

SNAKEBITE

FLIPPER CARD



HOSPITAL CARE PROVIDER



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Trauma Society of South Africa



Emergency Medicine
Society of South Africa

This Flipper Chart gives you all the general guidelines to
treat a snakebite as an in-hospital provider

ASSESSING THE SNAKEBITE

INITIAL ASSESSMENT

- **Scene safety** – Ensure that the snake (if brought in) is securely contained.
- **Trauma principles are used in snakebite: ABCDE** Provide supplemental oxygen, connect to monitors (Oxygen saturation; ECG and blood-pressure) and consider insertion of an intravenous line.
- **Pressure Bandages** – Ensure adequate circulation is present in the distal point of the limb. Do not remove in suspected neurotoxic (progressive weakness) bites, until ready to administer antivenom where indicated.
- **TOURNIQUETS:** Do not remove in suspected **NEUROTOXIC BITES** (progressive weakness). In all other cases remove as soon as possible. **FOR NEUROTOXIC BITES:** If an improvised tourniquet is in place, **REPLACE** it with an **INFLATABLE TOURNIQUET ABOVE** the improvised one. Once the inflatable tourniquet is **INFLATED TO 10mmHg ABOVE THE SYSTOLIC BLOOD PRESSURE, THEN, REMOVE** the improvised tourniquet. **PROCEED** to do a **STAGED RELEASE. STAGED RELEASE: DEFLATE THE TOURNIQUET GRADUALLY AT 5 - 10mmHg EVERY 3 - 5 MINUTES. THIS SHOULD BE DONE SIMULTANEOUSLY WITH THE ADMINISTRATION OF THE ANTIVENOM OVER 30 MINUTES.**

VITALS AND ESSENTIAL INVESTIGATIONS

- | | | |
|------------------|----------------------------------|--|
| • Heart Rate | • ETCO ₂ if intubated | • SpO ₂ |
| • Temperature | • – prep if intubation needed | • Assess GCS |
| • Blood Pressure | • PEAK flow | • ECG monitoring |
| • Glucose | • Respiratory Rate | • Do 20WBCT, FBC, INR and Urea/Creat/Elect |
| | • Skin condition | |

PHYSICAL EXAMINATION

- Fang marks – absence of fang marks does not rule out snakebite.
- Signs and Symptoms – Progressive weakness: **Ps** Paralysis, Ptosis, Paraesthesia, **Ss** Sweating, Salivation, Slurred speech. Painful progressive swelling: Swelling, blisters, skin discoloration, Bleeding, etc.
- Signs of Respiratory distress or Shock?

HISTORY

- SAMPLE
- How did the bite occur?
- Where on the body was the patient bit?
- How long has it been since the snakebite?
- Is there an identification/description of the snake? [Have a poster in your emergency department]
- What activity was performed at the time of the bite and what treatment was given?
- Has the patient sustained a snakebite before?

SNAKEBITE EMERGENCY CONTACT NUMBERS

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Snakebite Syndromes

Painful Progressive Swelling

- Swelling due to cytotoxic venom starting at the bite site and progressing up the limb.
- Immense pain with the affected area being warm and hard.
- Complications include: blistering, discoloration, bleeding under the skin, necrosis, pseudocompartment syndrome, nerve and vessel entrapment, deep vein thrombosis, hypotension, and hypovolaemic shock. True compartment syndrome is rare in snakebite
- Species responsible: Puff Adder, Gaboon Adder, some of the dwarf Adder species, Spitting Cobras (Mozambique Spitting Cobra & Black Spitting Cobra), Stiletto Snakes, and Night Adders.

