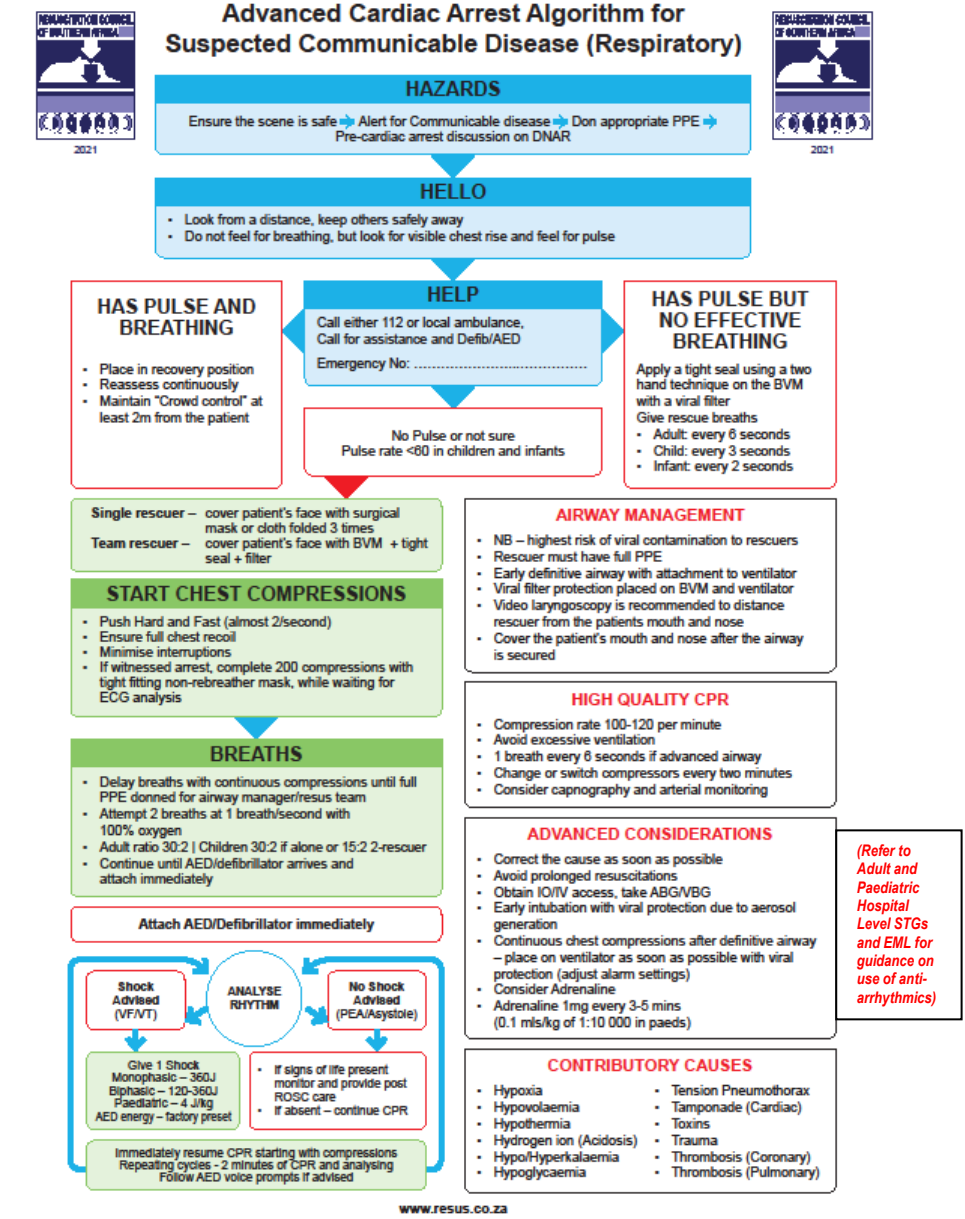


Figure 21.2: Advanced cardiac arrest algorithm - suspected respiratory communicable disease *(adapted with permission from the Resuscitation Council of South Africa)*

DESCRIPTION

Defined as the loss of a heart beat and loss of a palpable pulse, irrespective of the electrical activity captured on ECG tracing.
Irreversible brain damage can occur within 2-4 minutes.
Clinical features include:

» sudden loss of consciousness;
» absent carotid pulse; and
» loss of spontaneous respiration.

COVID-19 CONSIDERATIONS

LoE: IVb[1]

» The infection risk that CPR poses to providers due to aerosolization of coronavirus particles is not negligible.
» This potential risk should be weighed against the probability of achieving spontaneous return of circulation to inform the decision to initiate or stop CPR.
» For in hospital cardiac arrest in patients with suspected COVID-19, CPR has been shown to not be beneficial unless an immediate reversible cause is suspected, e.g., dislodgement of ET tube, etc. and is therefore not recommended.
» For out of hospital cardiac arrest in patients with suspected COVID-19, it is recommended to not start conventional CPR in unwitnessed cardiac arrest as it will likely not be beneficial.
» Appropriate PPE should be worn by all staff before initiating CPR: FFP3 mask, visor, gloves and gown.

GENERAL MEASURES

LoE: IIIb[2]

» Diagnose cardiac arrest rapidly.
» Make a note of the time of starting resuscitation.
» Document medication given and progress after the resuscitation.
» Follow instructions as per the appropriate algorithm (Fig 21.1 or 21.2) and below.

EMERGENCY TREATMENT

Hazards, Hello, Help

» Assess for any hazards and remove. Make use of personal protective equipment i.e. gloves, masks.
» Speak to the patient. If they respond, turn into recovery position and continue management as directed by findings.
» If no response, check for carotid pulse and breathing. Take no longer than 10 seconds.
» Call for skilled help and an automated external defibrillator (AED) or defibrillator.

Cardiopulmonary resuscitation (CPR)

» Place the patient on a firm flat surface and commence resuscitation immediately.
» Initiate CAB (Circulation Airway Breathing) sequence of CPR.
» Check the rhythm as soon as defibrillator or AED is available and defibrillate if a shockable rhythm is identified.

Circulation

» If there is no pulse or you are not sure, start with 30 chest compressions at a rate of 100-120 compressions per minute, and a depth of +/-5 cm.
» Allow full chest recoil between compressions.

» Minimise interruptions during compressions.

Airway and **B**reathing

» To open the airway, lift the chin forward with the fingers of the one hand and tilt the head backwards with other hand on the forehead. Do not do this where a neck injury is suspected (see below).
» If there is no normal breathing, give 2 breaths with bag-valve-mask resuscitator and face mask.
» The administered breaths must cause visible chest rise.
» If not able to perform breaths, continue compressions (reposition head and insert correctly sized oropharyngeal airway and try again after 30 compressions).
» If advanced airway is placed, administer 1 breath every 6 seconds without interrupting chest compressions. Avoid excessive ventilation.
» Oxygenate with 100% oxygen.
» Repeat the cycle of 30 compressions followed by 2 breaths (30:2) until the AED or defibrillator arrives.

Where neck injury is suspected:

» Do not perform a chin lift or head tilt manoeuvre if a neck injury is suspected.
» To open the airway, use a jaw thrust:
  - place your fingers behind the jaw on each side
  - lift the jaw upwards while opening the mouth with your thumbs "Jaw thrust"
» Ideally use a 3rd person to provide in-line manual stabilisation of the neck

Initiate fluids, IV/IO access

- Sodium chloride 0.9%, IV, 1000 mL *LoE: IIb*[3]

AED/Defibrillator

Attach leads and analyse rhythm as soon as the defibrillator arrives:

If pulseless with shockable rhythm (ventricular fibrillation/tachycardia)

» Defibrillate, as indicated per algorithm (1 shock).
» Immediately resume CPR. Starting with chest compressions.
» Continue CPR cycles of 30:2 for 2 minutes, then reassess for a pulse.
» Administer adrenaline (epinephrine) as per algorithm and medicine treatment below.
» Seek reversible cause of arrest.
» Continue CPR until spontaneous breathing and/or pulse returns.

If pulseless and no respirations with non-shockable rhythm

» Immediately resume CPR. Starting with chest compressions.
» Continue CPR cycles of 30:2 for 2 minutes then reassess for a pulse.
» Administer adrenaline as per algorithm.
» Seek reversible cause of arrest.
» Continue CPR until spontaneous breathing and/or pulse returns.

IMMEDIATE EMERGENCY MEDICINE TREATMENT:

Adrenaline (epinephrine) is the mainstay of treatment. Give immediately, IV, IO, or endotracheal, when there is no response to initial resuscitation or defibrillation.

- Adrenaline (epinephrine 1 mg), 1:1 000, 1 mL , IV immediately as a single dose.
  - Flush with 5–10 mL of sterile water or sodium chloride 0.9%.
  - Repeat every 3–5 minutes during resuscitation.

OR

- Adrenaline (epinephrine 1 mg), intra-osseous (IO), 1:1 000, 1 mL, via IO line. *LoE: IVb*[4]

ADDITIONAL GUIDANCE

Connect bag-valve-mask resuscitator to 100% oxygen at 10-15L/min flow.
Check glucose and treat hypoglycaemia.
Continue CPR until spontaneous breathing and/or heart beat returns.
Assess continuously (every 2 minutes) until the patient shows signs of recovery.

Termination of resuscitation:

» The decision to stop CPR attempts depends on the specifics of the individual patient and should be based on clinical judgement.
» Consider stopping resuscitation attempts and pronouncing death if there is incurable underlying disease, or if asystole > 20 minutes or in the absence of the factors for prolonging resuscitation as listed below.

LoE: IIIb[5]

Consider carrying on for longer especially with:

» hypothermia and drowning
» poisoning or medicine overdose
» neurotoxic envenomation (e.g. black and green mamba or Cape cobra snakebite) – see Section 21.3.1.4: Snakebites

This decision should take into consideration the potential risk that CPR poses to the rescuer e.g. infectious diseases.

REFERRAL

All patients: transfer with supportive care and accompanying skilled worker until care is taken over by doctor at receiving institution.

21.1.2 CARDIOPULMONARY ARREST, CHILDREN

I46.0/I46.9

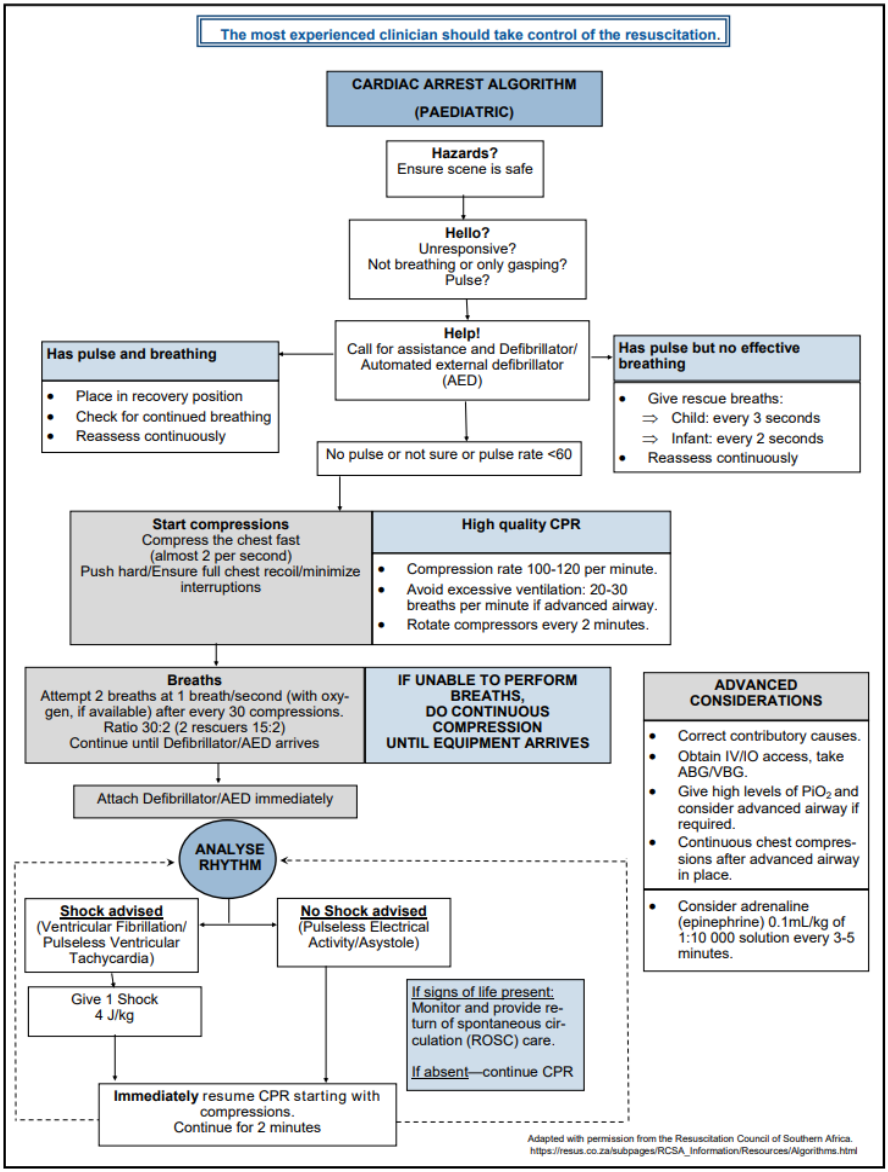


Figure 21.3 Advanced cardiac arrest algorithm for children

DESCRIPTION

Cardiopulmonary arrest is the cessation of respiration or cardiac function and in children is usually a pre-terminal event as a result of a critical illness.

The most effective treatment of cardiorespiratory arrest in children is the prevention of the arrest by early recognition and management of severe disease.
Bradycardia in children is a pre-terminal event and needs to be treated with resuscitation.

Cardiorespiratory arrest in children usually follows poor respiration, poor circulation or poor respiratory effort (e.g. prolonged seizures, poisoning, neuromuscular weakness etc.).

The following table outlines signs of serious disease/impending cardiorespiratory failure in a child. These are an indication that urgent effective management is needed.

	Neurological	Respiratory	Circulatory
Signs of impending cardio-respiratory failure/ severe disease	Decreased level of consciousness or extreme weakness	Increased respiratory rate: > 60 breaths/minute	Increased heart rate: > 160 beats/min in infants > 120 beats/min in children
	Abnormal posture	Marked chest indrawing	Decreased pulse volume
	Pupils – unequal or abnormal size	Grunting	Capillary refill time > 3 seconds
	Presence of convulsions	Flaring nostrils, gasping, shallow/irregular breathing	Poor colour: bluish, grey or marked pallor

GENERAL MEASURES

» Diagnose the need for resuscitation rapidly.
» Make a note of the time of starting.
» Place the patient on a firm flat surface and commence resuscitation immediately.
» Document timings of interventions, medication and any response to these. (Ideally, during resuscitation, one staff member should act as a 'scribe').
» Collect all ampoules used and total them at the end.

EMERGENCY TREATMENT

Hazards, Hello, Help

» Assess for any hazards and remove. Make use of personal protective equipment i.e. gloves, masks.
» Call for skilled help and an automated external defibrillator (AED) or defibrillator.

Cardiopulmonary resuscitation (CPR)

Circulation

» Check for signs of life and presence of central pulse for 5–10 seconds. In younger children (infants) check brachial or femoral pulse, in older children use femoral or carotid pulse.
» If there is no pulse (or pulse < 60 beats/minute) with no signs of life, give 30 chest compressions at a rate of 100-120 compressions/minute.
» Compress over lower half of sternum and compress chest by approximately 1/3 of the anteroposterior diameter of the chest.
» Allow chest to fully recoil before next compression.

» Minimise interruptions in compressions.

Airway

» Manually remove obvious visible obstruction from the mouth.

CAUTION

Do not use blind finger sweeps of the mouth or posterior pharynx as this can impact any obstruction further down the airway.

» In neonates and infants: position the head in neutral position. In children: position in the sniffing position.
» Lift the chin forward with the fingers under the bony tip of the jaw.

Breathing

» If there is no breathing, give breaths:
  - preferably with bag-valve-mask resuscitator

  or

  - mouth-to-nose (covering child's mouth AND nose with your mouth)

  or

  - mouth-to-mouth (occluding nose by pinching child's nostrils).

» Give 2 effective breaths at one breath/second.
» Breaths must produce visible chest rise.

Then

» If 2 rescuers are present, carry out cycles of 15 chest compressions followed by 2 breaths (15:2).
» If only 1 rescuer present, carry out cycles of 30 compressions to 2 breaths (30:2).
» Review after 2 minutes or 5 cycles - if pulse is not palpable continue CPR sequence until help arrives.

- Oxygenate with 100% oxygen, if available.

Keep patient covered and warm while resuscitating (although the patient should be fully exposed for short periods during examination).

