eswatini
antivenom
foundation

BEST PRACTICES
FOR SNAKEBITE MANAGEMENT
CONSENSUS GUIDELINES

eswatiniantivenom.org

An Ode to Thea and Team EAF

From venom's grip, I once did fall,
A silent battle, a desperate call.
But through the dark, a light did shine,
In Thea's hands, my hope aligned.
The EAF stood firm, a beacon bright,
Their care, their love, a guiding light.
With skill and heart, they made me whole,
Restoring life, mending my soul.
To you, who fight with grace and might,
I stand, a survivor in the light.
Forever grateful, this heart will sing,
For Thea and the EAF – your praises ring.

A TRIBUTE TO MY BELOVED HUSBAND - CLIFTON KOEN (1996 - 2023)

Today, as I reflect on our life together, my heart is filled with gratitude and love for the incredible man you were. Though you are no longer by my side, your spirit resonates in every corner of my life, reminding me of the joy, love, and unwavering support you provided over the last 20 years. The landscape of conservation and snakebite has changed completely. Because of you.

Your unwavering belief in me pushed me and my cause, and your steadfast support helped me navigate the road we traveled and its many challenges. I am profoundly thankful for the countless sacrifices you made. Your selflessness did not go unnoticed, and it shaped the person we all are today.

You were more than just my husband; you were my best friend, my confidant, and my biggest cheerleader. Through laughter and tears, victories and setbacks, you stood by my side. Your ability to listen, understand and quietly guide was unmatched, and I always felt safe in your presence.

Together, we created a lifetime of memories – traveling to new places, enjoying quiet evenings at home, and celebrating life's milestones, both big and small. Your laughter filled our home with joy, and your wisdom guided us through the storms. So many of these moments bring a smile to my face, even as I navigate this new reality without you.

Even though our time together has come to an end, I will forever carry your love in my heart. Your legacy lives on in the lessons you taught us all, the love we shared, and the strength you instilled in me. I promise to honor your memory by living life fully and pursuing the dreams we envisioned together.

Thank you for every beautiful moment, for every shared dream, and for loving me so completely. I am eternally grateful for you and all that you brought into my life. Until we meet again, my love.

With all my heart,

Thea

FOREWORD

A Word from the Experts and Emerging Professionals

The field of snakebite management is one that continuously evolves as new knowledge, research, and techniques emerge. It is a domain where expertise is built upon years of practice and dedication, yet there is always room for fresh perspectives, innovation, and growth.

In this booklet, we have brought together the insights of both seasoned experts and emerging professionals – yet equally committed to the mission of improving care for those affected by snakebites. The voices of these individuals represent a valuable blend of time-tested wisdom and innovative approaches, each contributing to the ongoing development of best practices.

The journey of learning and mastery in the field of snakebite management is never truly complete. As we strive for better outcomes, this collaborative effort, bridging the experiences of experts and emerging professionals, serves as a testament to our collective commitment to saving lives and enhancing care for those who need it most. – Thea

CONTENTS

DECODING THE CODE: YOUR KEY TO THE SNAKEBITE PROTOCOLS

Airway & Ventilation

- BVM – Bag-Valve Mask
- LMA – Laryngeal Mask Airway
- SGA – Supraglottic Airway
- RSI – Rapid Sequence Intubation
- ETT – Endotracheal Tube
- $ETCO_2$ – End-Tidal Carbon Dioxide
- SpO_2 – Peripheral Capillary Oxygen Saturation

Oxygen Delivery

- NP O – Nasal Prong Oxygen
- NRB – Non-Rebreather Mask
- HFNC – High-Flow Nasal Cannula

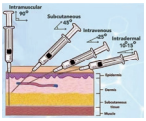
Ventilation & Respiratory Support

- PPV – Positive Pressure Ventilation
- SIMV – Synchronized Intermittent Mandatory Ventilation
- PEEP – Positive End-Expiratory Pressure
- I:E – Inspiratory to Expiratory Ratio

Coagulation & Snakebite-Related

- WBCT – Whole Blood Clotting Test
- VICC – Venom-Induced Consumption Coagulopathy
- INR – International Normalized Ratio
- TEG – Thromboelastography
- ROTEM – Rotational Thromboelastometry

Access & Medication Routes



- IO – Intraosseous
- IV – Intravenous
- IM – Intramuscular
- SC – Subcutaneous

Trauma & Emergency Care

Head tilt-chin lift maneuver

Jaw thrust maneuver

- HTCL – Head-Tilt, Chin-Lift
- JT – Jaw Thrust

Miscellaneous & Mnemonics

- **MIDSOLES** – A mnemonic for assessing the critically ill (Mental status, Inotropes, Dyspnea, SpO_2, Oxygenation, Lactate, End-tidal CO_2, Shock index)
- **DOPE** – Mnemonic for troubleshooting ventilator issues (Displacement, Obstruction, Pneumothorax, Equipment failure)
- **ANALGOSEDATION** – A combination of analgesia and sedation, used for pain relief and sedation in critical care

KETAMINE-ONLY BREATHING INTUBATION (KOBI)

KOBI is an airway management technique that uses a dissociative-dose of ketamine to facilitate intubation while preserving spontaneous breathing. Unlike Rapid Sequence Intubation (RSI), which requires paralytics, KOBI relies solely on ketamine's dissociative effects, allowing the patient to remain unconscious but breathe independently during the procedure.

Key Features

- Spontaneous Breathing: By avoiding paralytics, KOBI allows patients to continue breathing, reducing the risk of hypoxia.
- Hemodynamic Stability: Ketamine helps maintain blood pressure, making it ideal for hypotensive patients.
- Extended Intubation Time: Preservation of spontaneous respiration gives clinicians more time to secure the airway.