Progressive Weakness

- Progressive weakness and paralysis due to neurotoxic venom.
- This syndrome can lead to complete paralysis, respiratory failure and cardiac arrest.
- Complications include: muscle spasms, drooling, incontinence, salivation, lacrimation, diaphoresis, dilated pupils, dyspnoea, respiratory failure and death.
- Species responsible: Black Mamba, Green Mamba, Non-spitting Cobras (Cape Cobra, Snouted Cobra & Forest Cobra), Berg Adder and the Desert Mountain Adder

Bleeding

- History may include need for the snake to be “pulled off” the bite site
- Bleeding tendencies are caused by haemotoxic venom leading to a venom induced consumption coagulopathy (VICC) that develops over time.
- Early symptoms are usually absent. This is followed by bleeding at the bite-site and bruising and a prolonged 20-minute whole blood clotting time.
- This syndrome eventually leads to widespread internal bleeding:
- Later complications include: Haematuria, haemoptysis, melena, epistaxis, cerebral haemorrhage, hypotension, and hypovolaemic shock. (12-36 hours)
- Species responsible: Boomslang and Vine Snakes

Mixed Painful Progressive Swelling & Bleeding

- Mix of complications from the Painful Progressive Swelling as well as Bleeding Syndromes
- Species responsible: Puff Adder, Gaboon Adder

Mixed Painful Progressive Swelling & Progressive Weakness

- Mix of complications from the Painful Progressive Swelling as well as Progressive Weakness Syndromes
- Species responsible: Rinkhals, Snouted Cobra, Berg Adder and Forest Cobra

AIRWAY AND BREATHING

Assess imminent respiratory compromise (respiratory rate, SpO₂, and signs of shock) (**C-spine is usually not an issue**) **Supplemental oxygen with nasal prongs ± a non-rebreather mask for SpO₂ less than 94%** Simple airway manoeuvres and bag-valve-mask (BVM) ventilation with 100% oxygen should be provided to apnoeic patients or patients suffering from hypoventilation.

EARLY INTUBATION WITH BOUGIE

RSI

Optimise preparation (equipment and patient) and pre-oxygenation

Laryngoscopy with video or bronchoscopic assistance (2-3 attempts)

Alternative Airway

LMA, LTA, iGel

Surgical Airway

Last resort should other options fail

RSI MEDICATION

mg/kg	INDUCTION
1-2	Ketamine
0.1-0.3	Etomidate
mg/kg	NEUROMUSCULARBLOCKER
1-2	Suxamethonium - AVOID in Neurotoxic Bites
1-1.2	Rocuronium - only if needed

BASELINE VENTILATOR SETTINGS

Mode	SIMV
Tidal Volume	7ml/kg
PIP	12-14cm H ₂ O
PEEP	5
I:E	1:2
Rate	12bpm (adults), 20bpm (paediatrics), 25bpm (neonates)

POST INTUBATION CHECKLIST

- ETT secured at correct depth
 - ETCO₂ Monitor attached
 - Ventilator set & attached
 - Analgesia administered
 - Sedation administered
 - Vital signs rechecked
 - ETT cuff pressure checked
 - Functional IV line for resuscitation
 - Analgo-sedation infusion prep: Ketamine 500mg/50ml. Titrate to effect at around 1-2mg/kg/hr
- AVOID** Morphine and Midazolam in **Neurotoxic bites**.
- AVOID** Opioids in **neurotoxic envenomation**: Perpetuates suppression of the respiratory drive and sedation.
- AVOID** Suxamethonium in **neurotoxic bites**: Risk of prolonged apnoea and ventilation.

CIRCULATION / BLEEDING

Shock is less common in the early phase but anaphylaxis to the snakebite (if previously bitten) or to the antivenom is fairly common

Fluid therapy in cases of cytotoxic bites follows the Surviving Sepsis approach of 20 - 30ml/kg crystalloid if shocked: Obtain large bore IV access or IO access. In regional facility, a rapid infusion catheter in the groin is effective. Maintenance fluid must also be given.

DISABILITY

Check the Glasgow coma score and check eyelid motor function. Assess power and swallowing capacity – if any of these are below normal, airway support is indicated.

DRUG THERAPY

Follow the **Syndromic Approach**. Consult a trained herpetologist to accurately identify the snake, enabling more precise decision-making.

If the need for Antivenom is confirmed, prepare the patient with a pre-dose adrenaline 0.25mg (quarter ampoule) subcutaneous on either thigh, abdominal wall or forearm.