IMMEDIATE EMERGENCY MEDICINE TREATMENT:

» Estimate the weight of the child by using a paediatric resuscitation tape (PAWPER tape or Broselow tape). If not available, use the following calculation: *LoE: IIIb*[6]

Weight *[kg]* = (Age *[yrs]* + 4) X 2

» If still no pulse or signs of life after cardiac compressions and ventilations:

- Adrenaline (epinephrine), IV, 0.1 mL/kg of 1:10 000 solution.
  - To make an 1:10 000 adrenaline (epinephrine) solution, dilute 1 mL ampoule of adrenaline (epinephrine) (1:1000) with 9 mL of sodium chloride 0.9% to give 10 mL of 1:10 000 solution.
  - Administer dose according to table below.
  - If no IV line is available, the same dose may be given IO.

Weight kg	Dose mg	Volume of diluted solution (1: 10 000 solution)	Age months/years
>2.5–7 kg	0.05 mg	0.5 mL	Birth–6 months
>7–11 kg	0.1 mg	1 mL	>6–18 months
>11–17.5 kg	0.15 mg	1.5 mL	>18 months–5 years
>17.5–25 kg	0.2 mg	2 mL	>5–7 years
>25–35 kg	0.3 mg	3 mL	>7–11 years
>35–55 kg	0.5 mg	5 mL	>11–15 years

Treat hypoglycaemia if present

- Dextrose 10%, solution, IV, 2–5 mL/kg.
  - To make 20 mL of 10% dextrose solution: draw 4 mL of 50% dextrose using 20 mL syringe and add 16 mL of sodium chloride 0.9% or water for injection.
  - After dextrose bolus, commence dextrose 5–10% infusion, 3–5 mL/kg/hour to prevent blood glucose dropping again.
  - Re-check the blood glucose after 15 minutes: if blood sugar is still low: give further bolus of dextrose 10%, IV, 2 mL/kg and continue dextrose infusion.
  - Assess continuously until the patient shows signs of recovery.

ADDITIONAL GUIDANCE

Consider stopping resuscitation attempts and pronouncing death if:

» No signs of life are present after 30 minutes of active resuscitation or in the absence of the factors for prolonging resuscitation as listed below. A doctor must be called before resuscitation is stopped. If no doctor on site, telephonic consultation should take place.

Consider carrying on for longer especially with

» hypothermia and drowning
» poisoning or medicine overdose
» neurotoxic envenomation (e.g.black and green mamba or Cape cobra snakebite) – see Section 21.3.1.4: Snakebites

This decision should take into consideration the potential risk that CPR poses to the rescuer e.g. infectious diseases.

REFERRAL

All patients: transfer with supportive care and accompanying skilled worker until care is taken over by doctor at receiving institution.
For guidance on neonatal resuscitation, see Section 6.6.2: Neonatal resuscitation.

21.1.3 BRADYCARDIA

R00.1

Refer to Adult Hospital Level and Paediatric Hospital Level STGs and EML for relevant guidance.

DESCRIPTION

In adults, bradycardia refers to a pulse rate <50 beats/minute.

In children, bradycardia refers to a pulse rate <60 beats/minute despite effective oxygenation and ventilation.

GENERAL MEASURES

» Assess ABC:
  - Airway: ensure airway is open and clear.
  - Breathing: give oxygen to target pulse oximeter saturation of 94–98%.
  - Circulation: assess peripheral perfusion, measure pulse and blood pressure.
» Attach ECG monitor, pulse oximeter and blood pressure cuff.
» Establish IV access.
» Print rhythm strip to confirm bradycardia; if possible, do 12 lead ECG.
» Assess for signs of instability:
  - Hypotension
  - Chest pain
  - Signs of shock: cold clammy peripheries and weak pulses
  - Altered mental status
  - Acute heart failure

MEDICINE TREATMENT:

Adults

If unstable:

- Atropine, IV, 0.5 mg as a bolus.
  - Repeat every 3–5 minutes, if no response.
  - Maximum dose: 3 mg.

» Look for and treat contributory causes for bradycardia (see table below).
» If no response to atropine, discuss with referral centre or refer to Adult Hospital Level STGs and EML for guidance.

If stable:

Look for and treat contributory causes for bradycardia (see table below):

Contributory causes for bradycardia and treatment	
Hypoxia	Give supplemental oxygen or ventilate.
Hypothermia	Warm the patient.
Head injury	Give oxygen, elevate head of bed.
Heart block	Look for cause of heart block.
Hydrogen ion (acidosis)	Look for cause of acidosis.
Hypotension	If no signs of heart failure: • Sodium chloride 0.9%, IV, 200 mL.
Toxins and therapeutic agents	Treat as for specific overdose.

Table 21.1: Causes and treatment of bradycardia

Children

If unstable:

» Start CPR:
  - 30 compressions: 2 breaths (1 rescuer), or
  - 15 compressions: 2 breaths (2 rescuers)

- Adrenaline (epinephrine), IV, 0.1 mL/kg of 1:10 000 solution (Doctor prescribed).
  - To make 1:10 000 adrenaline (epinephrine) solution: dilute 1 mL ampoule of adrenaline (epinephrine) (1:1000) with 9 mL of sodium chloride 0.9% to give 10 mL of 1:10 000 solution.
  - Administer dose every 3–5 minutes, according to table below.

Weight kg	Dose mg	Volume of diluted solution (1: 10 000 solution)	Age months/years
>2.5–7 kg	0.05 mg	0.5 mL	Birth–6 months
>7–11 kg	0.1 mg	1 mL	>6–18 months
>11–17.5 kg	0.15 mg	1.5 mL	>18 months–5 years
>17.5–25 kg	0.2 mg	2 mL	>5–7 years
>25–35 kg	0.3 mg	3 mL	>7–11 years
>35–55 kg	0.5 mg	5 mL	>11–15 years

If heart block or increased vagal tone suspected: *LoE: IVb*[7]

- Atropine, IV, 0.02 mg/kg/dose as a single dose (Doctor prescribed).
  - Maximum single dose: 0.5 mg.
  - Repeat dose, if no response.

If stable: *LoE: IVb*[8]

» Look for and treat contributory causes for bradycardia (see Table 21.1 above).
» Close monitoring required.
» Ensure adequate oxygenation and ventilation if necessary.

REFERRAL

Urgent

All patients: transfer with supportive care and accompanying skilled worker until care is taken over by doctor at receiving institution.

21.1.4 TACHYDYSRHYTHMIAS

R00.0

Refer to Adult and Paediatric Hospital Level STGs and EML for relevant guidance.

DESCRIPTION

Adults: tachydysrhythmias refers to a pulse rate > 150 beats/minute.
Children: tachydysrhythmias refers to a pulse rate > normal range for age (see table).

EMERGENCY TREATMENT

Assess ABC:

» Airway: ensure airway is open and clear
» Breathing: give oxygen to target pulse oximeter saturation of 94-98%
» Circulation: assess peripheral perfusion, measure pulse and blood pressure.

Child heart rate ranges for age	
Age	**Normal heart rate range** (beats/minute)
Newborn to 3 months	85–205
3 months to 2 years	100–190
2 years to 10 years	60–140
> 10 years	60–100

Table 21.2: Child heart rate ranges

» Supraventricular tachycardia is suspected when the pulse rate > 180 beats/minute in a child and > 220 beats/minute in an infant.

» Attach ECG monitor, pulse oximeter and blood pressure cuff.
» Establish IV access.
» Print rhythm strip to confirm tachycardia, if possible do 12 lead ECG.
» Assess for signs of instability:
  - Hypotension
  - Chest pain
  - Signs of shock: cold clammy peripheries and weak pulses
  - Altered mental status
  - Acute heart failure

Adults

<u>If unstable:</u>

» Synchronised cardioversion at 100 J.
» Consider analgesia and sedation if time permits.

<u>If stable:</u>

Assess QRS length on rhythm strip or 12 lead ECG:

» If QRS < 0.12 = Narrow complex tachycardia (supraventricular tachycardia):
  - Attempt vagal stimulation: Modified valsalva manoeuvre.
    Ice water applied to face.
    Cough, breath holding.
    Carotid sinus massage (not in elderly or those with cardiac disease).
» If QRS > 0.12 = Wide complex tachycardia (ventricular tachycardia):
  - Correct electrolyte disturbances.
  - Consider toxins, overdoses.

Children

<u>If unstable:</u>

» Synchronised cardioversion at 0.5-1 J/kg initially (max 4 J/kg).
» Consider analgesia and sedation if time permits.

<u>If stable:</u>

Assess QRS length on rhythm strip or 12 lead ECG:

» If QRS < 0.08 = Narrow complex tachycardia (supraventricular tachycardia):
  - Attempt vagal stimulation: Ice water applied to face.
» If QRS > 0.08 = Wide complex tachycardia (ventricular tachycardia):
  - Correct electrolyte disturbances.
  - Consider toxins, overdoses.

REFERRAL

Urgent

All patients: transfer with supportive care and accompanying skilled worker until care is taken over by doctor at receiving institution.

21.1.5 MANAGEMENT OF SUSPECTED CHOKING/FOREIGN BODY ASPIRATION IN CHILDREN

T17.2-5/T17.8-9/ T18.0-1

If the child is **able to talk and breathe**	Encourage the child to cough repeatedly while arranging transfer to hospital urgently with supervision.
If the child is **conscious but with no effective cough or breathing**	Give up to 5 abdominal thrusts and if ineffective up to 5 back slaps, followed by re-assessment of breathing. Repeat as a cycle until recovery or child becomes unconscious. See technique below and figure 21.4 for differences between infants and children.
If the child is **unconscious with no effective breathing**	Call for assistance. Open airway and check for any visible foreign body and remove. Start CPR: compressions and breaths (30:2) (check airway for foreign body each time before giving breaths).

(Infant: < 1 year of age; Child: > 1 year of age until puberty).
Table 21.3: Managing suspected choking/foreign body aspiration in children

Techniques for back blows and chest/abdominal thrusts:

Infants

» Place the baby along one of the rescuer's arms in a head down position with baby face down.
» Rescuer to rest his/her arm along own thigh and deliver 5 back slaps to the child.
» If this is ineffective turn the baby over (face up) and lay on the rescuer's thigh in the head down position.
» Apply 5 chest thrusts – use the lower ½ of the sternum – compress at least 1/3 of the anteroposterior diameter of the chest. If baby too large to carry out on the thigh this can be done across the lap.

Children

» In older children, rather lie child across rescuer's lap to deliver back blows. Use abdominal thrusts (Heimlich manoeuvre) in place of chest thrust.
» For abdominal thrust in the standing, sitting, or kneeling position, rescuer to move behind the child and pass his/her arms around the child's body. Then, form a fist with one hand, and place against the child's abdomen above the umbilicus and below the xiphisternum. Then place the other hand over the fist and thrust both hands sharply upwards into the abdomen towards the chest.
» In the lying (supine) position, the rescuer to kneel astride the victim and do the same manoeuvre except use the heel of one hand rather than a fist.

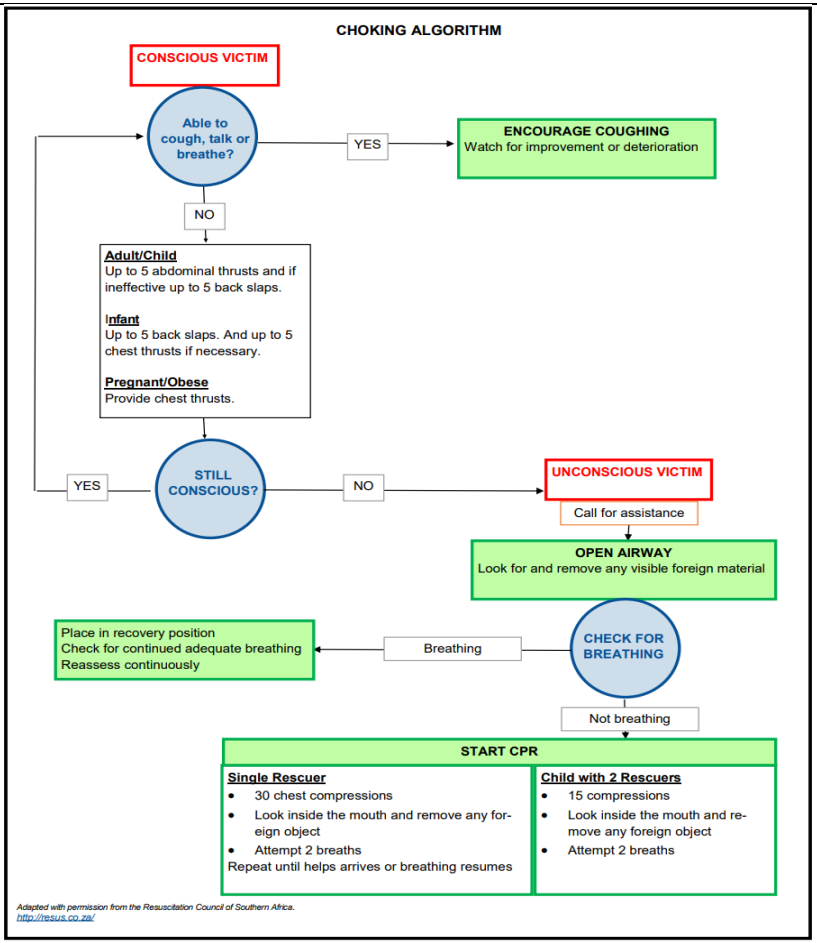


Figure 21.4 Choking algorithm

21.2 MEDICAL EMERGENCIES

21.2.1 PAEDIATRIC EMERGENCIES

Certain emergencies of the airway, breathing, circulation and neurological system are dealt with in the respiratory, cardiac, and nervous system chapters. All doctors should ensure that they have received appropriate training in at least providing basic (and preferably advanced) life support to children.

21.2.1.1 RAPID TRIAGE OF CHILDREN PRESENTING WITH ACUTE CONDITIONS IN CLINICS AND CHCS

TRIAGE OF ALL SICK CHILDREN

Triage is the process of rapidly examining all sick children when they first arrive at clinic.

- It involves the rapid examination of all sick children when they first arrive at the clinic to priotiise their care.
- They should be reassessed regularly while awaiting definitive care.
- Early recognition of life-threatening emergencies and rapid provision of appropriate care can prevent childhood deaths and reduce associated morbidity.

CATEGORIES

1. **EMERGENCIES:** Conditions that cannot wait and require immediate treatment.
2. **PRIORITY SIGNS:** Place ahead of the normal queue.
3. **NON-URGENT**: Join the queue.

1. ASSESS & TREAT AS EMERGENCIES

Conditions that cannot wait and require immediate treatment.

A&B	**AIRWAY AND BREATHING** • Not breathing, ***or*** • Obstructed breathing, ***or*** • Central cyanosis, ***or*** • Severe respiratory distress	ANY SIGN POSITIVE
C	**CIRCULATION** • Cold hands, ***and*** • Capillary refill 3 secs or more, ***and*** • Weak and fast pulse	ALL SIGNS POSITIVE
C	**COMA/CONVULSING** • Coma, ***or*** • Convulsing (at the time of evaluation)	IF COMA OR CONVULSING
D	**SEVERE DEHYDRATION** *(only in child with diarrhea)* Diarrhoea ***plus any two*** of the following: • Lethargy • Sunken eyes • Very slow skin pinch (fold visible for >2 sec)	DIARRHOEA *plus* 2 SIGNS +ve

If any emergency sign is present, give emergency treatment (s), call for help and draw blood for emergency laboratory investigations as needed.

Refer to relevant chapters of the EML for management guidance.

2. ASSESS FOR PRIORITY SIGNS

Place ahead of the normal queue.
These children need prompt assessment and treatment.

- Tiny baby (< 3 months)
- Temperature very high (>38 ^{0}C) or very low (<36.4 ^{0}C)
- Trauma or other urgent surgical condition
- Severe pallor
- History of poisoning
- Severe pain
- Respiratory distress
- Restless, continuously irritable or lethargic
- Referred for urgent attention
- Malnutrition
- Oedema of both feet
- Burns (major)

Note:
If a child has trauma or other surgical problems, get surgical help or follow surgical guidelines.

3. NON-URGENT (queue)

No emergency or priority signs.

Proceed with assessment and further treatment according to the child's priority.

Adapted from Pocketbook of Hospital Care for Children. Management of Common Childhood Illnesses. National Department of Health, South Africa, 2016. www.health.gov.za/ and the Integrated Management of Childhood Illness 2022: NDoH.

Figure 21.5: Triage of sick children

The Emergency Triage Assessment and Treatment (ETAT) triage process, presented above, should be a minimum standard of triage in community health centres.