Considerations

- Airway Complications: Potential for muscle rigidity or laryngospasm; have paralytics on hand for emergencies.
- Skill Required: Clinicians should be experienced in airway management and ready to switch to traditional methods if needed.
- Patient Selection: KOBI is best for patients who require maintained spontaneous breathing and where **paralytics** may be harmful. - **AS IN NEUROTOXIC ENVENOMATION**

KOBI offers a safer, more controlled alternative to traditional intubation, but requires proper training and patient assessment to be effective. For a practical demonstration, visit: **EMUPDATES.COM**

ICP EchiTAb-ICP ANTIVENOM: A CRITICAL THERAPEUTIC RESOURCE FOR MANAGING SNAKE ENVENOMATION IN ESWATINI

OVERVIEW OF ICP ECHITAB-ICP POLYSPECIFIC ANTIVENOM

WHAT IS ICP EchiTAb-ICP ANTIVENOM?

The EchiTAb-ICP Polyspecific Antivenom is a polyvalent equine-derived immunoglobulin preparation specifically designed to neutralize venom from medically significant African viperid and elapid snakes. It is produced by the Clodomiro Picado Institute (ICP) in Costa Rica and is used for the treatment of snakebite envenomation in various African countries, including Eswatini.

COMPOSITION & POTENCY

Each **10 mL vial** of **EchiTAb-ICP** neutralizes:

- **30 mg** of Bitis arietans venom
- **4 mg** of Naja annulifera venom
- **1 mg** of Dendroaspis polylepis venom
- **2 mg** of Hemachatus haemachatus venom
- **4 mg** of Naja mossambica venom

The active components are derived from **equine-derived immunoglobulins,** specifically purified to ensure high efficacy while reducing adverse reactions.

The production process involves:

- Venom Collection: Controlled milking of target snake species to extract venom.
- Venom Detoxification: Venoms are carefully processed to retain antigenicity while reducing toxicity.
- Horse Immunization: Horses are injected with gradually increasing doses of
- detoxified venom, stimulating an immune response.
- Plasma Harvesting: Plasma is collected from immunized horses, which contains antibodies specifically targeting venom toxins.
- Purification and Processing: Plasma undergoes fractionation to isolate immunoglobulin fragments, removing non-essential proteins to minimize allergic reactions.
- Formulation and Lyophilization: The purified immunoglobulins are formulated into a stable, freeze-dried product for extended shelf life and easy storage.

STORAGE & STABILITY GUIDELINES

- Storage Conditions: Room temperature (<30°C).
- Shelf Life: 5 years.
- Pre-administration check: Inspect vial integrity and expiration before use.

MEDICALLY SIGNIFICANT SNAKES IN ESWATINI COVERED BY ICP ANTIVENOM

The **ICP Polyvalent Antivenom** is effective against envenomation from:

- **Bitis arietans** ***(Puff Adder)*** – Causes severe local tissue damage, swelling, and systemic coagulopathy.
- **Naja annulifera** ***(Snouted Cobra)*** – Cytotoxic venom causing necrosis and potential systemic effects.
- **Dendroaspis polylepis** ***(Black Mamba)*** – Neurotoxic venom, leading to respiratory failure if untreated.
- **Hemachatus haemachatus** ***(Rinkhals)*** – Spitting cobra with cytotoxic and neurotoxic venom, causing local necrosis and mild paralysis.
- **Naja mossambica** ***(Mozambique Spitting Cobra)*** – Highly cytotoxic venom causing severe necrosis and systemic symptoms.

HOW ICP ANTIVENOM WORKS

The **ICP EchiTAb-ICP Polyspecific Antivenom** functions by **binding to venom toxins,** neutralizing their effects, and allowing for their elimination from the body.

MECHANISM OF ACTION

- Binding to venom toxins to neutralize their effects.
- Preventing systemic spread of venom by reducing free-circulating toxins.
- **Neutralization of Hemotoxic Venoms** *(e.g., Bitis arietans)*: Restoring hemostatic function in cases of coagulopathy caused by venoms. Prevents bleeding disorders, coagulopathy, and systemic hemorrhage.
- **Cytotoxic Effects Counteraction** *(e.g., Naja annulifera, Naja mossambica):* Reduces necrosis, pain, and swelling.
- **Neurotoxic Venom Neutralization** *(e.g., Dendroaspis polylepis, Hemachatus haemachatus):* Counteracting neurotoxic effects seen in elapid envenomation by blocking toxin interaction with neuronal receptors. Reverses paralysis and respiratory failure by neutralizing neurotoxins at synaptic junctions.

ADMINISTRATION PROTOCOL

PLEASE REFER TO THE CONSENSUS EMERGENCY MANAGEMENT FOR SNAKEBITE PATHWAY (ESWATINI)

The antivenom is effective when administered **intravenously (IV), intraosseous (IO),** ensuring **RAPID circulation and binding** to venom components **before systemic damage becomes irreversible.**

CONCLUSION AND RECOMMENDATIONS

EchiTAb-Plus-ICP is included in the World Health Organization's List of Essential Medicines, underscoring its critical role in addressing snakebite envenomations in sub-Saharan Africa.
Clinical studies have demonstrated the **effectiveness and safety of EchiTAb-Plus-ICP** in neutralizing venom effects, including local tissue damage, systemic bleeding, and coagulation disorders. Its comprehensive protection makes it an **essential component in the management of snakebites across the region.**

pmc.ncbi.nlm.nih.gov

'Ultimately, EchiTAb-Plus-ICP antivenom, has emerged as an indispensable therapeutic resource, delivering critical, life-saving treatment for venomous snakebites in Eswatini, with no reported fatalities in a year'; ESWATINI ANTIVENOM FOUNDATION

MEDECINS SANS FRONTIERES
DOCTORS WITHOUT BORDERS

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Eswatini Antivenom Foundation (EAF) & Médecins Sans Frontières (MSF: Doctors Without Borders) United in Advancing Snakebite Care – Independent Efforts, Shared Solutions

Delivering Life-Saving Treatment with EchiTAb-Plus-ICP

TACKLING SNAKEBITE ENVENOMATION – A NEGLECTED CRISIS

- Snakebite envenomation is one of the most overlooked and deadly Neglected Tropical Diseases (NTDs).
- Over **20,000 deaths annually** occur in sub-Saharan Africa due to limited access to effective antivenoms.
- **EAF & MSF** are actively working to close this treatment gap through **clinical care, advocacy, research, and innovation.**