WE ADVISE TO ADMINISTER ANTIVENOM AS:

1. Administer **POLYVALENT ANTIVENOM** as a 200ml-infusion **without** test-dosing by **controlled IV infusion** over a period of **30-60 minutes** **without the use of steroids or antihistamines**.
2. **Do not administer POLYVALENT ANTIVENOM** as an **IV push dose**.
3. **BOOMSLANG MONOVALENT ANTIVENOM** can be administered as an **IV push dose**.

A physician should be present during administration. Steroids or Antihistamines may form part of treatment if anaphylaxis occurs, but should **not** be given routinely **before** antivenom administration.

RECOMMENDED DOSING FOR TREATMENT:

SAVP - South African Vaccine Producers Antivenom

- **Neurotoxic bite** – 80 - 120 ml of **SAVP** Polyvalent antivenom.
- **Cytotoxic bite** – 40 - 80 ml **SAVP** Polyvalent antivenom.
- **Haemotoxic bite** – **ONLY Boomslang**: 10-20 ml of **SAVP** Monovalent specific antivenom.

PANAF - Pan-African Antivenom

Generally, the agreed dose from the **NSAG (National Snake Advisory Group)** is **1.5X** the number of **SAVP** vials

- **Neurotoxic bite** – 120 - 180 ml of **PANAF** Polyvalent antivenom.
- **Cytotoxic bite** – 60 - 120 ml of **PANAF** Polyvalent antivenom.

SAVP and PANAF antivenoms can be safely used together when clinically indicated.

Neostigmine may be considered as a **therapeutic** option in the management of **rapidly progressing neurotoxic effects** following a **confirmed non-spitting Cobra** envenomation, ensuring timely intervention to support respiratory function and patient stability.

Neostigmine is **INEFFECTIVE** for **Mamba Bites**.

IN THE EVENT OF NO AVAILABILITY OF ANTIVENOM, PLEASE CARRY OUT SUPPORTIVE TREATMENT AND CONSIDER TRANSFER TO A HOSPITAL WITH ANTIVENOM.

INDICATIONS FOR ANTIVENOM:

- All patients with systemic signs and symptoms or severe spreading local tissue damage should receive antivenom.
- **Any signs** of neurotoxicity.
- Positively identified Puff Adder, Snouted Cobra, Mozambique Spitting Cobra, Rinkhals bite **AND** evidence of severe progressive Cytotoxicity.

Unidentified snakebites and evidence of severe progressive cytotoxicity envenomation, i.e.:

- swelling of the whole hand or foot within 1 hour
- swelling to the knee or elbow in < 6 hours (or two joints above the bite site in 6hrs)
- swelling of the whole limb in < 12 hours
- swelling progression > 5cm per hour
- discoloration of the skin/necrosis at the bite-site.
- a threatened airway due to swelling
- evidence of complication, e.g. **suspected** compartment syndrome – must get AV before surgery
- thrombocytopaenia or raised INR / abnormal TEG/ROTEM
- positively identified Boomslang bite – do not wait for onset of **VICC**

20-MINUTE WHOLE BLOOD CLOTTING TEST (20WBCT)

- Use a clean, dry, **additive-free** test tube for sample collection.
A brown-top tube is recommended.
- Draw 2-3 ml of fresh venous blood from the patient.
- Place the tube in an upright position at room temperature for 20 minutes, leave undisturbed.
- After 20 minutes (note times) gently tilt the tube to check for clotting.
- If blood remains liquid, this indicates **coagulopathy, VICC**. Add other lab bloods as needed.

EYE CARE

- Flush affected eye/eyes with a bland liquid, 0.9% Sodium Chloride solution preferred.
- If a local anesthetic agent is available, add 2% lignocaine 1ml per 1000ml saline.
- Add a mydriatic eye drop in cases where corneal damage is noted.
- Refer to an ophthalmologist.
- Do a slit lamp fluorescein check for corneal damage and cover with antibiotic drops for 5/7.