For management guidance, refer to relevant sections of the EML as listed below:
» For foreign body aspiration see Section 21.1.5
» For acute asthma see Section 17.1.1
» For acute bronchiolitis see Section 17.1.3
» For croup see Section 17.2.1
» For shock see Section 21.2.11
» For hypoglycaemia and hypoglycaemic coma see Section 21.2.6
» For acute diarrhoea see Section 2.9.1

21.2.2 ANGINA PECTORIS, UNSTABLE

See Section 4.3: Angina pectoris, unstable/ Non ST elevation myocardial infarction (NSTEMI).

21.2.3 MYOCARDIAL INFARCTION, ACUTE (AMI)

See Section 4.4: Myocardial infarction, Acute (AMI)/ ST Elevation Myocardial Infarction (STEMI).

21.2.4 DELIRIUM

F05.0-1/F05.8-9/F44.8/R45.1/R45.4-6

DESCRIPTION

Delirium is a medical emergency.

Delirium is a disturbance in attention, awareness (reduced orientation to the environment), and cognition (e.g. deficits in memory, language, visuospatial ability, or perception). It is acute, developing within hours to days, and fluctuates during the day, worsening in the evenings. It may be hyperactive, with increased mood lability, agitation, and/or uncooperative behaviour, or hypoactive, with poor responsiveness and stupor.

Delirium should not be mistaken for psychiatric disorders like schizophrenia or a manic phase of a bipolar disorder. It is a physiological consequence of another medical condition, substance intoxication or withdrawal (including prescription or over the counter medications and recreational substances), exposure to a toxin, or multiple aetiologies.

There are many possible causes including extracranial causes. Organic or physical illness should also be considered as possible causes.

The elderly are particularly prone to delirium caused by medication, infections, electrolyte and other metabolic disturbances.

Main clinical features are:
» acute onset (usually hours to days)
» impaired awareness
» confusion
» disorientation
» a fluctuating course and disturbances of the sleep-wake cycle

Other symptoms may also be present:
» restlessness and agitation
» hallucinations

» autonomic symptoms such as sweating, tachycardia and flushing
» hypo-activity, with reduced responsiveness to the environment
» aggressiveness
» violent behaviour alone occurs in exceptional cases only

Risk factors for delirium include:

» > 65 years of age
» history of stroke, neurological disorder, falls, previous delirium
» HIV infection
» polypharmacy
» dementia
» medicines such as anticholinergics and hypnotics
» multiple comorbidities
» severe illness
» psychoactive substance intoxication and withdrawal

GENERAL MEASURES

» Perform investigations to exclude or diagnose an underlying medical problem, the treatment of which is the primary management (e.g. hypoglycaemia, hypoxia, pain etc).

Checklist for diagnosis:

D Drugs (Intoxication and withdrawal. Consider Wernicke's encephalopathy).
I Infections, e.g. sepsis, pneumonia, urinary tract infections, peritonitis, meningitis.
M Metabolic, e.g. hypoglycaemia, electrolyte abnormalities (e.g. hyponatraemia); organ failure (e.g. liver failure, renal dysfunction), CO2 narcosis.
T Trauma, e.g. chronic subdural haematoma.
O Oxygen deficit (including hypoxia, carbon monoxide poisoning).
P Psychiatric or physical conditions, e.g. severe stress or pain.

» Nurse in a calm, predictable and safe environment, avoid changes of staff or rooms/ wards.
» Maintain circadian rhythm: in the day mobilise, provide sensory stimulation/ spectacles/ hearing aids; at night avoid noise, light and procedures
» Ensure effective communication: introduce self with each patient contact, be aware of patient's non-verbal cues, listen attentively, reassure frequently.
» Re-orientate verbally, with a clock, and signage
» Assess for and address dehydration, constipation, hypoxia, infections, pain, and discomfort.
» Avoid abrupt substance withdrawal (see Section 16.9: Substance misuse).

CAUTION – physical restraint:

» Worsens the outcomes of delirious patients: this is a last resort when all else has failed and is a short-term measure until chemical restraint and other measures have been achieved.
» Manual restraint: respectful, controlled, applied by personnel of the same sex as the patient.
» Mechanical restraint: only if absolutely necessary to protect the patient and others for as short a time as possible. Document the type, sites and duration of any restraints used. 15-minute monitoring of vital signs, the mental state, restraint sites, and reasons for use.

MEDICINE TREATMENT

» Manage the underlying medical or surgical condition.
» The aim is to contain the person while awaiting transfer to hospital and to enable initial care of the underlying condition.
» Keep antipsychotic or benzodiazepine use to a minimum.
» Use small doses regularly rather than large doses less frequently.
» Adjust doses according to clinical circumstances, e.g., lower doses in the elderly, debilitated

Acute management

For severe aggression and disruptive behaviour, see Section 16.1.2 : Aggressive, disruptive behaviour in adults or Section 16.1.3 Aggressive, disruptive behaviour in children and adolescents.

If the delirium is caused by seizures or substance withdrawal, or if communication is difficult

- Midazolam, IM, 7.5–15 mg immediately.
  - Repeat after 30–60 minutes if needed.

OR

- Diazepam, slow IV, 10 mg no faster than 5 mg/minute for immediate sedative or hypnotic action.
  - If no response, give a 2nd dose after 30 to 60 minutes.

Switch to oral administration, once containment is achieved.

» Secure airway.
» Exclude hypoglycaemia.
» Monitor for respiratory depression.

CAUTION - Benzodiazepines

» Benzodiazepines, especially diazepam IV, can cause respiratory depression.
» Monitor vital signs closely during and after administration. In the frail and elderly patient or where respiratory depression is a concern, reduce the dose by half.
» The safest route of administration is oral followed by IM with the IV route having the highest risk of respiratory depression and arrest. Use the safest route wherever possible.
» In patients with respiratory insufficiency: use oral haloperidol or olanzapine oro-dispersible tablets, IM, or oral instead of IM or IV benzodiazepines.
» Do NOT use IM olanzapine with IM/IV benzodiazepines.
» In the short-term, benzodiazepines can aggravate delirium.
» Allow at least 15–30 minutes for the medication to take effect. Repeated IM doses of benzodiazepines may result in toxicity owing to accumulation.

LoE:IVb[9]

If the most likely cause of delirium is a medical disorder and if very restless or agitated:

- Haloperidol, oral, 0.75–1.5 mg, repeated in 30–60 minutes, if required

OR

If unable to swallow or oral medication declined:

- Haloperidol, IM, 0.5–1mg.

OR

If haloperidol, IM is not available:

- Olanzapine, oral dispersible tablet or IM, 2.5–5 mg.
  - Use lowest dose with caution in the elderly
  - May be repeated in 30–60 minutes, if required
  - Monitor vital signs and beware of oversedation, neuroleptic malignant syndrome, and acute dystonia.

If alcohol withdrawal/ Wernicke's encephalopathy suspected:

- Thiamine, IM, 200 mg immediately. *LoE:IVb*[10]

See Section 16.9.4: Alcohol withdrawal (uncomplicated).

CAUTION

Thiamine should preferably be administered prior to intravenous glucose to prevent permanent neurological damage.
Do not delay the dextrose administration in a hypoglycaemic patient.

REFERRAL

Urgent

All cases.

21.2.5 HYPERGLYCAEMIA AND KETOACIDOSIS

See Section 9.3.2: Severe hyperglycaemia (Diabetic ketoacidosis (DKA) & hyperosmolar hyperglycaemic state (HHS)).

21.2.6 HYPOGLYCAEMIA AND HYPOGLYCAEMIC COMA

E10.0/ /E11.0//E12.0/E13.0/ /E14.0//E16.0/E16.1/E16.2

DESCRIPTION

Hypoglycaemia is a blood glucose concentration <3 mmol/L (<2.6 mmol/L in neonate) and may rapidly cause irreversible brain damage and/or death.

Clinical features include:

- tremor
- sweating
- tachycardia
- dizziness
- hunger
- headache
- impaired concentration
- confusion
- delirium
- coma
- convulsions
- transient aphasia or speech disorders
- irritability

There may be few or no symptoms in the following situations:

- chronically low blood glucose
- patients with impaired autonomic nervous system response, e.g.
  - the elderly
  - very ill
  - those with long-standing diabetes mellitus
  - malnourished
  - treatment with beta-blockers

People at risk of hypoglycaemia:
» neonates with low birth weight or ill or not feeding well
» malnourished or sick children
» shocked, unconscious or convulsing patients
» alcohol binge
» liver disease
» diabetics on treatment

Hypoglycaemia may be a marker of deteriorating renal function.

EMERGENCY TREATMENT

» Obtain blood for glucose determination immediately.
» Establish blood glucose level with glucometers or testing strip.

Conscious patient, able to eat

Adults
- Sweets, sugar, glucose or milk by mouth.
  or
- Oral sugar solution.
  - Dissolve 3 teaspoons of sugar (15 g) in 200 mL cup of water.

Breastfeeding child
- Administer breast milk.

Older children
- A formula feed of 5 mL/kg.
  or
- Oral sugar solution.
  - Dissolve 3 teaspoons of sugar (15 g) in 200 mL cup of water; administer 5 mL/kg.
  or
- Sweets, sugar, glucose by mouth.

Conscious patient, not able to feed without danger of aspiration

Administer via nasogastric tube:
- Dextrose 10%, 5 mL/kg.
  (add 1 part 50% dextrose water to 4 parts water to make 10% solution)
  or
- Milk.
  or
- Sugar solution.
  - Dissolve 3 teaspoons of sugar (15 g) in 200 mL cup of water – administer 5 mL/kg.

Unconscious patient

Children
- Dextrose 10%, IV, 2–5 mL/kg.
  - 10% solution, e.g.: 1 part 50% dextrose water to 4 parts water for injection to make 10% solution.
  - After dextrose bolus, commence dextrose 5–10% infusion, 3–5 mL/kg/hour to prevent blood glucose dropping again.

- Re-check blood glucose after 15 minutes: if still low: give further bolus of dextrose 10%, IV, 2 mL/kg and continue dextrose infusion.
- Feed the child as soon as conscious.
- Investigate underlying cause e.g. infection.

Adults

- Dextrose 10%, IV, 5 mL/kg immediately and reassess.
  - 10% solution, e.g.: 1 part 50% dextrose water to 4 parts water for injection to make 10% solution.
  - Generally, an immediate clinical response can be expected.
  - Maintain with 5% dextrose solution infusion until blood glucose is stabilised within the normal range.
  - Investigate underlying cause e.g. infection.

LoE:IIIb[11]

LoE:IIIb[12]

Alcoholics/ malnourished (adults)

- Thiamine, IV/IM, 200 mg immediately.

CAUTION

Thiamine should preferably be administered prior to intravenous glucose to prevent permanent neurological damage.
Do not delay the dextrose administration in a hypoglycaemic patient.

Although potentially serious allergic adverse reactions may rarely occur during, or shortly after, parenteral administration, it is recommended that:
- This should not preclude the use of parenteral thiamine in patients where this route of administration is required, particularly in patients at risk of Wernicke-Korsakoff syndrome where treatment with thiamine is essential;
- Intravenous administration should be by infusion over 30 minutes;
- Facilities for treating anaphylaxis (including resuscitation facilities) should be available when parenteral thiamine is administered.

LoE:IVb[13]

REFERRAL

Urgent

» All hypoglycaemic patients on oral hypoglycaemic agents.
» Hypoglycaemic patients who do not recover completely after treatment.
» All children who have had documented hypoglycaemia (unless the cause is clearly identified and safe management instituted to prevent recurrence).

21.2.7 NOSE BLEED (EPISTAXIS)

R04.0

DESCRIPTION

Nose bleed may be caused by local or systemic diseases, or local trauma, especially nose picking, and occurs from an area anterior and inferior to the nasal septum. Consider other conditions associated with nosebleeds, especially if recurrent, e.g. hypertension and bleeding tendency.

MANAGEMENT

Acute episode
Control bleeding by pinching the nasal wings (alae) together for 5–10 minutes.
If this fails, insert nasal tampons or BIPP stripping into bleeding nostril(s), if available.
Identify underlying cause.

REFERRAL

» Recurrent nose bleeds.
» Failure to stop the bleeding.

21.2.8 PULMONARY OEDEMA, ACUTE

J81

DESCRIPTION

A life-threatening condition with abnormal accumulation of fluid in the lungs.
Common causes include acute heart failure and acute renal failure (e.g. acute nephritis).
Persons with pulmonary oedema may present similarly to acute bronchospasm.
It is important to distinguish this condition from an acute attack of asthma.

EMERGENCY TREATMENT

Place the patient in a sitting or semi-Fowlers position.

Children

- Oxygen, using a 40% face mask or nasal cannula at 2–3 L/minute.
- Furosemide, IV, 1 mg/kg immediately administered slowly over 5 minutes. See dosing table, pg 23.5.
  - Do not put up a drip or run in any IV fluids.

Adults

- Oxygen, using face mask to deliver 40% oxygen at a rate of 6–8 L/minute.

AND

- Furosemide, slow IV, 40 mg.
  If response is adequate follow with:
  - Furosemide, IV, 40 mg in 2–4 hours.

  If no response within 20–30 minutes:
  - Furosemide, IV, 80 mg.

AND

- Isosorbide dinitrate, sublingual, 5 mg immediately.
  - If needed, repeat every 5–10 minutes.
  - Do not administer if hypotensive. Monitor BP.

LoE:IVb

CAUTION

Do not use morphine for pulmonary oedema, as there is observational data providing a signal of harm.

LoE:IIIb[14]

Pulmonary oedema due to a hypertensive crisis:

To treat hypertension:
I10
ADD
- ACE-inhibitor, e.g.
- Enalapril 10 mg, oral, as a single dose and refer.

REFERRAL
Urgent
All cases.
(Continue oxygen during transfer).

21.2.9 SHOCK
R57.0-2/R57.8-9/ /T79.4/T78.2/Y57.9

DESCRIPTION
Shock is a life-threatening condition characterised by any evidence of inadequate organ perfusion.

Signs and symptoms of shock in adults
» Low blood pressure (systolic BP < 80 mmHg) is the key sign of shock.
» Weak and rapid pulse
» Rapid shallow breathing.
» Low urine output
» Restlessness and altered mental state
» Weakness

Signs and symptoms of shock in children
Shock must be recognised while still in the compensated state to avoid irreversible deterioration. Therefore, the following are primarily assessed in children:
» Prolonged capillary filling (> 3 seconds).
» Decreased pulse volume (weak thready pulse).
» Increased heart rate (>160 beats/minute in infants, > 120 beats/minute in children).
» Decreased level of consciousness (poor eye contact).
» Rapid breathing.
» The signs mentioned above are more sensitive in detecting shock before it is irreversible. Decreased blood pressure and decreased urine output are late signs of shock and can be monitored.

	Age of child (years)				
	<1	**1-2**	**2-5**	**5-12**	**>12**
Respiratory rate (breaths/min)	30–40	25–35	25–30	20–25	15–20
Heart rate (beats/min)	110–160	100–150	95–140	80–120	60–100
Systolic BP (mmHg)	80–90	85–95	85–100	90–110	100–120

Source: The Hands-on Guide to Practical Paediatrics, First Edition. Rebecca Hewitson and Caroline Fertleman. © 2014 John Wiley & Sons, Ltd. Published 2014 by John Wiley & Sons, Ltd. Companion Website: www.wileyhandsonguides.com/paediatrics
Table 21.4: Normal ranges in children:

Types of shock:
» *Hypovolaemic shock:* Most common type of shock. Primary cause is loss of fluid from circulation due to haemorrhage, burns, diarrhoea, etc.
» *Cardiogenic shock:* Caused by the failure of heart to pump effectively e.g. in myocardial infarction, cardiac failure, etc.
» *Septic shock:* Caused by an overwhelming infection, leading to vasodilation.
» *Anaphylactic shock*: Caused by severe allergic reaction to an allergen, or medicine.

EMERGENCY TREATMENT

» Maintain open airway.
• Administer face mask oxygen, if saturation < 94%. *LoE:IIb*[15]
» Consider the need for intubation and seek advice from referral centre.
» Check for and manage hypoglycaemia.
» If anaphylactic shock suspected, see Section 21.2.10: Anaphylaxis.

Intravenous fluid therapy is important in the treatment of all types of shock, except for cardiogenic shock and septic shock (as fluid-overloaded patients do not need fluid replacement) – these patients should receive a fluid challenge as detailed below. Prompt diagnosis of the underlying cause is essential to ensure optimal treatment.

Fluid replacement (avoid in cardiogenic and septic shock):

Adults
- Sodium chloride 0.9%, IV, 1 L as a rapid bolus.
  - Repeat bolus until haemodynamic status is improved.
  - Once stable, maintain IV fluids with careful monitoring of haemodynamic status; adjust infusion rate as needed to maintain stability pending transfer.