PATIENT CARE & ANTIVENOM ADMINISTRATION

- **Lifesaving Treatment** – MSF provides emergency snakebite care to thousands of patients in **South Sudan, Burkina Faso,** and the Central African Republic Médecins Sans Frontières
- **Targeted Antivenom Use** – MSF implements the use of **EchiTAb-Plus-ICP and SAIMR-Polyvalent** to treat envenomation from:

- **West African carpet viper (Echis ocellatus)**
- **Puff adder (Bitis arietans)**
- **Black-necked spitting cobra (Naja nigricollis)** MSF South Africa Unicat

RESEARCH & TECHNOLOGICAL ADVANCEMENTS

- **Clinical Trials & Safety Studies** – MSF rigorously assesses the **efficacy and safety** of antivenoms to ensure the best patient outcomes. PubMed Central *https://pmc.ncbi.nlm.nih.gov/articles/PMC8863263/*
- **AI-Driven Innovation** – MSF is piloting an **AI-powered snake identification app** in South Sudan, enabling precise, species-specific antivenom administration. The Guardian

ADVOCACY & ACCESS TO TREATMENT

- **Raising Awareness** – MSF highlights the global snakebite crisis, advocating or urgent action to improve treatment accessibility. Médecins Sans Frontières

- **Antivenom Accessibility** – MSF champions the production and distribution of **affordable, high-quality antivenoms,** working towards **sustainable solutions** for affected regions. MSF Access

STRATEGIC COLLABORATION WITH ICP

- MSF partners with **Instituto Clodomiro Picado (ICP)** in Costa Rica to utilize **EchiTAb-Plus-ICP,** proven effective against major venomous species. **Unicat**
- **Field Success** – EchiTAb-Plus-ICP has been effectively deployed in **Burkina Faso & the Central African Republic,** with MSF reporting **positive treatment outcomes.** **echitabplusicp.org**

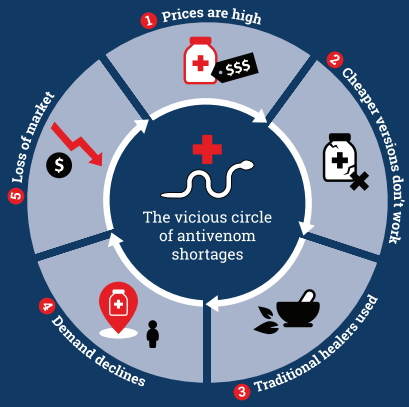
Through their dedicated efforts, EAF and MSF are advancing snakebite care across Africa by driving clinical excellence, policy advocacy, and scientific innovation to reduce mortality and morbidity. Their transformative initiatives ensure that effective treatments, such as EchiTAb-Plus-ICP, are accessible to those who need them most.

Join us at the Eswatini Snakebite Symposium – Uniting Expertise to Save Lives!

The annual Eswatini Snakebite Symposium will be live-streamed.
It will also be recorded and uploaded onto our website:
www.eswatiniantivenom.org

Youtube: https://youtube.com/live/HaxacMFwSds?feature=share

WHY CAN'T PEOPLE ACCESS EFFECTIVE SNAKEBITE TREATMENT?



The major reasons include: high prices for antivenoms that must be paid out of pocket, the unavailability of effective antivenom in remote places when urgently needed, and a lack of skilled health-care workers. In a study carried out in 2010, it was estimated that only 2% of people bitten by venomous snakes in sub-Saharan Africa have access to quality antivenom treatment. Here's why:

1. Prices for antivenoms vary, but often reach hundreds of dollars for the multiple doses people may need for treatment.
2. High prices mean patients turn to more affordable antivenoms; however, some of these antivenoms are substandard, toxic or ineffective.
3. When these poor-quality products don't cure snakebite, people develop distrust for all antivenom products and avoid them, often turning instead to traditional healers.
4. Due to reduced demand for antivenom, health authorities fail to prioritise the supply of these products to local health facilities. In turn, local health workers don't receive adequate training and do not gain experience diagnosing and administering antivenom treatment.
5. Low market demand prohibits the achievement of economies of scale for antivenom manufacturers. Pharmaceutical companies avoid entering the antivenom market – or stop production and exit the market – because the products are not sufficiently lucrative, and prices remain high for the few quality products that do exist.

ACCESS CAMPAIGN
MEDECINS SANS FRONTIERES

SUPPORTIVE PATHWAY GUIDELINE ONLY/NOT A SUBSTITUTE FOR CLINICAL JUDGMENT

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CONSENSUS EMERGENCY MANAGEMENT FOR SNAKEBITE ©

ASSESS AND TREAT AS PER ABCDE APPROACH
ABCDE (AIRWAY, BREATHING, CIRCULATION, DISABILITY, EXPOSURE)

IDENTIFY SIGNS AND SYMPTOMS OF SYNDROMIC ENVENOMATION

SIGNS AND SYMPTOMS OF SNAKE ENVENOMATION

CYTOTOXIC SYMPTOMS (PONDS)
SYNDROME: PAINFUL PROGRESSIVE

S WELLING (PPS)
P AIN (INTENSE)
O OZING
N ODE ENLARGEMENT
D ISCOLOURATION
S WELLING (PROGRESSIVE)
- BLISTERS
- PSEUDO COMPARTMENT
- COMPARTMENT

NEUROTOXIC SYMPTOMS
PROGRESSIVE WEAKNESS & PARALYSIS (PW)

P'S - PARALYSIS, PTOSIS, PUPILS DILATED, PERIORAL NUMBNESS

S'S - SLURRED SPEECH, SWEATING SWALLOWING, SALIVATION

D'S - DROWSINESS, DYSPHAGIA, DIFFICULTY IN BREATHING, DECREASE IN PEAK FLOW
- METALLIC TASTE

HAEMOTOXIC SYMPTOMS
SYNDROME: BLEEDING (B)

- BLEEDING FROM PUNCTURE, MOUTH, GUMS, NOSE
- SEVERE HEADACHES
- DIZZINESS, FAINTING
- CONVULSIONS
- NON CLOTTING BLOOD IN 20 MIN