SNAKEBITE AND ANTIVENOM IN PAEDIATRICS

- **Dose of antivenom administered in PAEDIATRICS is the same as for adults.**
- Antivenom is designed to neutralize a fixed venom dose, which the snake injects indiscriminately into humans, large or small, including neonates.
- Higher doses of venom are relative to their body weight compared to adults.
- Venous access may be difficult. The intraosseous route may be required.
- Coagulopathies occur sooner, as does weakness and respiratory failure due to a faster evolution of envenomation.
- Frequent reassessment of snake-bitten children is necessary.

SNAKEBITE AND ANTIVENOM IN PREGNANCY

- **Antivenom is NOT contraindicated in pregnancy.**
- Indications for antivenom administration remain the same as with non-pregnant patients.
- Snakebite envenomation increases the chance of foetal loss in the first and early second trimester.
- Envenomation can cause foetal bradycardia in viable gestation pregnancies - thus foetal monitoring is indicated.
- Envenomation by haemotoxic snakebite may increase the chance of bleeding complications such as antepartum and postpartum haemorrhage.

SNAKEBITE AND ANTIVENOM IN THE ELDERLY

- **The Elderly are no different than younger patients when it comes to the administration of antivenom for snakebite.**
- May be more prone to hypotension.
- Therapeutic fluid overload and adverse effects of adrenaline (epinephrine) are more likely from intercurrent and unrelated chronic illnesses such as hypertension, cardiovascular diseases, chronic obstructive bronchitis, and diabetes mellitus.

Patients bitten by snakes should be observed in a hospital for at least **24 hours** after the bite.

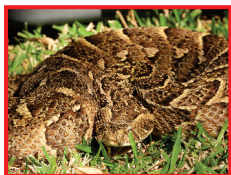
For **Bleeding Syndrome Patients**, monitor for at least **48 hours** after the bite.

POLYVALENT ANTIVENOM SPECIES —



RINKHALS (*Hemachatus haemachatus*)

- **Distribution:** KZN, Mpumalanga, Western Cape, Eastern Cape, Northwest, Limpopo, Free State, Gauteng
- **Colour:** Black, brown or olive with white throat bands or black and yellow/orange body bands with yellow throat bands
- **Length:** 1.0-1.5m
- **Venom:** **Cytotoxic & Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis along with Painful Progressive Swelling



PUFF ADDER (*Bitis arietans*)

- **Distribution:** Throughout South Africa
- **Colour:** Colour varies but has V-shaped markings down the back pointing towards the tail
- **Length:** 0.9-1.2m but up to 1.4m
- **Venom:** **Cytotoxic**
- **Venom Effects:** Mixed Painful Progressive Swelling & Bleeding



GABOON ADDER (*Bitis gabonica*)

- **Distribution:** Coastal Northern KZN
- **Colour:** Various shades of pastel colours with blocks along the back and triangles down the sides
- **Length:** 1.2m can get bigger
- **Venom:** **Cytotoxic**
- **Venom Effects:** Mixed Painful Progressive Swelling & Bleeding



BLACK MAMBA (*Dendroaspis polylepis*)

- **Distribution:** KZN, Mpumalanga, Northern Cape, Northern Coastal parts Eastern Cape, Northwest, Limpopo, Gauteng
- **Colour:** Dark Olive, greyish brown or gunmetal grey
- **Length:** 2.8-3.2m but up to 4.5m
- **Venom:** **Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis with or without minor swelling



GREEN MAMBA (*Dendroaspis angusticeps*)

- **Distribution:** Coastal Bush KZN, Northern Coastal Bush Eastern Cape
- **Colour:** Uniform green with irregular yellow scales
- **Length:** 1.8-2.5m
- **Venom:** **Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis with or without minor swelling



MOZAMBIQUE SPITTING COBRA (*Naja mossambica*)

- **Distribution:** KZN, Mpumalanga, Northern Coastal Bush Eastern Cape, Northwest, Limpopo, Gauteng
- **Colour:** Brown with an orange/salmon belly and black bands on the neck
- **Length:** 1.2-1.6m
- **Venom:** **Cytotoxic**
- **Venom Effects:** Painful Progressive Swelling