Children
- Sodium chloride 0.9% or ringers lactate, IV, 10 mL/kg as over 20 minutes.
  - Repeat bolus until haemodynamic status is improved.
  - Once stable, maintain IV fluids with careful monitoring of haemodynamic status; adjust infusion rate as needed to maintain stability pending transfer.

Note: If patient develops respiratory distress, recheck airway and breathing and discontinue fluids.

In adults with suspected cardiogenic or septic shock: give a fluid challenge:
- Sodium chloride 0.9%, IV, 500 mL over 30 minutes.
  - Assess blood pressure and pulse rate response. Response is defined by improvements in blood pressure, pulse rate and mental status (adequate cerebral perfusion) in addition to a good urine output, rather than an absolute blood pressure value.
  - If response is positive, then continue with intravenous fluid. Monitor the patient and stop fluids if patient is breathless. Avoid over hydrating as this could exacerbate hypoxia associated with adult respiratory distress syndrome.
  - If no adequate response to fluid challenge (as described above), suspect septic shock and repeat fluid challenge.

Septicaemia in children:
All children with shock, which is not obviously due to trauma or simple watery diarrhoea, should in addition to fluid resuscitation, receive antibiotic cover for probable septicaemia.

- Ceftriaxone, IM, 80 mg/kg/dose immediately as a **single dose**. See dosing table, 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.

REFERRAL

Urgent
All patients, after resuscitation.

21.2.10 ANAPHYLAXIS

T78.2/Y57.9

DESCRIPTION

A very severe allergic reaction that usually occurs within seconds or minutes after exposure to an allergen, but may be delayed for up to 1 hour. The reaction can be short-lived, protracted or biphasic, i.e. acute with recurrence several hours later. Immediate reactions are usually the most severe and/or life-threatening.
Clinical features include:

» Acute onset of signs and symptoms.
» Urticaria (hives) or angioedema.
» Bronchospasm, wheezing, dyspnoea, chest tightness.
» Laryngeal oedema with upper airway obstruction or stridor.
» Gastrointestinal symptoms such as nausea, vomiting, diarrhoea.
» Hypotension and/or shock.
» Dizziness, paraesthesia, syncope, sweating, flushing, dysrhythmias.

GENERAL MEASURES

<u>Anaphylaxis associated with vaccinations:</u>

» Always keep a fully equipped emergency tray at the vaccination point.
» It is advisable to observe clients for 15 minutes after a vaccination. If a client is known with severe allergies, an observation period of 30 minutes is advised.
» Clients who develop symptoms should be assessed for possible vaccination associated anaphylaxis by considering the following:
  - If signs and symptoms are generalised – involving more than 2 body systems, manage as anaphylaxis.

- If signs and symptoms are serious or life-threatening, even if only one body system is involved (including hypotension, respiratory distress, significant swelling of lips or tongue), treat as anaphylaxis.
- If isolated rash in an otherwise well client, monitor for 30 minutes.

» Collapse following vaccination might be due to anaphylaxis or other causes such as a vasovagal episode:
- Call for help and put patient on his/her back and raise legs.
- Check if responsive – if unresponsive, commence CPR (See section 21.1)
- A vasovagal episode is usually associated with a transient loss of consciousness (< 1 minute), relieved by raising the legs when supine, transient low BP and low HR.
- Collapsing after vaccination usually occurs 5-10 minutes post-vaccination, but can occur up to an hour afterwards.
- Treat as anaphylaxis if loss of consciousness is not brief and not relieved by raising the legs, or if any of the signs or symptoms of anaphylaxis occur.

		ACUTE STRESS RESPONSE	
	ANAPHYLAXIS	GENERAL	VASOVAGAL REACTION WITH SYNCOPE
Onset	Usually 5 min after immunization but may be delayed up to 60 min	Sudden, occurs before, during or shortly after (< 5 min) immunization	Sudden, occurs before, during or shortly after (< 5 min) immunization. May present after 5 min if the individual stands suddenly.
System			
Skin	Generalized urticaria (hives) or generalized erythema, angioedema, localized or generalized, generalized pruritus with or without skin rash, generalized prickle sensation, localized injection site urticaria, red and itchy eyes	Pale, sweaty, cold, clammy	Pale, sweaty, cold, clammy
Respiratory	Persistent cough, noisy breathing and airway constriction: wheeze, stridor. If very severe, respiratory arrest.	Hyperventilation (rapid, deep breathing)	Normal to deep breaths
Cardiovascular	↑ heart rate, ↓ blood pressure, circulatory arrest	↑heart rate, normal or ↑systolic blood pressure	↓ heart rate with or without transient ↓in blood pressure
Gastrointestinal	Nausea, vomiting, abdominal cramps	Nausea	Nausea, vomiting
Neurological and other symptoms	Uneasiness, restlessness, agitation, loss of consciousness, little response when supine or lying flat	Fearfulness, light-headedness dizziness, numbness, weakness, tingling around the lips, spasms in hands, feet	Transient loss of consciousness, good response once supine or lying flat, with or without tonic–clonic seizure

Table 21.5: Differences between anaphylaxis, general acute stress response and vasovagal reaction with syncope

Source: Immunization stress-related response. A manual for program managers and health professionals to prevent, identify and respond to stress related responses following immunization. Geneva: World Health Organization; 2019. https://apps.who.int/iris/handle/10665/330277

EMERGENCY TREATMENT

» Resuscitate (CAB) immediately (See Section 21.1: Cardiopulmonary arrest–cardiopulmonary resuscitation).
» Place hypotensive or shocked patient in horizontal position. Do NOT sit the patient up.
» Severe anaphylaxis: administer oxygen by facemask at high flow rate of 15 L/min.
» Remove the trigger if possible.

MEDICINE TREATMENT

First line priority:

Adrenaline (epinephrine) is the mainstay of treatment and should be given immediately.

- Adrenaline (epinephrine), 1:1000, IM, 0.01 mL/kg as a single dose.
  - Children: 1:1000, IM, 0.01 mL/kg as a single dose. See dosing table, pg 23.5.
  - Adults: 1:1000, IM, 0.5 mg (0.5 mL) as a single dose, into the lateral thigh.
  - Repeat in 5 minutes if no improvement.

Second line priority:

- Oxygen, 8-10 L/minute via facemask or up to 100% oxygen, as needed.

AND *LoE:IVb*[16]

If hypotension not responding promptly to adrenaline (epinephrine), also give:

- Sodium chloride 0.9%, IV:
  - Children: 20 mL/kg, over 5 to 10 minutes. Repeat as needed.
  - Adults: 1–2 L, at the most rapid flow rate possible in the first minutes of treatment. Repeat as needed.

CAUTION
Monitor continuously for clinical response and fluid overload.

AND *LoE:IVb*[17]

If wheeze:

- Salbutamol 0.5%, (5mg/mL) solution, nebulised, with high flow oxygen.
  - Children: 0.5–1 mL (2.5–5 mg) salbutamol 0.5% solution,
  - Adults: 1 mL (5 mg) salbutamol 0.5% solution,

AND *LoE:IVb*[18]

- Ipratropium bromide, solution, added to salbutamol solution.
  - Children: Ipratropium bromide 0.25mg/2ml; nebuliser solution: 2mL (0.25 mg) nebulised with salbutamol and made up to a total volume of 4mL with sodium chloride 0.9%.
  - Adults: Ipratropium bromide 0.5mg/2ml; nebuliser solution, 2 mL (0.5 mg) nebulised with salbutamol and made up to a total volume of 4mL with sodium chloride 0.9%. *LoE:IVb*[19]

AND

- Hydrocortisone IM/slow IV, immediately.
  - Children: 5 mg/kg immediately. See dosing table, pg 23.5. *LoE:IVb*[20]
  - Adults: 200 mg immediately. *LoE:IVb*[21]

AND

- Promethazine IM/slow IV.
  - Children > 2 years: 0.25 mg/kg. See dosing table, pg 23.8. *LoE::IVb*[22]
  - Adults: 25–50 mg.

REFERRAL

All patients.
Note: Adrenaline (epinephrine) administration may have to be repeated due to its short duration of action. Observe closely during transport.

21.2.11 SEIZURES AND STATUS EPILEPTICUS

G41.0-2/G41.8-9
For description and general measures of seizures, see Section 15.3: Seizures.

DESCRIPTION

This is a medical emergency and has the potential for causing high mortality.
Status epilepticus is a series of seizures following one another lasting >30 minutes with no intervening periods of recovery of consciousness. The seizure may be generalised or partial, convulsive or non-convulsive.
Do not wait for established status epilepticus to terminate convulsions. Convulsions lasting > 5 minutes should be terminated.

GENERAL MEASURES

» Place the patient in a lateral (recovery) position.
» **Do not** place anything (spoon or spatula, etc.) in the patient's mouth.
» Do not try to open the patient's mouth.
» Maintain airway.
» Assist respiration and give high flow oxygen
» Prepare for intubation if sufficiently skilled in the procedure and relevant rescue devices are available.
» Check blood glucose (exclude hypoglycaemia).
» Monitor vital signs every 15 minutes.
» Establish an IV line.

MEDICINE TREATMENT

<u>Children < 12 years of age</u>

- Midazolam, buccal, 0.5 mg/kg/dose. See dosing table, pg 23.7.
  - Use midazolam for injection 5 mg in 1 mL undiluted.
  - Draw up the required volume in a 5 mL syringe.
  - Remove needle then administer midazolam into the buccal cavity (between gum and cheeks).
  - If seizures persist for > 5 minutes, repeat the dose and refer urgently.
  - Note: Buccal midazolam should not be used in infants < 6 months of age.

OR *LoE:IIIa*[23]

- Midazolam, IM:
  - Child > 13 kg: midazolam, IM, 5 mg, repeat once after 5–10 minutes if still fitting.

OR *LoE:IIa*[24]

- Diazepam, rectal, 0.5 mg/kg/dose as a single dose. See dosing table, pg 23.4.
  - Use diazepam for injection 10 mg in 2 mL undiluted.
  - Draw up the required volume in a 2 mL syringe.
  - Remove needle then insert the whole barrel of the lubricated syringe into the rectum and inject the contents.
  - Remove syringe and hold buttocks together to minimise leakage.
  - Maximum dose: 10 mg in 1 hour.
  - May be repeated after 10 minutes if convulsions continue.
  - Expect a response within 1–5 minutes.

CAUTION
Benzodiazepines, can cause respiratory depression.
Monitor closely for respiratory depression. If this occurs, assist ventilation with bag-valve mask (1 breath every 3–5 seconds) and refer urgently.

If no response after two consecutive doses of either midazolam or diazepam, and if the convulsion has lasted more than 20 minutes:

ADD

- Phenobarbital, oral, crushed and given by nasogastric tube, 20 mg/kg as a single dose. See dosing table, pg 23.8. *LoE: IIIb*[25]

Adults

- Midazolam, IM, 10 mg, immediately.
  - Repeat once after 5–10 minutes if still fitting. *LoE: IIb*[26]

OR

- Midazolam, buccal, 10 mg using the parenteral formulation.
  - Repeat once after 5–10 minutes if still fitting. *LoE: IVb*

OR

- Diazepam, slow IV, 10 mg.
  - Administer at a rate not exceeding 5mg/minute.
  - Repeat within 5 minutes if needed.
  - Maximum dose: 20 mg within 1 hour.
  - Expect a response within 1–5 minutes. *LoE: IIIa*[27]

CAUTION
Benzodiazepines can cause respiratory depression.
Monitor closely for respiratory depression. If this occurs, assist ventilation with bag-valve mask (1 breath every 3-5 seconds) and refer urgently.
Avoid diazepam IM since absorption is slow and erratic.
Do not mix diazepam with other medicines in same syringe.

REFERRAL

Urgent
Seizures that cannot be controlled.

Non-urgent
All patients once stabilised.

Note: Clinical notes describing medication administered, time, dose, and route of administration should accompany patients.

21.3 TRAUMA AND INJURIES

21.3.1 BITES AND STINGS

21.3.1.1 ANIMAL BITES

S01.0-9/S11.0-2/S11.7-9/S21.0-2/S21.7-9/S31.0-5/S31.7-8/S41.0-1/S41.7-8/S51.0/S51.7-9/S61.0-1/S61.7-9/S71.0-1/S71.7-8/S81.0/S81.7-9/S91.0-3/S91.7/T01.0-3/T01.6/T01.8-9/T09.1/T11.1/T13.1/T14.0-1/A82.0-1/A82.9/Z24.2/Z20.3 + External Cause Code (W,X,Y,Z)

Note: Rabies and tetanus are notifiable medical conditions.

DESCRIPTION

Animal bites may be caused by:

» Domestic animals e.g. horses, cows, dogs, cats.
» Wild animals e.g. jackals, mongooses (including meerkats), bats.

Animal bites may result in:

» Wound infection, often due to mixed aerobic and anaerobic infection.
» Puncture wounds.
» Tissue necrosis.
» Transmission of diseases, e.g. tetanus, rabies.

NICD hotline for rabies advice: 0828839920

Suspected rabid bite

Any mammal bite can transmit rabies. Rabies incubation period is at least 9–90 days, but could be much longer. In suspected rabies exposure of a person by a domestic animal, attempt to trace the source animal to determine likelihood of rabies. Observe the suspected rabid animal for abnormal behaviour for 10 days. If the animal remains healthy for 10 days, rabies is unlikely.

Note: If the animal has to be put down, care should be taken to preserve the brain, as the brain is required by the state veterinarian for confirmation of diagnosis. The animal must not be killed by shooting it in the head, as this will damage the brain.

PATIENT WITH ANIMAL EXPOSURE			
Severity of exposure	**No direct contact** with animal (for example, being in the presence of a rabid animal or petting an animal)	Direct contact with animal but **no breach of skin, no bleeding** (for example bruising or superficial scratch)	Direct contact with animal with **breach of skin, any amount of bleeding, contact with mucosal membranes** (for example lick on/in eyes or nose)**, contact with broken skin** (for example licks on existing scratches), **any contact with a bat.**
Management based on severity of the exposure	Washing of exposed skin surfaces	Wound management ***AND*** Full course of rabies vaccine (Rabies immunoglobulin, only if severely immuno-compromised)	Wound management ***AND*** Rabies immunoglobulin ***AND*** Full course of rabies vaccine

Table 21.6: Algorithm for rabies post exposure prophylaxis (PEP)

MEDICINE TREATMENT

Wound management:

Wash wound thoroughly with soap under running water for 15 minutes. *LoE: IVb*[28]

- Chlorhexidine 0.05%, aqueous solution.

Apply disinfectant if available:

- Povidone-iodine 10%, solution.

CAUTION

Primary suturing of wounds should be avoided unless for urgent haemostasis.

Clean wound thoroughly, dress (avoid compressive dressings), and review after 48 hours for secondary closure at that time.

The following treatment may be commenced in facilities designated by Provincial/Regional Pharmaceutical Therapeutics Committees. If access to rabies vaccine and/or immunoglobulin is not immediately available refer urgently.

Immunocompromised individuals:

Individuals with documented immunodeficiency, such as symptomatic HIV infection, patients with cancer on chemotherapy/radiotherapy, and patients on long-term corticosteroids dosed at 20 mg/day for ≥2 weeks, should be evaluated on a case-by-case basis and receive a complete course of PEP including RIG and 4 doses of rabies vaccine in all exposures with direct animal contact.

Note: HIV-infected individuals receiving ART who are clinically monitored and well managed are not considered immunocompromised. Such patients have been shown to respond normally to rabies vaccines.

Rabies immunoglobulin (RIG) – doctor prescribed: *LoE: IVb*[29]

» Only indicated for:
  - Direct animal contact with breach of skin/ bleeding/ mucosal contact, immunocompetent patients
  - Any direct animal contact, immunocompromised patients
  - All bat exposures
» Patients who have received PEP or PrEP do not require RIG. Only wound treatment is required.
» Available from the nearest district hospital.
» If not immediately available, source and give as soon as possible.
» When 7 days have lapsed since the initial rabies vaccination, RIG is no longer indicated as the vaccine induced immune response will be effective at that time.
» Infiltrate as much as possible in and around the wound.
» It is **no longer** recommended to inject the remainder of the calculated RIG dose at a site distant to the wound.
» In the case of smaller wounds/areas where it is not possible to infiltrate the entire calculated dose, infiltrate as much as is anatomically feasible in and around the wound site/s without causing compartment syndrome.
» In case of large and multiple wounds, RIG can be diluted with sodium chloride 0.9% solution if necessary to ensure infiltration of all wounds.
» Follow with a complete course of vaccine.