RAPID CLINICAL ASSESSMENT

- OXYGEN IF SIGNS OF RESPIRATORY DISTRESS, OXYGEN SATURATION <94% ON ROOM AIR
- THREATENED AIRWAY-PLACE AN ADVANCED AIRWAY (ETT / SGA)
- VENTILATE (PPV), 100% O2, 15L/MIN
- ESTABLISH LARGE BORE IV/ IO ACCESS
- ATTACH TO MONITOR
- VITAL SIGNS: BP, SATS, ECG MONITORING, ETCO2
- **SAMPLE HISTORY**

20-MINUTE WHOLE BLOOD CLOTTING TEST (20WBCT)

- USE A CLEAN, DRY, AND NON-HEPARINIZED GLASS TEST TUBE
- 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

PATIENTS WITH POSITIVELY CONFIRMED IDENTIFIED BOOMSLANG BITE – DO NOT WAIT FOR ONSET OF VICC

PATIENTS WITH CONFIRMED BLACK MAMBA /NEUROTOXIC BITES MAY NEED ESCALATION TO ADVANCED AIRWAY MANAGEMENT

STABLE PATIENT → IF VICTIM SHOWS SIGNS AND SYMPTOMS OF ENVEMONATION ← **UNSTABLE PATIENT**

IF VICTIM DOES NOT SHOW ANY SIGNS OR SYMPTOMS OF ENVENOMATION, KEEP UNDER OBSERVATION FOR 12-24HOURS AND THEN DISCHARGE (CHILDREN 24 HOURS)

ADMISSION

START ANTIVENOM

PRE-ADMINISTRATION CHECK:
INSPECT VIAL INTEGRITY AND EXPIRATION BEFORE USE

PREPARE PATIENT WITH A PRE-DOSE ADRENALINE 0.25MG (QUARTER AMPOULE) SUBCUTANEOUS ON EITHER THIGH, ABDOMINAL WALL OR FOREARM

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

WE ADVISE TO ADMINISTER ANTIVENOM AS:

INTRAVENOUS (IV) / INTRAOSSEOUS (IO)

WE ADVISE TO ADMINISTER ANTIVENOM AS:
A PHYSICIAN SHOULD BE PRESENT DURING ADMINISTRATION

CANNULATE IV (NOT ON SAME LIMB)

1. **DILUTION:** DILUTE EACH VIAL JUST BEFORE ADMINISTRATION. DO NOT PREPARE MULTIPLE DOSES IN ADVANCE. RECONSTITUTE EACH VIAL WITH 10 ML OF THE PROVIDED STERILE WATER. (10 ML OF RECONSTITUTED POWDER)
2. **ADMINISTRATION:**
   - 2.1 **SLOW IV PUSH**: 1ST VIAL: ADMINISTER **10 ML OVER 2 MINUTES**, MONITORING VITAL SIGNS AND ADVERSE REACTIONS.
   - 2.2 **IF** NO ADVERSE EFFECTS, ADMINISTER REMAINING VIALS AT **1 VIAL PER MINUTE** UNTIL ALL DOSES ARE GIVEN.
   - 2.3 MONITOR VITALS AND PATIENT RESPONSE AFTER EVERY DOSE.
   - 2.4 **INFUSION:** ADD **PRESCRIBED** DOSE OF **ANTIVENOM** IN 200 ML NACL, INFUSE NO MORE THAN **30 MINUTES** WITHOUT TEST DOSING. **PAEDIATRIC CAUTION:** ADJUST FLUID VOLUMES TO PREVENT **FLUID OVERLOAD** DURING ANTIVENOM INFUSIONS. MONITOR VITALS AND ASSESS FREQUENTLY.
   - 2.5 STEROIDS OR ANTIHISTAMINES SHOULD **NOT** BE GIVEN ROUTINELY PRIOR TO ANTIVENOM ADMINISTRATION.

RECOMMENDED DOSING FOR TREATMENT:

- **NEUROTOXIC BITE** – 40 -120 ML OF **POLYVALENT** ANTIVENOM. (4 - 12 VIALS)
- **CYTOTOXIC BITE** – 30 - 100 ML OF **POLYVALENT** ANTIVENOM. (2 - 5 VIALS)
- **HAEMOTOXIC BITE** – **ONLY** BOOMSLANG: 10-20 ML **SAVP MONOVALENT** SPECIFIC ANTIVENOM (1 - 2 VIALS)

ANTIVENOM DOSAGE: THE UPPER LIMIT IS **NOT FIXED.** DOSES MAY EXCEED 10 VIALS BASED ON SEVERITY. ADJUST AS CLINICALLY INDICATED. **TITRATE TO EFFECT.**

PATIENTS BITTEN BY SNAKES SHOULD BE OBSERVED IN HOSPITAL FOR **AT LEAST 24 HOURS** AFTER THE BITE.
FOR BLEEDING SYNDROME PATIENTS, MONITOR FOR **AT LEAST 48 HOURS** AFTER THE BITE.

HAEMOTOXIC ENVENOMATION
BOOMSLANG: 10-20 ML OF SAVP MONOVALENT SPECIFIC ANTIVENOM (1 – 2 VIALS)

VENOM OPHTHALMIA

- FLUSH AFFECTED EYE/EYES - 0.9% SODIUM CHLORIDE SOLUTION PREFERRED LOCAL ANAESTHETIC - ADD 2% LIGNOCAINE 1ML PER 1000ML SALINE OR
- A SINGLE DROP OF 1:1000 ADRENALINE CAN BE INSTILLED INTO THE EYE
- SLIT LAMP FLUORESCEIN CHECK FOR CORNEAL DAMAGE
- MYDRIATIC DROPS FOR CORNEAL DAMAGE **ONLY**
- ANTIBIOTIC DROPS FOR 5/7
- REFER TO OPHTHALMOLOGIST

NO ADVERSE REACTION

COMPLETE FULL DOSE OF ANTIVENOM
ADMINISTER THE FULL DOSE WITHIN 1 HOUR
CONTINUOUSLY MONITOR FOR ADVERSE REACTIONS

SUPPORTIVE AND ANCILLARY CARE

PAIN MANAGEMENT:
- SIMPLE ANALGESIA (PARACETAMOL)
- KETAMINE (ANALGO-SEDATION)
- TETANUS PROPHYLAXIS: 0.5ML IM

LIMB ELEVATION:
- AFFECTED LIMB - ABOVE THE LEVEL OF THE HEART
- MONITOR FOR COMPARTMENT SYNDROME: ULTRASOUND
- SURGICAL INTERVENTION IF INDICATED