CAPE COBRA (*Naja nivea*)

- **Distribution:** Western, Northern and Eastern Cape, Northwest, Free State
- **Colour:** Varied between yellow, brown, black, cream and a speckled phase
- **Length:** 1.4-1.6m
- **Venom:** **Neurotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis



SNOUTED COBRA (*Naja annulifera*)

- **Distribution:** KZN, Mpumalanga, Northwest, Limpopo, Gauteng
- **Colour:** Yellowish brown with a yellow belly, or black and cream bands
- **Length:** 1.8-2.5m
- **Venom:** **Neurotoxic & Cytotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis along with Painful Progressive Swelling



FOREST COBRA (*Naja subfulva*)

- **Distribution:** Northern Coastal Bush KZN, Limpopo along the Pafuri River in KNP to Eastern Soutpansberg Mountains
- **Colour:** Black back half with a yellowish-brown front half
- **Length:** 2-2.7m
- **Venom:** **Neurotoxic & Cytotoxic**
- **Venom Effects:** Progressive Weakness and Paralysis along with Painful Progressive Swelling

MONOVALENT ANTIVENOM SPECIES —



BOOMSLANG (*Dispholidus typus*)

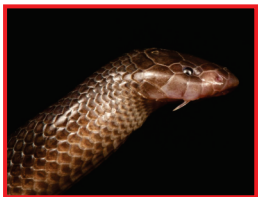
- **Distribution:** Widespread throughout South Africa where tree habitat is found
- **Colour:** Grey, Brown, Green, Red, Blue, Green with Black "bands", black backs with yellow bellies
- **Length:** 1.5-2.0m
- **Venom:** **Haemotoxic**
- **Venom Effects:** Bleeding

OTHER SPECIES



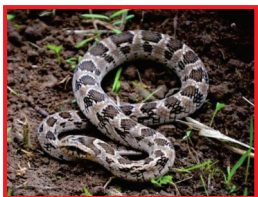
VINE SNAKE (*Thelotornis capensis*)

- **Distribution:** KZN, Mpumalanga, Northwest, Limpopo, Gauteng
- **Colour:** Cryptically coloured resembling a stick
- **Length:** 1.2-1.5m
- **Venom:** **Haemotoxic**
- **Venom Effects:** Bleeding



BIBRON'S STILETTO (*Atractaspis bibronii*)

- **Distribution:** KZN, Mpumalanga, Northern Cape, Northern Coastal Bush Eastern Cape, Northwest, Limpopo, Free State, Gauteng
- **Colour:** Body brown to blackish, belly may be white
- **Length:** 40-60cm, max 98cm.
- **Venom:** **Cytotoxic**
- **Venom effects:** Moderate swelling with potential of causing local tissue necrosis.



COMMON OR RHOMBIC NIGHT ADDER (*Causus rhombeatus*)

- **Distribution:** KZN, Mpumalanga, Western Cape, Eastern Cape, Northwest, Limpopo, Free State, Gauteng
- **Colour:** Dark brown Rhombic markings on the back. Body colour varies from light grey to brown. Characteristic "V" shape marking on the head.
- **Length:** 40-60cm. Max 1m
- **Venom:** **Cytotoxic**
- **Venom effects:** Moderate local swelling and pain.

Photo Credit: Neville's Snake and Reptile Rescue, Eastern Cape.

Even though localized symptoms could seem extreme, there is no antivenom for the treatment of stiletto and night adder bites.

DISCLAIMER The authors and editor have exerted every effort to ensure that the clinical procedures and recommendations described herein are based on current knowledge and state-of-the-art information obtained from acknowledged authorities, texts and journals. However, they cannot be considered absolute and universal recommendations. Each patient's situation must be considered individually, using a **SYNDROMIC** approach. The reader is urged to check the package inserts of drugs and equipment and the manufacturer's recommendations for indications, contraindications, proper usage, warnings and precautions before use. The authors and editor disclaim responsibility for any adverse effects resulting directly or indirectly from information presented in this booklet, undetected errors or misunderstandings by the readers. **SNAKE**

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