- Human-derived rabies immunoglobulin (HRIG), IM 20 IU/kg (doctor prescribed). Infiltrate as much as possible in and around the wound. *LoE:IVb*[30]

OR

- Equine-derived rabies Immunoglobulin (ERIG), IM 40 IU/kg (doctor prescribed). Infiltrate as much as possible in and around the wound.
  - Administer ERIG only in facilities where anaphylaxis or adverse reactions can be managed. (Refer to Section 21.2.10). *LoE:IVb*[31]

Product name	Max. dose	Description	Site of administration	Schedule
HRIG			Infiltrate up to the maximum calculated dose in and around the wound site/s. For smaller wounds where it is not possible to infiltrate all of the calculated dose, infiltrate as much as is anatomically feasible in and around the wound site/s.	On day 0 (when patient presents for first time)/ as soon as possible after exposure to be effective to neutralise virus. When RIG is not available it should be sourced as a matter of urgency. When 7 days have lapsed since initial rabies vaccination, RIG is no longer indicated.
Rabigam®	20 IU/kg	150 IU/mL (Supplied in 2 mL vial)		
KamRAB®	20 IU/kg	150 IU/mL (Supplied in 2, 5 and 10 mL vials).		
ERIG				
Equirab®	40 IU/kg	200 IU/mL (Supplied in 5 mL vial).		

Table 21.7: Summary of regimen for HRIG and ERIG
Source: NICD updated human rabies prophylaxis guideline. www.nicd.ac.za

Rabies vaccination – doctor initiated: *LoE: IVb*[32]

» Only indicated for direct animal contact.
» Patients who have previously been fully immunised or who received PEP more than 3 months ago need only two doses: on Day 0 and Day 3.
» Patients who have received previous PEP or PrEP within the previous 3 months do not require vaccination against rabies. Only wound treatment is required.
» Available from the nearest district hospital.

Children

- Rabies vaccine, 1 amp, IM anterolateral thigh (doctor initiated).
  - Day 0 – single dose
  - Day 3 – single dose
  - Day 7 – single dose
  - Between day 14-28 – single dose

Adults

- Rabies vaccine, 1 amp, IM deltoid (doctor initiated).
  - Day 0 – single dose
  - Day 3 – single dose
  - Day 7 – single dose
  - Between day 14-28 – single dose

CAUTION
Do not administer rabies vaccine into buttocks (gluteus maximus).

Tetanus prophylaxis if not previously immunised within the last 5 years:
Z23.5

- Tetanus toxoid vaccine (TT), IM, 0.5 mL.

Note: In a fully immunised person, tetanus toxoid vaccine or tetanus immunoglobulin may produce an unpleasant reaction, e.g. redness, itching, swelling or fever, but in the case of a severe injury the administration is justified.

Antibiotic treatment (only for direct animal contact with broken skin, hand wounds):

Adults and Children > 35 kg

- Amoxicillin/clavulanic acid, oral, 875/125 mg 12 hourly for 5 days.

Children ≤ 35 kg

- Amoxicillin/clavulanic acid, oral, 15–25 mg/kg/dose of amoxicillin component, 8 hourly for 5 days.

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

Severe penicillin allergy:
Z88.0

Adults and Children > 35 kg

- Macrolide, e.g.:
- Azithromycin, oral, 500 mg daily for 3 days.

Children

- Macrolide, e.g.:
- Azithromycin, oral, 10 mg/kg daily for 3 days. See dosing table pg 23.2.

AND

Adults

- Metronidazole, oral, 400 mg, 8 hourly for 5 days.

Children

- Metronidazole, oral, 7.5 mg/kg/dose 8 hourly for 5 days. See dosing table, pg 23.7.

PREVENTION

» Regular vaccination of domestic cats and dogs.
» Pre-exposure vaccine may be given to those at risk, e.g. occupation, endemic areas, laboratories.

REFERRAL
» Deep and large wounds requiring suturing.
» Shock and bleeding.
» Possible rabies exposure (for immunoglobulin and vaccination).
» Severe infected wounds or infected wounds not responding to oral antibiotics.
» Hand bites.

21.3.1.2 HUMAN BITES
S01.0-9/S11.0-2/S11.7-9/S21.0-2/S21.7-9/S31.0-5/S31.7-8/S41.0-1/S41.7-8/S51.0/S51.7-9/S61.0-1/S61.7-9/S71.0-1/S71.7-8/S81.0/S81.7-9/S91.0-3/S91.7/T01.0-3/T01.6/T01.8-9/T09.1/T11.1/T13.1/T14.0-1 + External Cause Code (W,X,Y,Z)

DESCRIPTION
Human bites may be accidental or intentional (form of assault).
Human bites may result in:
» Wound infection, often due to mixed aerobic and anaerobic infection.
» Puncture wounds.
» Tissue necrosis.
» Transmission of diseases, e.g. HIV, hepatitis.

MEDICINE TREATMENT
Wound management:
Wash wound thoroughly with soap under running water for 5–10 minutes.
- Chlorhexidine 0.05%, aqueous solution.

Apply disinfectant if available:
- Povidone-iodine 10%, solution.

CAUTION
Do not suture bite wounds unless on the head/face. Clean thoroughly, dress (avoid compressive dressings). Review after 48 hours for secondary closure at that time.

Tetanus prophylaxis:
Z23.5
If not previously immunised within the last 5 years:
- Tetanus toxoid (TT), IM, 0.5 mL. *LoE: IIIa*[33]

Antibiotic treatment:

Adults and Children > 35 kg
- Amoxicillin/clavulanic acid, oral, 875/125 mg 12 hourly for 5 days.

Children ≤ 35 kg
- Amoxicillin/clavulanic acid oral, 15–25 mg/kg/dose of amoxicillin component, 8 hourly for 5 days.

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

Severe penicillin allergy:
Z88.0

Adults and Children > 35 kg

- Macrolide, e.g.:

Azithromycin, oral, 500 mg daily for 3 days

Children

- Macrolide, e.g.:
- Azithromycin, oral, 10 mg/kg daily for 3 days. See dosing table pg 23.2.

AND

Adults

- Metronidazole, oral, 400 mg, 8 hourly for 5 days

Children

- Metronidazole, oral, 7.5 mg/kg/dose 8 hourly for 5 days. See dosing table, pg 23.7.

Hepatitis B prophylaxis (if bite is severe enough to cause bleeding):
Z29.8
See section 21.3.6.3: Post exposure prophylaxis, inadvertent (non-occupational).

HIV prophylaxis
The risk of HIV transmission through biting is negligible. Post-exposure prophylaxis is not indicated after a bite. *LoE: IIIb*[34]

REFERRAL

» Deep and large wounds requiring suturing.
» Shock and bleeding.
» Severe infected wounds or infected wounds not responding to oral antibiotics.
» Hand bites.

21.3.1.3 INSECT STINGS, SCORPION STINGS AND SPIDER BITES

T63.2-4 + External Cause Code (V,W,X,Y)

Poisons Information Helpline:0861555777
See Section 21.3.3: Exposure to poisonous substances.

DESCRIPTION

Spider bites and stings by bees, wasps, scorpions and other insects.
Symptoms are usually localised such as pain, redness, swelling and itching.

Bees and wasps

» Venom is usually mild but may provoke severe allergic reactions (see Section 21.2.10: Anaphylaxis).

Spiders and scorpions

» Most are non-venomous or mildly venomous, but some may be extremely venomous resulting in neurotoxicity and constitute a medical emergency.

MEDICINE TREATMENT

Emergency treatment:
Treat anaphylaxis (bee/wasp stings). See Section 21.2.10: Anaphylaxis.

Local symptoms:

- Calamine lotion, apply when needed.

If severe itch:

Children

- Chlorphenamine, oral, 0.1 mg/kg/dose 6–8 hourly. See dosing table, pg 23.3.

Adults

- Chlorphenamine, oral, 4 mg, 6–8 hourly.

AND
If there is a wide local response to insect bite with inflamed lesion, see Section 5.10.4: Papular urticaria.

Pain:

Children

- Paracetamol, oral, 10–15 mg/kg/dose 6 hourly when required. See dosing table, pg 23.8.

Adults

- Paracetamol, oral, 500mg -1 g 4–6 hourly when required (to a maximum of 4 g in 24 hours).
  - Maximum dose: 15 mg/kg/dose.

Very painful scorpion stings:

- Lidocaine 2%, 2 mL injected around the bite as a local anaesthetic.

Local application of ice, if tolerated.

Cytotoxic lesions:
Avoid giving prophylactic antibiotics for bites and stings.
If secondary skin infection (site red, swollen, hot, tender, pus may be present), manage as cellulitis. See Section 5.4.3: Cellulitis.

Spider bites and scorpion stings:
Tetanus prophylaxis:
Z23.5

If not immunised within the last 5 years: *LoE:IVb*[35]

- Tetanus toxoid vaccine (TT), IM, 0.5 mL.

REFERRAL

» For possible antivenom (neurotoxic spider bites or scorpion stings), if applicable, and intensive care, if necessary.
» Presence of systemic manifestations:
  - weakness
  - drooping eyelids
  - hypersalivation
  - sweating
  - difficulty in swallowing and speaking
  - double vision
  - muscle cramps
  - paraesthesia
  - difficulty in breathing
  - agitation/restlessness in children

  Note: Send the spider or scorpion with the patient, if available.
» Secondary infection of bite/sting that is not responding to 1st line antibiotics.

For guidance on the identification and clinical management of snake/spider/scorpion bites, contact:
Poisons Information Helpline: 0861555777

For procurement of snake/spider/scorpion antivenom, contact:
South African Vaccine Producers (SAVP):
Telephone (011) 386 6062/6063/6078 (0ffice hours only) or
Email: Benita.mouton@nhls.ac.za
In the rare event that antivenom needs to be released/procured afterhours:
Tel 071 680 9897

21.3.1.4 SNAKEBITES

T63.0 + (X20.99/W59.99)

DESCRIPTION

Of all the snake species found in South Africa less than 10% are potentially harmful to humans. However, all snakebites should be considered dangerous until proven otherwise. In the majority of snakebite incidents, the offending snake is not identified.
South African poisonous snakes can be broadly divided into 3 groups according to the action of their venom, although there may be overlap of toxic effects from some snake venoms.

1. **Cytotoxic venoms:**

» Venom causes local tissue damage and destruction around the area of bite, including swelling, discolouration of the skin, and blister formation.
» Bite is painful and symptoms usually start within 10–30 minutes.
» Examples include: puff adder, Gaboon adder, Mozambique spitting cobra, other smaller adders and spitting cobras, stiletto snake, rinkhals (cytotoxic as well as neurotoxic).

2. **Neurotoxic venoms:**

» Neurotoxic venom causes weakness, ptosis, drooling, dysphagia, pins and needles, sweating, blurred vision, hypotension, paralysis of skeletal muscles and respiratory compromise.
» Bite is not as painful as cytotoxic venom bites.
» Symptoms usually start in 15–30 minutes.
» Examples include: black and green mamba, non-spitting cobras (Cape, forest, snouted), berg adder (neurotoxic as well as cytotoxic), rinkhals (cytotoxic as well as neurotoxic).

3. **Haemotoxic venoms:**

» Venom affects the clotting of blood causing bleeding tendency that may present within hours or up to a few days after the bite.
» Examples include: boomslang, vine snake

Symptoms and signs of snakebite envenomation include:

Local

» Bite marks with or without pain.
» Swelling around the bite, which may be severe with discolouration of skin and/or blister formation.
» Bleeding or oozing from bite site.

Note: the absence of bite marks does not exclude envenomation.

Systemic

» Nausea, vomiting.
» Sweating, hypersalivation and hypotension.
» Pins and needles.
» Skeletal muscle weakness (descending paralysis), which may cause:
  - drooping eyelids
  - double vision
  - difficulty in swallowing
  - difficulty in breathing
» Shock.
» Rarely bleeding (epistaxis, haematuria, haematemesis or haemoptysis).

CAUTION

Do not apply a tourniquet.
Do not apply a restrictive bandage to the head, neck or trunk.
Do not squeeze or incise the wound.
Do not attempt to suck the venom out.

GENERAL MEASURES

» Remove clothing from site of the bite and jewellery e.g. rings if an extremity bite.
» Clean the wound thoroughly with chlorhexidine 0.05%, aqueous solution.
» Immobilise the affected limb with a splint or sling.
» Be prepared to support ventilation in neurotoxic bites as this can be life-saving.
» For neurotoxic bites only:
  - Immediately apply a wide crepe bandage firmly from just below the bite site up to 10–15 cm proximal to the bite site. Apply no tighter than for a sprained ankle.
» Obtain an accurate history e.g. time of the bite, type of snake.
» If the snake is unidentified, observe for 24 hours with repeated examinations. Absence of symptoms and signs for 6–8 hours usually indicates a harmless bite.

MEDICINE TREATMENT

Venom in the eyes:

S05.9 + (X20.99)

Irrigate the eye thoroughly for 15–20 minutes with water or sodium chloride, 0.9%.

- Local anaesthetic ophthalmic drops, e.g.:
- Tetracaine 1%, drops (if available), instil 1 drop into the affected eye(s) before irrigation. *LoE:IIIb*[36]

Refer the patient.

Pain:

- Non-opioid analgesics according to severity. See Section 20.3: Chronic non-cancer pain.

Note: The use of NSAIDs is not recommended due to the antiplatelet effect and the potential danger of renal failure in a hypotensive patient. *LoE:IVb*[37]

Shock:

Treat if present. See Section 21.2.9: Shock.

Tetanus prophylaxis:

Z23.5

If not previously immunised within the last 5 years:

- Tetanus toxoid (TT), IM, 0.5 mL.

Note:

» **The majority of patients do not need and should not be given antivenom.**
» Adverse reactions to antivenom (including anaphylaxis) are common and may be severe.
» The dose of antivenom is the same for adults and children.
» Polyvalent antivenom does NOT include antivenom for berg adders or stiletto snakes. Management for these snakebites is symptomatic and supportive only.
» Antibiotics are seldom needed, except for secondary infection.

LoE:IVb[38]

Criteria for antivenom administration
» Signs of neurotoxicity.
» Positively identified puff adder, Gaboon adder, Mozambique spitting cobra or rinkhals bites AND evidence of severe progressive cytotoxicity.
» Unidentified snakebites and evidence of severe progressive cytotoxicity envenomation, i.e.:
  - swelling of whole hand or foot within 1 hour
  - swelling to the knee or elbow in <6 hours
  - swelling of the whole limb in <12 hours
  - swelling progression >2.5 cm per hour
  - a threatened airway due to swelling
  - evidence of complication, e.g. compartment syndrome

LoE:IVb[39]

REFERRAL

» All patients with bites or likely bites even if puncture marks are not seen. If possible, take the dead snake to the referral centre for identification. Referral centre will determine if antivenom is indicated.
» If patient presents at the clinic with their own antivenom, contact the secondary level hospital for advice (antivenom should be given as soon as possible, however administration may be considered even as late as 48-72 hours after the bite, if there is continued clinical deterioration indicating ongoing venom activity).

For guidance on the identification and clinical management of snake/spider/scorpion bites, contact:
Poisons Information Helpline: 0861555777

For procurement of snake/spider/scorpion antivenom, contact:
South African Vaccine Producers (SAVP):
Telephone (011) 386 6062/6063/6078 (0ffice hours only) or
Email: Benita.mouton@nhls.ac.za
In the rare event that antivenom needs to be released/procured afterhours:
Tel 071 680 9897

21.3.2 BURNS

T30.0-3/T31.0-9 + (Y34.99)

DESCRIPTION

Burns lead to skin and soft tissue injury and may be caused by:
» heat, e.g. open flame, hot liquids, hot steam,
» chemical compounds,
» physical agents, e.g. electrical/lightning) or
» radiation.

The extent and depth may vary from superficial (epidermis) to full-thickness burns of the skin and underlying tissues.
Initially, burns are usually sterile.

Depth of burn wound	Surface /colour	Pain sensation/healing
Superficial or epidermal	Dry, minor blisters, erythema	» Painful » Heals within 7 days
Partial thickness superficial or superficial dermal	Blisters, moist	» Painful » Heals within 10–14 days
Partial thickness deep or deep dermal	Moist white or yellow slough, red mottled	» Less painful » Heals within a month or more » Generally needs surgical debridement and skin graft
Full thickness (complete loss of skin)	Dry, charred whitish, brown or black	» Painless, firm to touch » Healing by contraction of the margins » Generally needs surgical debridement and skin graft

Table 21.8: Assessment of burns

EMERGENCY TREATMENT

Follow the 7C's:

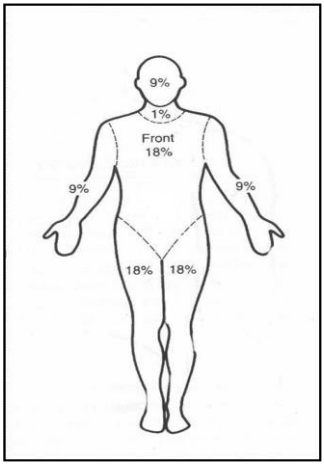
» Clothing: remove non-sticking clothing especially if hot or smouldering or constrictive (e.g. rings).
» Cool: with tap water for 30 minutes.
» Clean: with chlorhexidine.
» Cover: with a non-adherent dressing.
» Comfort: provide pain relief.
» Carbon dioxide poisoning: consider if enclosed fire, decreased LOC, disorientation.
» Consider inhalation injury if: carbonaceous (black-coloured) sputum, shortness of breath, perioral burns, hoarse voice, stridor. Discuss with referral centre as early intubation may be needed.