WOUND CARE:
- ANTIBIOTIC THERAPY **ONLY** IF SIGNS OF INFECTION

OBSERVE FOR SERUM SICKNESS:
- (5–20 DAYS POST-TREATMENT) TREAT WITH ANTIHISTAMINES/STEROIDS
- REASSURE THE PATIENT AND EXPLAIN ALL INTERVENTIONS, PROVIDE SUPPORT AS NEEDED, INCLUDING FAMILY

INDICATIONS FOR REFERRAL TO HIGHER CENTRE

- **NO AVAILABLE ANTIVENOM AT FACILITY**
- SIGNS OF STROKE
- SIGNS OF ACUTE CORONARY SYNDROME
- ACUTE KIDNEY INJURY, NEED FOR DIALYSIS
- PERSISTENT BLEEDING, NEED FOR BLOOD TRANSFUSION
- GANGRENE, DEBRIDEMENT, ADVANCED WOUND CARE
- PROGRESSIVE SEPTICAEMIA
- COMPARTMENT SYNDROME, SURGERY
- RESPIRATORY FAILURE AND PROLONGED NEED FOR MECHANICAL VENTILATION

REFER TO HIGHER CENTRE

PREHOSPITAL TOURNIQUET IN SITU?

IF IMPROVISED TOURNIQUET IS IN PLACE

- **DO NOT REMOVE**
- APPLY **INFLATABLE** BLOOD PRESSURE CUFF PROXIMAL TO THE IMPROVISED ONE
- INFLATE BP CUFF TO **10MMHG** ABOVE THE SYSTOLIC BLOOD PRESSURE
- START ANTIVENOM INFUSION AND THEN, REMOVE THE INITIAL TOURNIQUET **(LEAVING THE BLOOD PRESSURE CUFF AS THE NEW TOURNIQUET)**

AFTER 15 MINUTES POST ANTIVENOM ADMINISTRATION:

- PROCEED TO DO A STAGED RELEASE
  - **STAGED RELEASE:** DEFLATE THE TOURNIQUET **GRADUALLY AT**
  - **5-10MMHG EVERY 3 - 5 MINUTES**
  - **CLOSELY MONITOR THE PATIENT FOR NEW SIGNS OF NEUROTOXICITY**

IF THE PATIENT **DETERIORATES**, REINFLATE THE CUFF, WAIT 10 MINUTES, BEGIN TO RELEASE SLOWLY WHILE CONTINUING WITH ANTIVENOM

ADVERSE REACTION

EARLY ADVERSE REACTIONS
BRONCHOSPASM , HYPOTENSION, URTICARIA

STOP INFUSION IMMEDIATELY

ANAPHYLAXIS PROTOCOL

- HIGH FLOW OXYGEN, MAINTAIN PATENT AIRWAY (INTUBATE/CRICOTHYROTOMY IF NECESSARY)
- HIGH-FLOW IV LINE
- BP, SATS, ECG MONITORING, ETCO2
- LIE PATIENT SUPINE WITH LEGS ELEVATED IF HYPOTENSIVE

ADMINISTER ANTIHISTAMINES, CORTICOSTEROIDS

- **ADRENALINE:1MG/ML (1:1000) - 0.01MG/KG IM** (MAX 0,5ML IM) ANTEROLATERAL ASPECT OF THIGH [>12 YRS - 0,5ML IM] [6-12 YRS - 0,3ML IM] [<6YRS - 0,15ML IM]
  - REPEAT EVERY 5-15 MINUTES IF NO IMPROVEMENT
- **HYDROCORTISONE IM OR SLOW IV** [>12 YRS - 200MG] [6-12 YRS - 100MG] [1-6 YRS - 50MG] [<1 YR - 25MG] [<1 YR - 25MG]
- **PROMETHAZINE IM OR SLOW IV** [>12 YRS - 25MG IM OR SLOW IV] [6-12 YRS - 12,5MG IM OR SLOW IV] [2-6 YRS - 6,25MG IM OR SLOW] (AVOID IF <2YRS OLD AND LOW BP)
- **CIMETIDINE IM OR SLOW IV** 5MG/KG (MAX - 300MG) DILUTED IN 20 ML OVER 2 MIN
- **NEBULISED BRONCHODILATORS** EVERY 15-20 MINS IF SEVERE BRONCHOSPASM
  - SALBUTAMOL [5MG ADULTS] [2,5MG PAEDIATRICS]
  - WITH IPRATROPIUM [0,5MG ADULTS] [0,25MG PAEDIATRICS]
- **CRYSTALLOID** (E.G. **RINGERS/BALSOL**) RAPID INFUSION OF 20ML/KG (MAX 1-2 LITRES) REPEAT IV INFUSION AS NECESSARY
  - **ADRENALINE INFUSION** (0,1 - 1 UG/KG/MIN) ONLY IF UNRESPONSIVE TO IM ADRENALINE &FLUIDS
- **GLUCAGON IM** OR SLOW IV 20UG/KG (=0.02 MG/KG) (MAX 1-2MG) EVERY 5 MINS IF UNRESPONSIVE TO ADRENALINE (LOOK OUT FOR VOMITING AND HYPERGLYCAEMIA)

RESTART INFUSION CAUTIOUSLY AFTER RESOLVING REACTION

DOCUMENTATION: RECORD HISTORY, MEDICATIONS, INTERVENTIONS, AND PATIENT RESPONSE:
NOTIFIABLE TO : MINISTRY OF HEALTH, ESWATINI – IDSR SYSTEM
WWW.HEALTH.GOV.SZ

APPROPRIATE PHYSICIAN REFFERAL

ADMISSION TO ICU HIGH CARE WARD

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eswatini antivenom foundation
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AIEM
Africa Institute of Emergency Medicine

SOUTH AFRICAN SNAKEBITE SYMPOSIUM
AFRICURE

An Approach to Airway Management in the Patient who has been bitten by ANY Snake: AIRWAY MANAGEMENT PROTOCOL

Step One: Monitor, Assess and Manage immediate Life Threats

Immediately place the patient in a position of comfort (for respiratory system/bite site)
If patient is not responsive place patient immediately lateral (on the side in recovery)
Patients with neurotoxic bites are most likely to need escalation to advanced airway management, these patients will need to be treated rapidly.

AIRWAY

Assess the Patency of the Airway Can air move easily?	• Clear any secretions as needed (lateral position or suction if needed – not deep, only mouth) • Perform Head-Tilt-Chin-Lift or Jaw Thrust if needed • Consider insertion of a Nasopharyngeal Airway ASAP **PRIOR TO ANY ADVANCED AIRWAY INTERVENTION - OPTIMAL OXYGENATION AND PREPARATION ARE REQUIRED**

BREATHING

Assess breathing • *Rate* • *Air entry* • *Colour* • *Effort* • *End-tidal CO2 if available* • *SPO2*	• Assist Ventilation if rate or depth not adequate for age • Support Oxygenation as needed with increased oxygen (FiO_2), or ventilation if required (consider PEEP valve @5-10cmH_2O) • Supported BVM ventilation if work of breathing increased or not present (scope and equipment dependent) • Attach $ETCO_2$ to BVM for rapid confirmation of ETT once inserted • Supplement Oxygen in a stepwise approach to meet patient's needs ***Refer to optimization steps later to prepare this patient for Advanced Airway Management***

CIRCULATION

Assess Circulation • *Rate* • *AVPU/LOC* • *Colour* • *End Organ Perfusion* • *Systolic BP or MAP*	• Assess Rate and treat rate issues as required (bradycardia or symptomatic severe tachycardia according to algorithm) • Be aware that snakebites may present with arrythmia, conservative management is best • Assess LOC and consider the need to manage airway long term • Determine perfusion of the peripheries (colour and the trunk, peripheral and central pulses) • Check capillary refill (>2seconds concerning) • Assess MAP (systolic >90mmHg or better MAP >65mmHg as a minimum) Manage life threats to perfusion rapidly ***Refer to optimization steps later to prepare this patient for Advanced Airway Management***

DISABILITY

Disability Assess blood sugar, pupils and other neurological deficit	• Rule out common medical reasons for possible decreased LOC • Document neurological findings and progression (paralysis, weakness, clonus or flaccidity)

EXPOSURE

Exposure Note any trauma (look for bite marks, wounds, injury, bleeding areas) Note rashes, swelling (mark these areas early)	• Note any injuries or issues and mark any swelling areas or necrotic tissue noted • Monitor patient temperature and attempt to maintain normothermia • Hunt for any other possible toxins or exposures

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AIEM
Africa Institute of Emergency Medicine

SOUTH AFRICAN SNAKEBITE SYMPOSIUM
AFRICURE

An Approach to Airway Management in the Patient who has been bitten by ANY Snake: AIRWAY MANAGEMENT PROTOCOL

Step Two: EMOVA Approach to airway management

Indications for Advanced Airway

Oxygenation
Ventilation
Airway protection (NOT GCS BASED)
Predicted clinical course or need

Not able to maintain with basic manoeuvres

Patient needs to be intubated

Optimise Oxygenation

- ☐ **Position**
  - ☐ Head and torso raised
  - ☐ NPA placed, HTCL/JT done
  - ☐ Sniffing position
  - ☐ Ramp (high BMI / pregnant)
  - ☐ Dentures (in for BVM, out for ETT)
- ☐ **Preoxygenate**
  - ☐ Nasal Cannula 15l/min (AP-Ox)
  - ☐ BVM or NRB 15l/min Oxygen
  - ☐ PEEP 15cmH2O if appropriate (FRC)
- ☐ **Predict**
  - ☐ All emergency airways should be anticipated to be difficult
  - ☐ Prepare rescue and surgical options

Consider the PHYSIOLOGY HOP killers (Resuscitate the patient for safer airway management)

1. Hypoxia present or not tolerable?
- ☐ Pre-oxygenation steps done
- ☐ Not able to do pre-ox? DSI

2. Hypotension present or not tolerable?
- ☐ Stop the bleed
- ☐ Fluid bolus/consider blood products (TXA not indicated if bleeding due to snake venom)
- ☐ Push-dose pressor/dirty adrenalin or infusion
- ☐ Choose the appropriate medications (safer options and dosing strategy)

3. Current Compensated Metabolic Acidosis (think about case)
- ☐ If paralytic to be used, continue ventilation post paralytic
- ☐ Consider KOBI (ketamine only intubation)
- ☐ Post intubation ventilation to match physiology (faster than usual)

Optimise environment, team + equipment

- ☐ **Equipment**
  - ☐ Equipment Checklist MIDSOLES (challenge/response)
  - ☐ Set monitors to 1-5minute cycle for assessment
  - ☐ Ventilator prepared with safe settings for starting vent
  - ☐ Attach ETC02 to the BVM/Vent before intubation
- ☐ **Team (clear roles and responsibilities)**
  - ☐ Brief the team include all plan options
  - ☐ Plan A, B, C and D (ready for FONA)
  - ☐ Prepare equipment for each plan
- ☐ **Oxygenation champion appointed and roles planned**
  - ☐ When will the attempt be aborted?
  - ☐ What are the criteria to move to plan B, C or D?
- ☐ **Practitioner**
  - ☐ Block breathing (breath in for 3 seconds, hold for 3 seconds and out for 3 seconds to calm yourself) and visualise success, plan for failure
  - ☐ Correct bed height, cockpit ready, equipment in reach
  - ☐ DON'T RUSH (10 seconds for the next 10 minutes)

Medications THINK ABOUT MEDICATIONS CAREFULLY choose something safe for the patient (refer to appropriate dosing on reverse)

- ☐ Intra-intubation medications
  - ☐ Induction Agent
  - ☐ Paralytic (prepare even if not in Plan A)
  - ☐ Pressor push dose/infusion
- ☐ Post Intubation
  - ☐ Analgesia and sedation

Administer the medications
Wait for effect
Place the airway and confirm placement
Start assessment again ABCDE

Post Intubation Checks and Actions

- ☐ Confirm ETT placement
  - ☐ ETC02 value and waveform
  - ☐ Equal air entry bilaterally, chest rise bilaterally, no sounds over stomach
- ☐ Secure ETT in place (take time do this well)
- ☐ Connect patient to ventilator ASAP and keep BVM at bedside incase
- ☐ Check cuff pressure (20-30cmH20)
- ☐ Pain management and analgesia running/ready
- ☐ Place gastric tube, and place inline suction if available
- ☐ Plan for blood gas in next 15mins
- ☐ Plan for CXR for ETT depth and gastric tube placement (US?)
- ☐ Vent alarm plan?