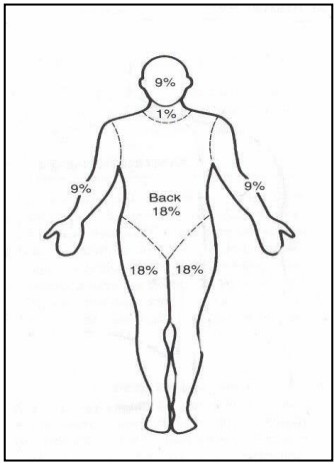
Child and adult percentages					
Age years	**Head + neck Front + back**	**Torso Front**	**Torso Back**	**Leg + foot Front + back**	**Arm+ hand Front+ back**
<1	18%	18%	18%	14%	9%
1-<2	17%	18%	18%	14.5%	9%
2-<3	16%	18%	18%	15%	9%
3-<4	15%	18%	18%	15.5%	9%
4-<5	14%	18%	18%	16%	9%
5-<6	13%	18%	18%	16.5%	9%
6-<7	12%	18%	18%	17%	9%
7-<8	11%	18%	18%	17.5%	9%
≥ 8	10%	18%	18%	18%	9%

Table 21.9: Estimated body surface area (BSA) percentages

The figures below are used to calculate body surface area %*.
These diagrams indicate percentages for the whole leg/arm/head (and neck in adults) not just the front or back.
In children the palm of the hand, including the fingers, is 1%.

Children 8 years and adults





Children < 8 years of age

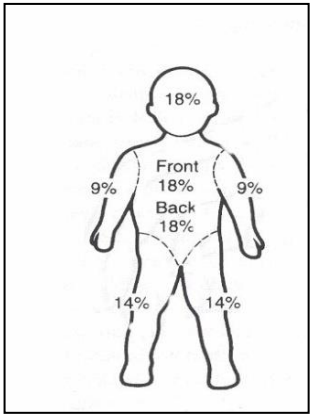


Figure 21.6: Calculating body surface area for management of burns
* Source: Karpelowsky JS, Wallis L, Madaree A, Rode H; South African Burn Society..South African Burn Society burn stabilisation protocol. S Afr Med J. 2007. Aug;97(8):574-7. https://www.ncbi.nlm.nih.gov/pubmed/17966146

MEDICINE TREATMENT

Fluid replacement

Burns ≤ 10% Total Body Surface Area (TBSA):
Oral fluids.

Burns > 10% of TBSA:

- IV fluid for resuscitation, replacement, and maintenance.

Note: IV fluid replacement is very important in large burns. However, if unable to obtain IV access, give fluids orally or via NGT and transfer urgently.

Calculation of fluid replacement

Fluids in adults:

If shocked, see Section 21.2.9: Shock.
First 24 hours:

- Sodium chloride 0.9%, IV.
  - Calculate total fluid requirement in 24 hours:
    Total % burn x weight (kg) x 4 mL.
  - Give half this volume in the first 8 hours.
  - Administer remaining fluid volume in next 16 hours.

Note: If urine output is not adequate, increase fluids for the next hour by 50%. Continue at a higher rate until urine output is adequate, then resume normal calculated rate.

Fluids in children:

Note: Avoid circumferential taping when securing infusion lines, as oedema under the eschar may decrease the venous return.

» **First 8 hours of fluid replacement in children**

Weight **kg**	Fluid volume (mL per hour) for the 1st 8 hours in burns of > 10% in PHC clinics while awaiting transfer: • **0.9% Sodium chloride with 100 mL of 50% dextrose added to each litre or 10 mL of 50% dextrose added to each 100 mL.**			
	Burns percentage of total body area			
	10–20%	>20–30%	>30–40%	>40%
>2–2.5 kg	15	19	23	28
>2.5–3.5 kg	20	25	31	36
>3.5–5 kg	28	36	44	51
>5–7 kg	40	50	62	73
>7–9 kg	53	70	84	100
>9–11 kg	67	85	105	120
>11–14 kg	82	105	125	150
>14–17.5 kg	95	125	155	185
>17.5–25 kg	115	155	190	235
>25–35 kg	147	200	250	310

» **Next 16 hours of fluid replacement in chidlren**				
Weight **kg**	Fluid volume (mL per hour) for the next 16 hours in burns of > 10% in PHC clinics if transfer has not been accomplished in the 1st 8 hours: • **0.9% Sodium chloride with 100 mL of 50% dextrose added to each litre or 10 mL of 50% dextrose added to each 100 mL.**			
	Burns percentage of total body area			
	10–20%	>20–30%	>30–40%	>40%
>2–2.5 kg	12	14	17	19
>2.5–3.5 kg	16	19	22	25
>3.5–5 kg	23	27	31	35
>5–7 kg	33	38	44	49
>7–9 kg	43	50	58	65
>9–11 kg	54	64	72	82
>11–14 kg	64	76	86	97
>14–17.5 kg	75	91	104	118
>17.5–25 kg	91	110	129	148
>25–35 kg	110	138	165	190

Table 21.10: Replacement fluids for burns >10% BSA in children

Pain:

Children

- Paracetamol, oral, 10–15 mg/kg/dose 6 hourly when required. See dosing table, pg 23.8.

Adults

- Paracetamol, oral, 500mg -1 g 4–6 hourly when required (to a maximum of 4 g in 24 hours)
  - Maximum dose: 15 mg/kg/dose.

Severe pain:

See Section 20.3: Chronic non-cancer pain.

Wound cleansing:

Clean the burn wound gently.
Sodium chloride 0.9% or clean water.

Burn dressing:

Keep the wound clean and dress with sterile dressings.

For patients requiring referral

» If within 12 hours, transfer patient wrapped in clean dry sheet and blankets.
» If delayed by >12 hours, paraffin gauze dressing and dry gauze on top.
» For full thickness and extensive burns cover with a paraffin gauze occlusive dressing. Cover the dressing with plastic wrap (e.g. cling film). *LoE:IVb*

For patients not requiring transfer (burns that can be treated at home)

» Paraffin gauze dressing.

If infected burn

- Povidone-iodine 5%, cream, applied daily. *LoE:IIIb*[40]

Tetanus prophylaxis:
Z23.5
If not vaccinated within the last 5 years
- Tetanus toxoid (TT), IM, 0.5 mL.

See Section 21.3.1.1: Animal bites or 21.3.1.2: Human bites, for detailed indications and management principles.

REFERRAL

» All children <1 year of age.
» All burns >5% in children 1–2 years of age.
» Full thickness burns of any size in any age group.
» Partial thickness burns >10% TBSA.
» Burns of special areas – face, hands, feet, genitalia, perineum and major joints.
» Electrical burns, including lightning injury.
» Severe chemical burns.
» Inhalation injury – fire or scald injury.
» Circumferential burns of the limbs or chest.
» Burn injury in a patient with pre-existing medical disorders which could complicate management, prolong recovery or affect mortality.
» Any patient with burns and concomitant trauma.
» Suspected child abuse.
» Burns exceeding the capabilities of the referring centre.
» Septic burn wounds.
» Consider rehabilitation services for reducing the risk of contractures and disfigurement.

21.3.3 EXPOSURE TO POISONOUS SUBSTANCES

T36.0-9/T37.0-5/T37.8-9/T38.0-9/T39.0-4/T39.8-9/T40.0-9/T41-0-5/T42.0-8/T43.0-6/T43.8-9/ 4.0-9/T45.0-9/T46.0-9/T47.0-9/T48-0-7/T49.0-9/T50.0-9/T51.0-3/T51.8-9/T52.0-4/T52.8-9/T53.0-9/T54.0-3/T54.9/T55/T56.0-9/T57.0-3/T57.8-9/T58/T59.0-9/T60.0-4/T60.8-9/T65.0-6/T65.8-9+ (X44.99/X49.99/X64.99/X69.99/Y14.99/Y19.99)

Note: Poisoning from all pesticides (i.e. agricultural stock remedies) is a notifiable medical condition. Please visit www.nicd.ac.za for further information.

POISON INFORMATION CENTRES		
Poisons Information Helpline (national service)	24 hours/day	0861 555 777
Red Cross War Memorial Children's Hospital Poisons Information Centre Email: poisonsinformation@uct.ac.za http://www.paediatrics.uct.ac.za/poisons-information-centre		
Tygerberg Poisons Information Centre Email: toxicology@sun.ac.za www.sun.ac.za/poisoncentre		
University of the Free State Poison Control and Medicine Information Centre	24 hours/day	082 491 0160
Telephone numbers tested April 2022		

Table 21.11: Poison information centre(s)

The Afritox database is available free of charge to public hospitals in South Africa: see www.afritox.co.za for information on how to access the database. If the above centres cannot be contacted, enquire at the nearest trauma and emergency unit.

DESCRIPTION

Acute poisoning is a common medical emergency. Poisoning may occur by ingestion, inhalation, or absorption through skin or mucus membranes. Frequently encountered poisons include:

» analgesics
» anti-epileptic agents
» antidepressants and sedatives
» anti-infectives
» pesticides
» volatile hydrocarbons, e.g. paraffin
» household cleaning agents
» antihypertensive and anti-diabetic agents
» vitamins and minerals, especially iron in children

Signs and symptoms vary according to the nature of poisoning.

GENERAL MEASURES

» Establish and maintain the airway.
» Ensure adequate ventilation and oxygenation.
» Treat shock. See Section 21.1: Cardiopulmonary arrest.
» Take an accurate history.
» Obtain collateral information, especially in patients with impaired consciousness.
» A special effort should be made to obtain tablets, packets, containers, etc. to identify poisons involved.
» Document, and respond to, abnormalities of:
  - pulse rate
  - blood pressure
  - respiratory rate
  - level of consciousness
  - pupillary size and reaction
  - oxygenation

Remove the patient from the source of poison:

» *Topical exposure*:
  - If skin contact has occurred, especially pesticides, wash the skin with soap and water, ensuring carer has protective measures, e.g., gloves, gowns, masks, etc.
  - Remove contaminated clothes in organophosphate poisoning
  - Remove eye contaminants, especially alkalis, acids, and other irritants, by continuous irrigation of the eye with sterile water or normal saline for 15–20 minutes. Analgesic eye drops may be required to perform this adequately.
» *Inhalation of poisonous gases*: move the patient to fresh air.

Contact the Poisons Information Helpline or nearest hospital for advice.

MEDICINE TREATMENT

Ingested poisons

- Activated charcoal.
  - Administer only when the airway is protected (i.e. patient is fully awake and cooperative, or intubated with a depressed level of consciousness).
  - Administer within 1 hour of ingestion of toxin, unless poison is a substance that delays gastric emptying.

Charcoal may be useful if these poisons are taken in toxic dose	Poisons where charcoal is ineffective and should not be given
» carbamazepine, barbiturates, phenytoin » dapsone, quinine » theophylline » salicylates » mushroom poisoning (Amanita phalloides) » slow release preparations » digoxin » beta-blockers » NSAIDs	» ethanol, methanol, ethylene glycol » brake fluid » petroleum products (e.g. petrol or paraffin) » iron salts » lead, mercury, arsenic » lithium » strong acids or alkalis » other corrosive agents (e.g. household detergents)

Table 21.12: Activated charcoal for poisoning(s) *LoE:IIIb*[41]

Children:

- Activated charcoal, oral, 1 g/kg mixed as a slurry with water. See dosing table, pg 23.1.

Adults:

- Activated charcoal, oral, 50 g (36 level medicine measures) diluted in 100 mL water.
  - When mixing, add a small amount of water to charcoal in a container.
  - Cap and shake container to make a slurry and then dilute further.

Specific poisons and antidotes:

Carbon monoxide poisoning

T58 + (X49.99/X69.99/Y19.99)

For hypoxia:

- Oxygen, 100% by non-rebreather mask.

Organophosphate and carbamate poisoning

T60.0 + (X48.99/X68.99/Y18.99)

» **Note**: Healthcare workers should wear personal protective equipment and all caregivers should avoid having skin contact with the poison or the patient's bodily fluids e.g. vomitus, faeces. If staff come into contact with body fluids, wash off immediately.

» Decontamination procedures for the patient should only be done once the patient is fully resuscitated. Remove patient's clothes and wash the body with soap and water. Place clothes in bags and seal.

» Signs and symptoms of poisoning include:
  - diarrhoea and vomiting
  - hypotension
  - bradycardia
  - muscle twitching
  - coma
  - hypersecretions (hypersalivation, sweating, lacrimation, rhinorrhoea)
  - bronchospasm and bronchorrhoea
  - weakness
  - pinpoint pupils
  - confusion
  - convulsions

» Protect airway if GCS <8.

» Suction secretions frequently.

» Intubate and ventilate if hypoxia, hypercarbia, or decreased respiratory effort.

» Start atropine antidote immediately.

For bronchorrhoea, bronchospasm or bradycardia:
Children:

- Atropine bolus, IV,0.05 mg/kg/dose. See dosing table, pg 23.2. *LoE:IVb*[42]

Adults:

- Atropine bolus, IV, 2 mg *LoE:IIIa*[43]

In both adults and children:

- Reassess after 3–5 minutes for evidence of atropinisation as indicated by reduced bronchial secretions, improvement of oxygenation, and decreased oxygen requirements.
- Give repeated atropine boluses incrementally doubling the dose until adequate clinical response achieved, e.g. 2 mg, 4 mg, 8 mg, 16 mg etc.
  - If no clinical response, give double the dose.
  - If some response, give the same or reduced dose.
- Continue to reassess frequently as additional doses may be required.

Note: Refer all patients urgently but only when stable.
Poisoning from all pesticides (i.e. agricultural stock remedies) is a notifiable medical condition. Please visit www.nicd.ac.za for further information.

Opioid overdose
T40.0-9 + (X42.99/X62.99/Y12.99)

» Respiratory support is the mainstay of treatment. Give naloxone for severe poisoning only (i.e. patients requiring ventilatory support) or as a single test dose for uncertain diagnosis.
  - If respiration adequate, observe the patient in a monitored setting and reassess frequently.
  - If patient is apnoeic or has slow/shallow respirations, assist ventilation with bag-valve mask attached to supplemental oxygen, whilst administering naloxone as described below. If GCS < 8, protect airway and consider intubation if persistent respiratory depression.

- Naloxone, IV (preferable) or IM

	Initial dose (IV/IM)	**Repeat dose:** Reassess every 2 minutes. If breathing still inadequate, give further naloxone every 2–3 minutes.
Children	• 0.1 mg/kg immediately	Repeat 0.1 mg/kg (maximum 2 mg/dose), up to total dose of 10 mg. *LoE:IIIb*[44]
Adults	• 0.4 mg immediately	Double the dose each time (e.g.: 0.8 mg, 2 mg, 4 mg), up to total dose of 10 mg. *LoE:IVb*[45]

  - Naloxone has a short duration of action (45 minutes) - continue to monitor closely as further doses of naloxone may be needed while awaiting and during transport.
  - In patients addicted to opioids, naloxone may precipitate an acute withdrawal syndrome after several hours. This must not prevent the use of naloxone.
  - Refer all patients.

Paracetamol poisoning
T39.1 + (X40.99/X60.99/Y10.99)
All symptomatic patients or those with a history of significant single ingestion (≥ 200 mg/kg or 10 g, whichever is less) should be referred urgently for paracetamol blood level (taken at least 4 hours post-ingestion) and consideration of N-acetylcysteine.

Where referral is delayed:
- N-acetylcysteine, oral, 140 mg/kg immediately.
  - Followed by 70 mg/kg 4 hourly, for seventeen doses. *LoE:IIIb*[46]

Note:
» Avoid giving oral N-acetylcysteine together with activated charcoal, as systemic absorption and effect of N-acetylcysteine is reduced. *LoE:IIIb*[47]
» Anaphylactoid reactions to N-acetylcysteine do occur and the loading dose should preferably be administered in a monitored area. *LoE:IIIb*[48]

Toxic alcohols (ethylene glycol and methanol poisoning)
» Refer all cases
» See Adult Hospital chapter 19 Poisonings section 19.17.2

REFERRAL
» All intentional overdoses.
» All symptomatic patients.
» All children in whom toxicity can be expected, e.g. ingestion with:
  - paracetamol ≥ 200 mg/kg or 10 g (whichever is less) *LoE:IVb*[49]
  - anti-epileptics
  - warfarin
  - anticholinergics
  - antihypertensives
  - tricyclic antidepressants
  - sulphonylureas (antidiabetic agents)
  - paraffin (unless patient has a normal respiratory rate after 6 hours)
  - iron tablets
  - pesticides

If in doubt, consult the referral hospital or Poisons Information Helpline.
Note: Send the following to hospital with the patient:
» detailed referral letter with all appropriate clinical details. Ensure to include time of ingestion and treatment received.
» a sample of the poison or the empty poison container

21.3.4 EYE, CHEMICAL BURNS
(See Chapter 18: Eye conditions).

21.3.5 EYE INJURY, FOREIGN BODY
(See Chapter 18: Eye conditions).

21.3.6 POST EXPOSURE PROPHYLAXIS

21.3.6.1 POST EXPOSURE PROPHYLAXIS, OCCUPATIONAL

Z20.6 + Z20.5 + (Z57.8+X58.92+Z29.8)

DESCRIPTION

Post exposure prophylaxis may prevent the risk of acquiring HIV and hepatitis B following a significant occupational exposure to infectious material from a patient (includes blood, CSF, semen, vaginal secretions and synovial/pleural/ pericardial/ peritoneal/amniotic fluid).

The risk of acquiring HIV following occupational exposure is estimated at 0.3%.

There is a higher risk when:

» the injury is deep or
» involves a hollow needle or
» if the source patient is more infectious, e.g.: WHO stage 4 defining illness or known to have a high HIV viral load, i.e. >100 000 copies/mL, seroconversion illness.

GENERAL MEASURES

» Where the source patient is on ARVs or has been on ARVs, initiate prophylaxis and seek expert opinion. An extra blood sample (unclotted, EDTA) of the source patient should be stored in case of need for further resistance testing.
» Other blood borne infections that can be transmitted include hepatitis C and syphilis. Test all source patients (see monitoring table).
» Offer comprehensive and confidential pre-test HIV counselling.
» Advise HCW about the need to take precautions, e.g. condom use (for 4 months), to prevent HIV and HBV transmission to sexual partners.
» Document occupational exposures adequately for possible subsequent compensation.

LoE:IVb[50]

INVESTIGATIONS

	Source patient	Exposed health care worker			
	Baseline	**Baseline**	**2 weeks**	**6 weeks**	**4 months**
HIV	Rapid test **PLUS** ELISA	Rapid test **PLUS** ELISA		ELISA	ELISA
Hepatitis B	Surface antigen	Surface antibody**			Surface antigen and surface antibody**
Hepatitis C	HCV antibody	HCV antibody*		HCV PCR*	
Syphilis	RPR/ TP antibody	RPR/TP antibody*			RPR/TP antibody*
Creatinine		If TDF part of PEP	If TDF part of PEP		
FBC		If AZT part of PEP	If AZT part of PEP		

*Only if source patient was positive (in the case of syphilis, source patient must be RPR positive)
**Only if source patient was positive AND health care worker unvaccinated or HBsAb <10 units/mL
Table 21.13: Investigations and monitoring in occupational exposures

MEDICINE TREATMENT

1. Prevent HIV:

Z20.6 + (Z57.8+X58.92+Z29.8)

» Initiate HIV PEP immediately after the injury - within 72 hours. Do not wait for the confirmatory test results on the source patient and health care worker.

» If higher risk exposure (defined above) consider initiation of treatment beyond 72 hours, as the risks of prophylaxis in this setting may outweigh the benefits. Avoid initiating PEP beyond 7 days after exposure.

Note: HIV PEP is **not** indicated if:

» HCW exposed to body fluids which carry no risk of infection, e.g. vomitus, urine, faeces or saliva.

» HCW is HIV-infected. Stop PEP if HIV test of the health care worker is positive at the time of the injury.

» The source is HIV sero-negative unless there are features suggesting sero-conversion illness.
- Continue prophylaxis until the results of additional tests are available.
- These cases should be discussed with virologists.

Exposure	HIV Status of source patient	
	Negative	**Unknown or Positive**
Intact skin	no PEP	no PEP
Mucosal splash **or** **non-intact skin** **or** **percutaneous injury**	no PEP	PEP: • TDF+3TC+DTG **OR** • 3-drug regimen

Table 21.14: PEP for healthcare worker following occupational HIV exposure.

When PEP is indicated (administered preferably as a fixed-dose combination):

- Tenofovir (TDF), oral, 300 mg daily for 4 weeks (provided baseline eGFR is >50 mL/minute).

AND

- Lamivudine (3TC), oral, 300 mg daily for 4 weeks

AND

- Dolutegravir (DTG), oral 50 mg once daily for 4 weeks. *LoE:IIIa*[51]

If DTG is not tolerated:

- Tenofovir (TDF), oral, 300 mg daily for 4 weeks (provided baseline eGFR is >50 mL/minute).

AND

- Emtricitabine (FTC), oral, 200 mg daily for 4 weeks.

AND *LoE:IIIb*[52]

- Atazanavir/ritonavir 300/100 mg daily for 4 weeks.

OR

- Lopinavir/ritonavir (LPV/r) 200/50 mg, oral, 2 tablets 12 hourly for 4 weeks.

If tenofovir is contraindicated or if source patient is known to be on a failing tenofovir based regimen, replace tenofovir and emtricitabine with:

- Zidovudine (AZT), oral, 300 mg 12 hourly for 4 weeks.

AND

- Lamivudine (3TC), oral, 150 mg 12 hourly for 4 weeks.

Note: Adverse effects of PEP:

» PEP is generally not well tolerated. Adverse effects occur in about half of cases and therapy is discontinued in about a third. Efavirenz is not recommended as it is very poorly tolerated in PEP.

» TDF is contra-indicated in renal disease or with concomitant use of nephrotoxic medicines, e.g. aminoglycosides (check baseline creatinine clearance). Where TDF is contraindicated, switch to AZT. If AZT is not tolerated, consult or refer for further management.

» Zidovudine often causes nausea and headache and so should only be given if TDF is contraindicated.

» If dolutegravir is not tolerated, give ATV/r as the first choice protease inhibitor as LPV/r frequently causes gastrointestinal side effects. ATV/r may commonly cause jaundice (i.e. unconjugated hyperbilirubinaemia without hepatitis) which is harmless.

» If the source patient is known to be on a failing ART regimen, modification of the PEP regimen may be required. Consultation with a virologist or infectious diseases physician is recommended for advice on which antiretroviral medicines to use for PEP

» If the patient is on AZT or stavudine then TDF should be used.

» Patients on a failing second line ART regimen almost always have no resistance to protease inhibitors, so ATV/r or LPV/r should still be effective.

2. Prevent hepatitis B

Decide on what treatment to give the exposed person according to the vaccination status (and antibody response) of the exposed person, as well as the HBsAg results of the source patient, if known. *LoE:IVb*[53]

PEP following hepatitis B exposure: *LoE:IVb*[54]

Z20.5 + (Z57.8+X58.92+Z29.8)

Vaccination status and antibody response status of HCW	Source patient status & treatment		
	HBsAg positive	**HBsAg negative**	**HBsAg unknown**
Unvaccinated **OR** vaccination incomplete	• HBIG, IM, 500 units* • Hep B vaccine (3 doses at monthly intervals)	• Initiate Hep B vaccination (month 0, 1 and 6)	• HBIG, IM, 500 units* • Hep B vaccine (3 doses at monthly intervals)
Vaccinated **AND** HBsAb ≥10 units/mL[#]	No treatment	No treatment	No treatment
Vaccinated **AND** HBsAb <10 units/mL	• HBIG, IM, 500 units* • Repeat Hep B vaccine (3 doses at monthly intervals)	• Initiate Hep B vaccination (month 0, 1 and 6)	• HBIG, IM, 500 units* • Repeat Hep B vaccine (3 doses at monthly intervals)

Table 21.15: PEP for healthcare workers following hepatitis B exposure

* HBIG and first dose of vaccine to be given simultaneously, but at different sites.
# If the delay in obtaining HBsAb results is more than 7 days initiate treatment as for vaccinated AND HBsAb < 10 units/mL.
After vaccination ensure the health care worker has a HBsAb ≥ 10 units/mL 1 – 2 months after the last vaccine dose.

REFERRAL

Note: Refer if there are inadequate resources with regard to:
» counselling
» laboratory for testing
» medico-legal examination
» medicine treatment

21.3.6.2 POST EXPOSURE PROPHYLAXIS, RAPE AND SEXUAL ASSAULT

Z29.8 + Z20.5 + Z20.2 + Z20.6

DESCRIPTION

Sexual offences are of grave concern and in particular to the most vulnerable persons including women, children and disabled persons. Sexual offences are physically and psychologically damaging to victims.
The definitions of sexual offences are within the Criminal Law (Sexual Offences and Related Matters) Amendment Act, No 32 of 2007., The ability to consent to a sexual act depends on the competence of the person to give consent and be knowledgeable of the consequences of that act - including the risk of contracting sexually transmitted diseases such as HIV.

GENERAL MEASURES

» Sexual offence victims must be regarded as emergencies but do not displace life-threatening management of other cases.
» Ensure appropriate management is in place for every case. So called “cold cases” (> 72 hours after the incident) may be managed medically and given an appointment for medico-legal investigation.
» If the victim wants to open a case, the Family Violence, Child Protection and Sexual Offences Unit (FCS) must be phoned and requested to come to the hospital.
» Cases must be opened in all cases of suspected or alleged rape/sexual abuse in children.

Offer 1st dose of antiretroviral PEP in all cases of suspected rape - the following matters can be resolved in due course:

HIV test

» Determine the patient’s HIV status before initiating PEP.
  - Prophylaxis given to a previously infected HIV person will have no clinical benefit and may lead to the development of viral resistance. Provide counselling and manage accordingly.
» Obtain informed consent from the patient and written consent from the parent in case of minors before HIV testing and giving the full course of treatment.
» Consent for HIV testing in children can be given by:
  - Children who are competent to give consent and are:

(i) ≥ 12 years of age; or
(ii) < 12 years of age and of sufficient maturity to understand the benefits, risks and social implications of such a test.
- Parents or caregivers of children who are not competent to sign consent (but the child should have this explained to them so they understand what is happening, appropriate to their age and development).
- The clinical head of the institution, where a competent person is not available to give consent for HIV testing and PEP (alleged rape in children is a medical emergency).

» Opting for immediate HIV testing remains the patient's choice.
- If the patient declines, give a 3–day starter pack of PEP and encourage the patient to reconsider testing within those 3 days.
- **No further PEP should be given in the case of continued refusal of HIV testing in adults, in children where the parent unreasonably refuses PEP this may be taken further.**
- If in doubt about the indications for HIV PEP, give PEP.

» A patient presenting after 72 hours since the alleged incident should not be given PEP, but should be counselled about the possible risk of transmission.
- HIV testing should still be offered at the time of presentation and 4 months later.

» If the HIV Elisa/Rapid test is positive in sexually abused children <18 months of age, perform HIV PCR to confirm if HIV infection is truly present.

» If HIV-uninfected or if the child has no access to immediate HIV PCR results, they should receive prophylaxis (until the HIV PCR result is obtained).

Pregnancy test

» Perform a pregnancy test in adult and pubertal girls to exclude pregnancy before initiating post exposure contraception and STI prophylaxis.
- Pregnant rape patients should be referred.

Initial counselling

Counsel all victims of sexual offences and their caregivers in the case of children

» Explain the side effects of ARVs, e.g. tiredness, nausea and flu-like symptoms.

» Use condoms for 4 months.

» Avoid blood or tissue donation for 6 months.

» Emphasise the importance of compliance with ARV PEP.

» Provide psychosocial support pertaining to:
- Restoring control of the victim by avoiding secondary traumatisation, and give choices and participation in treatment decisions.
- Medical risks, e.g. transmission of sexually transmitted infections including HIV, syphilis, hepatitis-B and C.
- Risk of pregnancy.
- Psycho-emotional-social effects of the sexual assault according to their level of understanding and maturity.

Follow-up support

» Discuss issues relating to stress management at subsequent visits.

» Inform the patient of the signs and symptoms of post-traumatic stress syndrome (PTSD), that may eventually cause exhaustion and illness. These include:

- general irritability
- trembling
- pain in neck and/or lower back
- change in appetite
- change in sleep pattern

Medico-legal assessment of injuries

» Complete appropriate required forms and registers.

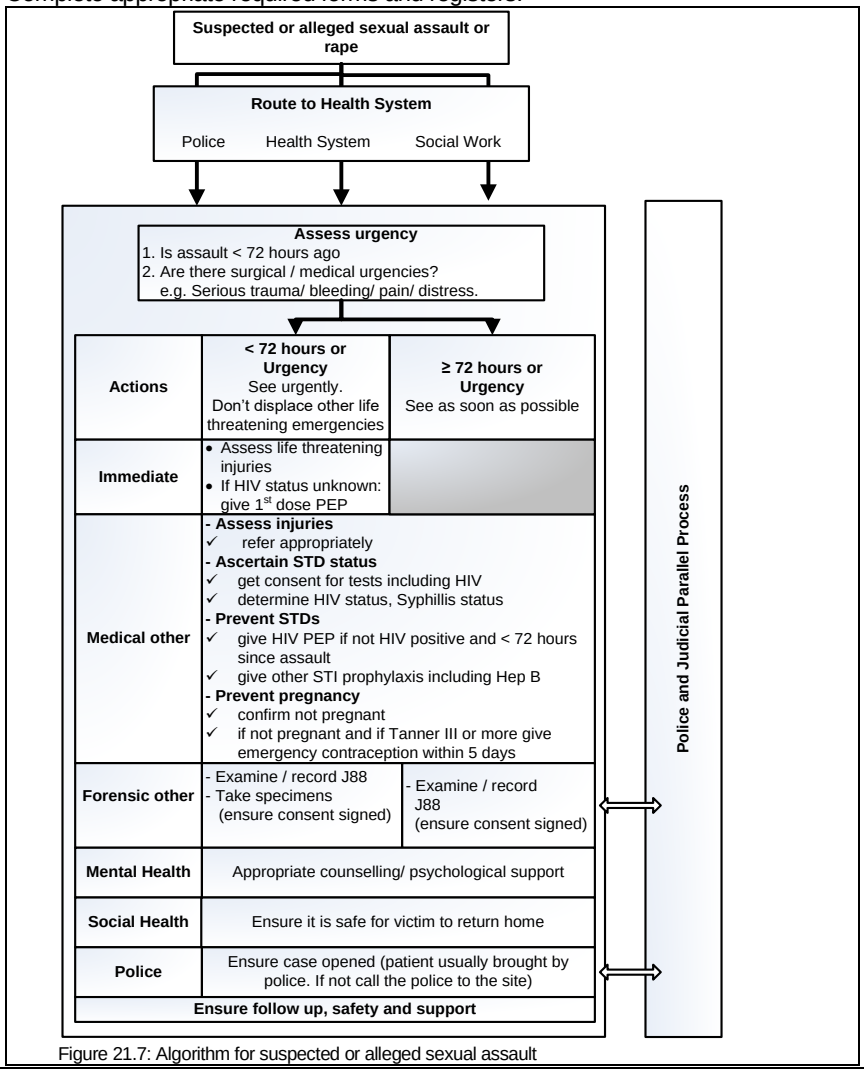


Figure 21.7: Algorithm for suspected or alleged sexual assault

INVESTIGATIONS

» Voluntary rapid HIV testing should be made available and should be done on all opting for PEP.
» Further baseline and follow-up investigations are the same as for occupational HIV exposure, with the addition of pregnancy testing in all women and female adolescents prior to post exposure contraception. See section 21.6.3.1 Post-exposure prophylaxis, occupational.

MEDICINE TREATMENT

Prevent the following:
1. HIV – PEP
2. HIV – PrEP
3. Hepatitis B
4. Pregnancy
5. STIs

Note:
» Obtain consent for HIV testing from all patients before initiating PEP.
» Offer PEP if the patient presents within 72 hours of being raped and is HIV-uninfected or HIV status is unknown.
» Initiate therapy as early as possible after the exposure to maximize the chance of effective prophylaxis.
» It is important to manage the medical condition before medico-legal examination. Most of these will require referral.
» If, for practical reasons, a person cannot return for the 3-day follow up, a 28-day course of ART should be provided.

1. HIV PEP
» Therapy may be given up to 72 hours after exposure.
» In children < 18 months of age: initiate antiretroviral PEP while awaiting transfer and HIV PCR results.

Children <10 years and < 30kg
- Zidovudine (AZT), oral, 12 hourly for 28 days.
  - Paediatric dose: 180–240 mg/m2. See Section 23: Standard Paediatric dosing tables.
  - Maximum: 300 mg/dose.