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DR CH BELL MBChB, Dip PEC(SA)

Critical Care & Emergency Service www.accis.co.za BLS, ALS, Critical Care & ECMO Training

SOUTH AFRICAN SNAKEBITE SYMPOSIUM AFRICURE

Basic Ventilation strategy for Neurotoxic Snakebites – Dr Christoff Bell and Mr Hugo Minnaar

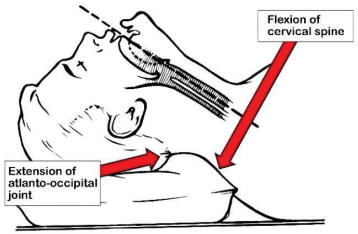
1. **Recognize Neurotoxicity as Emergency**
2. Prepare for Airway Control and Ventilation
3. Supplemental Oxygen via nasal prongs +- non rebreather mask for SPO2< 94% or HFNO on 100% O2 and 40 – 60 lpm flow
4. If Hypoventilation / Apnea – start bag-valve-mask (BVM) ventilation with O2. (If this happens the patient will require intubation and ventilation)

Pre Intubation Checklist (SOAP MEA)

1. **S**uction with yankauer catheter
2. **O**xygen (Mask, NPO2, HFNO, BVM ventilation)
3. **A**irway Equipment
   - Laryngoscopes with different size blades and video laryngoscope (If available)
   - ETT (2 sizes)
   - Introducer and bougie (if available)
   - Supraglottic airway device
   - Surgical airway equipment
   - Stethoscope
   - Strapping/fixing material ready to secure ET tube
4. **P**harmacy
   - Running IV line + backup IV line for inotropes if needed
   - Medication - sedation, Neuromuscular blocker on standby, Emergency drugs (ie. Adrenaline, Atropine)
   - Draw up drugs and keep it in sequence of administration
5. **M**onitoring Equipment – SpO2, BP, ECG
6. **E**TCO2 - if available, **E**levate head 30degrees
7. **A**ssign roles – Airway control (Intubater), assistant, drug administrator, nurse runner

Drugs:	
RSI MEDICATION	
mg/kg	**INDUCTION**
1 - 2	Ketamine
0.1 - 0.3	Etomidate
mg/kg	**INDUCTION**
1 - 2	Suxamethonium - **AVOID**
1 - 1.2	Rocuronium – **only if needed**

Sniffing Position



Notes:

- In patients without comorbidities, a basic ventilation setup should be adequate for Neurotoxic Envenomation
- Neurotoxicity may mimic brain death - be careful to not make this diagnosis prematurely
- Prolonged ventilation is often required especially in the absence of antivenom administration. Several cases have been recorded of patients requiring ventilation for more than a week
- The **Snake's Venom** acts as a **Neuromuscular Blocker (NMB)**, mimicking the effects of intravenous neuromuscular blocking agents
- Avoid **Suxamethonium (Scoline)** due to the risk of prolonged apnea which may result in prolonged ventilation
- **Additional NMBs** are not necessary for intubation
- However, if there is a risk of aspiration, a non-depolarizing NMB such as Rocuronium may be used
- For Post-Intubation Sedation, **Ketamine Infusion** is generally preferred over **(AVOID)** Midazolam and Morphine

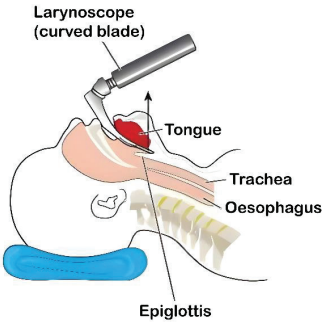
Positioning (rolled up blanket under shoulders works well, "sniffing morning air" position, C-Spine protection should not be a major concern)

1. Difficult Airway anticipated (Examine patient - neck mobility, Mallampati score, teeth concerns, cricothyroid area)
2. Pre-Oxygenation
3. Circulation/ Haemodynamics optimized
4. Consider NG Suction

Intubation Laryngoscopy 2-3 attempts (Consider different size blade or different size ET Tube) → Alternative Airway (LMA, LTA, iGel) → Surgical Airway.

Post intubation

1. Check correct Position of ET Tube (Misting, EtCO2, Rising O2 Saturation, Equal Air Entry/Rising Chest bilaterally) and note Depth of ET Tube
2. Blow up Cuff and check Cuff Pressure
3. Secure ET tube
4. Oropharyngeal Airway
5. Ensure correct Ventilation Settings, Ventilator attached and opitmized
6. Recheck Vital Signs
7. Ensure adequate Sedation (Ketamine 1-2mg/kg/hour)



Basic Ventilation settings

BASELINE VENTILATOR SETTINGS		MONITOR
Mode	Volume SIMV or Volume A/C	Monitor PIP keep less than 30 cmH20
FiO2	Start on 1 (100%) and wean rapidly	PaO2 if you have a blood gas, or keep SpO2 > 94%
Tidal Volume	4 -6 ml/kg	PaCO2 if you have a blood gas or keep EtCO2 35 -45
PEEP	5 cmH20	PaO2 if you have a blood gas, or keep SpO2 > 94%
I:E	1:2	
Rate	12-16 bpm (adults), 20-25bpm (pediatrics), 25bpm (neonates)	PaCO2 if you have a blood gas or keep EtCO2 35 - 45

- To Manipulate PaO2 change FiO2 or PEEP
- To Manipulate PaCO2 change Rate or Vt (Tidal Volume)
- **Basic Weaning:** Monitor the patient's own efforts and wean rapidly if own effort increases i.e, patient produce good own tidal volumes and respiratory rate. Do a **RSBI** (Rapid Shallow Breathing Index) daily.
- **RSBI=** Put patient on CPAP with a PEEP of 5 for 5 minutes and read the rate and tidal volume. Divide the rate by the tidal volume in liters i.e 22/0.45 is 48 therefore the patient is ready to be weaned because RSBI is 48 and must be less than 105 to start the weaning process.
- Target before extubation - First wean FiO2 to .4 (40%), then PEEP to 5cmH2O, then rate to 8 bpm before extubating.