AND
- Lamivudine (3TC), oral, 4 mg/kg 12 hourly or 8mg/kg daily for 28 days.
  - Maximum: 150 mg/dose if given 12 hourly or 300 mg/dose if given daily. See Section 23: Standard Paediatric dosing tables.

AND
- Dolutegravir (DTG), oral, for 28 days.
  - For dosing guidance, see Section 23: Standard Paediatric dosing tables.

Dosages may vary by±1 mg/kg/dose, to allow a convenient volume of medication.
Use the adult dosage regimen if children require more than the maximum dose.
Follow-up visits should be at 2 weeks, 6 weeks, and 4 months after the rape.

Adults and children ≥ 10 years and ≥ 30 kg

Management for HIV prevention is the same as for occupational HIV exposure. See section 21.3.6.1 Post-exposure prophylaxis, occupational.

LoE:IVb[55]

2. HIV PrEP (see Section 11.11: Pre-exposure prophylaxis (PrEP))

If patient is at ongoing high risk of HIV acquisition, commence PrEP after PEP has been completed.

Perfom HIV test 4-weeks after initiating PrEP.

3. Hepatitis B prevention

Management for Hepatitis B prevention is the same as for occupational hepatitis B exposure. See section 21.3.6.1 Post-exposure prophylaxis, occupational.

4. Emergency contraception (after pregnancy is excluded)

Do a pregnancy test in all women and female adolescents.

Children must be tested and given emergency contraception from Breast Tanner Stage III. If unsure of staging, give emergency contraception when you detect any breast development (DO NOT REGARD MENARCHE AS AN INDICATION). Refer all pregnant rape victims.

- Copper IUCD, e.g.:
- Cu T380A, inserted as soon as possible after unprotected intercourse /sexual assault and not later than 5 days.

LoE:IIIb[56]

OR

- Levonorgestrel 1.5 mg, oral, as a single dose as soon as possible after unprotected intercourse/sexual assault, and not later than 5 days.
  - If the woman vomits within 2 hours, repeat the dose.

LoE:Ia[57]

Advise women that their period should be on time; very rarely it is delayed but it should not be more than 7 days late. If this occurs, they should come back for a pregnancy test.

CAUTION

Emergency contraceptive tablets must be taken as soon as possible, preferably within 72 hours of unprotected intercourse, and not later than 5 days.

Enzyme inducers (including efavirenz and carbamazepine) cause a significant reduction in levonorgestrel concentrations.

Women on these medicines should preferably have copper IUCD inserted or alternatively double the dose of levonorgestrel.

Women > 80 kg or BMI ≥ 30 should also preferably have copper IUCD inserted or alternatively double the dose of levonorgestrel.

LoE:IIIb[58]

An anti-emetic:

- Metoclopramide oral, 10 mg 8 hourly as needed.

5. STI prophylaxis

LoE:IIIb[59]

Adults

- Ceftriaxone, IM, 250 mg as a single dose.
  - For ceftriaxone IM injection: Dissolve ceftriaxone 250 mg in 0.9 mL lidocaine 1% without epinephrine (adrenaline).

AND

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

AND

- Metronidazole, oral, 2 g immediately as a single dose.

Children

Prior to hospital referral, administer:

Children < 45 kg

- Macrolide, e.g.:
- Azithromycin, oral, 20 mg/kg/dose, as a single dose, and refer.

Weight kg	Dose mg	Use one of the following:			Age Months/years
		Susp	Tablet		
		200 mg/5mL	250 mg	500 mg	
>7–9 kg	160 mg	4 mL			>6-12 months
>9–11 kg	200 mg	5 mL	–	–	>12–18 months
>11–14 kg	240 mg	6 mL	–	–	>18 months–3 years
>14–18 kg	320 mg	8 mL	–	–	>3–5 years
>18-25	400 mg	10 mL	–	–	>5-7 years
>25–35 kg	500 mg	–	2 tablets	1 tablet	>7–11 years
>35–45 kg	750mg	–	3 tablets	–	>11–13 years
> 45 kg	1000 mg	–	–	2 tablets	>13 years

Children ≥ 45 kg

- Macrolide, e.g.:
- Azithromycin, oral, 1g, as a single dose, and refer.

AND

- Metronidazole, oral, as a single dose, and refer.
  - 1–3 years: 500 mg
  - 3–7 years: 600–800 mg
  - 7–10 years 1 g
  - > 10 years 2 g

AND

- Ceftriaxone, IM, 80 mg/kg/dose immediately as a single dose. See dosing table, pg 23.3.
  - 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.

LoE:IIIb[60]

REFERRAL

» All patients with severe physical or psychological injuries.
- All children for medico legal and general care assessment after initiation of PEP as outlined above at PHC.
- If uncertain, phone Childline 0800055555
- Pregnant rape victims.
- Adults with:
  - » Active bleeding
  - » Abdominal pain
  - » Multiple injuries
  - » History of the use of a foreign object

Note: Refer if there are inadequate resources with regards to:
- counselling
- laboratory for testing
- medico-legal examination
- medicine treatment

21.3.6.3 POST EXPOSURE PROPHYLAXIS, INADVERTENT (NON-OCCUPATIONAL)

Z29.8 + Z20.5 + Z20.2 + Z20.6

DESCRIPTION

Inadvertent (non-occupational) exposure to infectious material from HIV and hepatitis B sero-positive persons often requires clinical judgement and includes:
» human bites (requires hepatitis B, but not HIV prophylaxis)
» sharing of needles during recreational drug use
» consensual sexual exposure, burst condoms
» contact sports with blood exposure

Management of inadvertent (non-occupational) HIV and hepatitis B exposure is the same as for occupational exposure. See Section: 21.3.6.1 Post exposure prophylaxis, occupational.

LoE:IIIa[61]

For exposures of a sexual nature (e.g. consensual sex with a burst condom), consider emergency contraception and STI prophylaxis on a case-by-case basis – see Section 21.3.6.2: Post exposure prophylaxis, rape and sexual assault.

21.3.7 SOFT TISSUE INJURIES

T14.0-1/T14.9

DESCRIPTION

Injuries may be minor, moderate or major:

Major injuries: it is important to recognise potentially life-threatening injuries. Indicators of such injuries are:
» Mechanism of injury: motor vehicle collision at speed exceeding 60 km/hour, ejection from the car, death of other occupant in the same car compartment, roll-over, pedestrian thrown out of his/her shoes, fall from height of more than 2 stories (more than thrice the patient's height in a child), multiple gunshot wounds.

- Physiological status: unable to maintain airway, tachycardia, hypoxia, hypotension on arrival (even if corrected with crystalloid infusion), tachycardia (especially in a child) or decreased level of consciousness.
- Anatomical distribution: (suspicion of) injuries to more than one body region (face, intracranial, chest, abdominal cavity, spine).
- Age: children < 2 years of age require admission.

Moderate injuries (list is not exhaustive):
- Head injuries: moderate head injuries (i.e. any GCS 11-14), facial fractures (airway maintained).
- Neck injuries: stable patient with a stabbed neck, tenderness over C-spine.
- Chest injuries: pneumothorax, haemothorax, rib fractures (2 or less).
- Abdominal injuries: any suspicion of an intra-abdominal injury in a haemodynamically stable patient: e.g. abdominal bruising (including seat belt sign in children), tenderness, distension, loss of bowel sounds, vomiting, haematemesis or haematuria.
- Extremity injuries: major open wounds, degloving injuries (boggy feel under intact skin), fractures, dislocations (in children: point tenderness around a major joint), crush injuries, multiple soft tissue injuries, enlarging or pulsating swelling.
- Suspicion of abuse (child abuse, intimate partner abuse, elderly abuse).

Minor injuries are injuries that can be managed as an outpatient and include bruises, small lacerations, sprains, concussions etc.
- Human bites (see Section 21.3.1.2: Human bites) and animal bites (see Section 21.3.1.1: Animal bites).
- Sprains or strains (see Section 21.3.8: Sprains and strains).
- Exclude fractures.

EMERGENCY MANAGEMENT

All trauma patients, except for those who only have minor injuries, should undergo these surveys:

A = **Airway:** check and maintain airway. If airway obstructed, first perform a jaw thrust manoeuver, then if able, insert an endotracheal tube. Patients with maxillofacial fractures may require a tracheostomy.

B = **Breathing:** assess respiratory rate, use of accessory muscles, symmetry, oxygen saturation. If needed, support breathing using a Bag-Valve-Mask device ('AMBU bag'). Look for signs of pneumothorax (affected site is hyperinflated, hypertympanic and has decreased breath sounds). If tension pneumothorax (distended neck veins, deviated trachea, hypoxia and hypotension): perform a needle thoracostomy.

C = **Circulation:** look for tachycardia and hypotension. Put up two large bore peripheral lines, a femoral line or an intraosseous line in the tibia (if no abdominal injury) or the proximal humerus. In adults: if SBP if < 90 mmHg, infuse 2 L of sodium chloride 0.9% until SBP ≥ 90 mmHg. If actively bleeding, it is permissible to maintain SBP≥ 80 mmHg (or a palpable radial pulse if you do not have access to a BP machine). In children the SBP should not fall below (70 + [2 x age]) mmHg.

D = **Disability:** perform a brief neurologic assessment and classify according to the Glasgow Coma Scale:

Glasgow Coma Scale: Add scores to give a single score out of 15:		
Best motor response:	Obeys commands	6
	Localises to pain	5
	Withdraws from pain	4
	Abnormal flexion to pain	3
	Extends to pain	2
	None	1
Best verbal response:	Orientated	5
	Confused	4
	Inappropriate words	3
	Incomprehensible sounds	2
	None	1
Eye opening	Spontaneous	4
	To voice	3
	To pain	2
	None	1
Total		

Table 21.16: Primary survey of trauma patients

E = **Exposure/environment:** expose the patient. If any suspicion of spinal cord injury (multi-trauma, decreased level of consciousness, neurological deficit, tenderness over the spine, severe mechanism of injury, anatomic deformity of the spine or any of the following: intoxication, inability to communicate or a distracting injury) cut the patient's clothes off, so as to minimise movement of the spine, and immobilise neck using a long back board. Use a hard collar and strapping to the trolley in other patients Prevent hypothermia by covering the patient with warm blankets, and infusing warm fluids.

When major physiological derangements are identified and patient is stabilised using the ABCDEs of the primary survey, perform an AMPLE history and secondary survey:

AMPLE history:

A = allergies
M = the patient's regular medication (including contraceptives and OTC medication)
P = past medical history
L = time of last meal (important is the time between the last meal and the accident)
E = events leading up to the incident

Secondary survey

The secondary survey is a head-to-toe examination of the patient to identify any injuries that may have been missed during the primary survey. The secondary survey is only performed in a stable patient.

First examine patient from the front, then log-roll the patient and examine the back (include a rectal examination).

All fracture sites must be immobilised by external splints.

Any additional investigations should be ordered according to availability of resources:

» Bloods may include FBC, clotting profile, cross-match and U & Es.
» Consider whether the patient requires transfer for x-rays.

MANAGEMENT OF WOUNDS AND LACERATIONS

» Assess wound: if significant devitalised tissue, especially if due to a crush injury or a bite, dress with povidone-iodine and refer for surgical debridement.
» Assess surrounding tissues and test function: look for associated fractures, ligament/tendon damage and nerve or vascular injuries. Document.

» If needed, anaesthetise wound. Remove foreign bodies and irrigate the wound with sodium chloride 0.9%. If needed, remove any devitalised tissue with a scalpel.
» Wounds may be glued with tissue adhesives if wound < 4 cm, clean and uncomplicated, especially in children and elderly patients. Avoid in the following cases: lacerations in areas under tension (hands, feet, joints), oral mucosa, wounds in moist or hairy areas (axillae/perineum), if needing high level of precision (hairline or vermilion border of lip), or wounds at increased risk of infection (bite wounds, puncture wounds, wounds with contaminated tissue). Wounds on the scalp can be glued but surrounding hair needs to be trimmed.

Tissue adhesive (glue):
- Clean wound thoroughly with chlorhexidine 0.05% aqueous solution.
- Ensure good haemostasis before applying glue.
- Appose wound edges (bring wound edges together). Ensure patient is positioned appropriately so that when applied, any excess glue does not run down into areas not meant to be glued. If this happens, quickly wipe away with dry gauze.
- Crush tissues adhesive vial and invert.
- Gently brush adhesive over laceration (avoid contact with gloves/ instruments and avoid pushing adhesive into wound).
- Apply three layers of adhesive (maximum bonding strength is achieved within 2.5 minutes of application).
- Do not put on any covering or dressings.
- Advise patients that they may shower but not soak in bath and to pat area dry.
- The bonded adhesives spontaneously slough off within 5 to 10 days.

MEDICINE TREATMENT

If fluid replacement needed, see Section 21.2.9: Shock.

Adults
- Sodium chloride 0.9%, IV, 1L as a rapid bolus.
  - Repeat bolus until blood pressure is improved.

Children
- Sodium chloride 0.9%, IV, 20 mL/kg as a rapid bolus.
  - Repeat bolus if no adequate response.

Note: If patient develops respiratory distress, discontinue fluids.

Tetanus prophylaxis:
Z23.5
If not previously immunised within the last 5 years
- Tetanus toxoid (TT), IM, 0.5 mL.

If sutures needed:
- Lidocaine without adrenaline (epinephrine), injection. *LoE:IVb*[62]
  - Infiltrate around the wound as local anaesthetic.
  - Maximum dose: 3 mg/kg.
  - See dosing table below.

Weight kg	Maximum dose, mg	Vial 1%, 10 mg/mL	Vial 2%, 20 mg/mL	Age months/years
>2.5–3.5 kg	7 mg	0.7 mL	0.35 mL	Birth–1 month
>3.5–5 kg	10 mg	1 mL	0.5 mL	>1–3 months
>5–7 kg	15 mg	1.5 mL	0.75 mL	>3–6 months
>7–9 kg	20 mg	2 mL	1 mL	>6–12 months
>9–11 kg	25 mg	2.5 mL	1.25 mL	>12–18 months
>11–14 kg	30 mg	3 mL	1.5 mL	>18 months–3 years
>14–17.5 kg	40 mg	4 mL	2 mL	>3–5 years
>17.5–35 kg	50 mg	5 mL	2.5 mL	>5–11 years
>35–55 kg	100 mg	10 mL	5 mL	>11–15 years

For children > 55 kg and adults:

- Lidocaine without adrenaline (epinephrine), injection.
  - Infiltrate around the wound as local anaesthetic.
  - Maximum dose: 3 mg/kg.

Pain:

Children

- Paracetamol, oral, 10–15 mg/kg/dose 6 hourly when required. See dosing table, pg 23.8.

Adults

- Paracetamol, oral, 500mg -1 g 4–6 hourly when required (to a maximum of 4 g in 24 hours).
  - Maximum dose: 15 mg/kg/dose.

For more severe pain, give analgesia as appropriate. See Section 20.1: Pain control.

Infected wound management:

Manage as for cellulitis. See Section 5.4.3: Cellulitis.

REFERRAL

Urgent

» All major and moderate injuries once stabilised.
» Infected wounds.

Note:

» If uncertain how to stabilise patient, phone for guidance from referral hospital.
» Before transport leaves, ensure endotracheal tube is securely strapped, all lines are secured, all drips are running well and patient is well covered to prevent hypothermia.
» If transport is delayed, ensure patient does not deteriorate while waiting: repeat ABCD survey at least hourly.

21.3.8 SPRAINS AND STRAINS

S03.4-5/S13.4-6/S23.3-5/S33.5-7/S43.4-7/S53.4/S63.5-7/S73.1/S83.4-6/S93.4-6/T11.2/T13.2/ T14.3

DESCRIPTION

Clinical features include:

» pain, especially on movement
» tenderness on touch
» limited movement
» history of trauma

May be caused by:

» sport injuries
» slips and twists
» overuse of muscles
» abnormal posture

Note: In children always bear non-accidental injuries (assault) in mind.

EMERGENCY TREATMENT

Immobilise with firm bandage and/or temporary splinting.

Children

- Paracetamol, oral, 10–15 mg/kg/dose 6 hourly when required. See dosing table, pg 23.8.

Adults

- Paracetamol, oral, 500mg -1 g 4–6 hourly when required (to a maximum of 4 g in 24 hours).
  - Maximum dose: 15 mg/kg/dose.

AND

Children >12 years of age and adults

- NSAID, e.g.:
- Ibuprofen, oral, 200–400 mg 8 hourly with or after a meal.

REFERRAL

» Severe progressive pain.
» Progressive swelling.
» Extensive bruising.
» Deformity.
» Joint tenderness on bone.
» No response to treatment.
» Severe limitation of movement.
» Suspected serious injury.
» Recurrence.
» Previous history of bleeding disorder.
» Consider rehabilitation services for sprains, strains, and overuse injuries to improve joint stability and assist with pain management.

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