Prolonged care in ICU DO FASTHUGSBID daily

– After initial resuscitation and stabilization phase (12 -24 hours):	
F	- Feeding (Start early NG feeding, if no bowel sounds start TPN. Note: Envenomation might affect peristalsis) / Fluids (if good urine output, maintain zero fluid balance)
A	- Analgesia if required / Antibiotics if required
S	- Sedation, reduce or increase
T	- Thromboprophylaxis
H	- Head up position
U	- Ulcer Prophylaxis (Gastric and Pressure Sore/Ulcer prevention)
G	- Glycemic Control
S	- Spontaneous Breathing Trial (RSBI)
B	- Bowel Sounds / Movements
I	- Indwelling catheters and lines (Remove or insert) / Imbalances – Correct electrolytes and fluid imbalances
D	- De-escalation of Drugs

NEUROTOXIC ENVENOMATION (SNOUTED COBRA)

Additional Drugs confirmed Snouted Cobra Bites *(Naja annulifera):*
Neostigmine may be considered as a **therapeutic** option in the management of **rapidly progressing neurotoxic effects** following a confirmed **Snouted Cobra (Naja annulifera) envenomation,** ensuring timely intervention to support respiratory function and patient stability. **Neostigmine** is **INEFFECTIVE** for **Black Mamba Bites.**
Neostigmine must be used with atropine.
Refer to dosing charts for exact atropine and neostigmine doses as per Eswatini Antivenom Foundation - https://eswatiniantivenom.org

FANGS & STINGERS: ESWATINI'S VENOMOUS CREEPERS

THE BLACK BUTTON SPIDER *(Latrodectus cinctus, Latrodectus renivulvatus* (BLACK WIDOW) AND THE BROWN BUTTON SPIDER *(Latrodectus geometricus)* (BROWN WIDOW)

Southern Africa's medically significant spiders, widely found in Eswatini, possess **neurotoxic venom.** Black and Brown Button Spider bites, though rarely fatal, cause severe pain and need medical care. Treatment includes pain management, muscle relaxants, and, where available, antivenom. Bites often occur on extremities, causing pain and mild inflammation (worse in brown widow bites). Symptoms include muscle cramps, abdominal rigidity, nausea, vomiting, sweating (no fever), brisk reflexes, hypertension, salivation, and tachycardia. Respiratory distress may develop as neurotransmitters deplete.

Management of Envenomation

- **Reassure** the patient (mortality <1-6%).
- **Apply** ice packs to the bite site.
- **Monitor** vitals, give IV fluids and symptomatic treatment (paracetamol for pain).
- **Administer** tetanus toxoid (0.5 ml IM).
- **Calcium gluconate 10%** (10 ml IV slowly) provides temporary cramp relief (lasts 20-30 min).
- **Avoid** opioids & benzodiazepines (may worsen respiratory depression).
- **Latrodectus antivenom** (5-10 ml IV –) 1-2 ampoules) if systemic symptoms present; be prepared for anaphylaxis.
- **Do not** give IM adrenaline prophylactically (worsens autonomic effects).
- **Observe** asymptomatic patients for 6 hours post-bite.

THE THICK-TAILED SCORPION *(Parabuthus transvaalicus)*

One of Southern Africa's most medically significant scorpions, is widely found in Eswatini. Its venom contains **neurotoxins and cardiotoxins,** causing severe pain, neurological hyperexcitability, paralysis, and, in extreme cases, death. Immediate medical care is essential, with antivenom used when indicated.

Treatment of Scorpion Envenomation

- **Supportive care:** IV access, oxygen, monitoring.
- **Airway management:** BVM ventilation & intubation if needed.
- **Antivenom:** 5–10ml IV over 15 mins (same dose for adults & children).
  - Peak effect in 2–6 hours; second dose if needed after 6 hours.
- **Avoid adrenaline** before antivenom – worsens autonomic instability.
- **Contraindicated:** Opiates, benzodiazepines (risk of respiratory depression).
- **Avoid atropine** for secretions – worsens tachycardia.
- **Tetanus prophylaxis** (if >5 years since last dose).
- **Pain relief:** Paracetamol; IV calcium gluconate (muscle cramps).
- **No alcohol** post-envenomation.
- **Monitor:** Cardiac dysrhythmias & pancreatitis development.

Patients should be hospitalized, and special care should be taken with children, with admissions for at least **12 hours post sting in asymptomatic children.**

1. Engelbrecht, A., Lalloo, V., 2012. *Primary Emergency Care.* **EMPRET**, University of Pretoria, pp 283-286.
2. Müller, G.J., Wium, C.A., Marks, C.J., et al., 2012. Spider bite in Southern Africa: diagnosis and management. *Continuing Medical Education*, 30 (10), pp.382-391.
3. Marx, J., Hockberger, R., Walls, R., et al., 2006. Venomous animal injuries. In: J. Marx, R. Hockberger, and R. Walls, eds. *Rosen's Emergency Medicine: Concepts and Clinical Practice.* 7th ed. St. Louis: Mosby Elsevier, pp.752-755.

Place Patient Sticker Here
Hospital / Clinic: .....
Admission No.: .....
Title: Prof. Dr. Rev. Mr. Mrs. Ms.
Surname: .....
Names: .....
Attending Doctor: .....
.....

Snakebite Management: Adapted for Eswatini – ESWATINI ANTIVENOM FOUNDATION

EMERGENCY DEPARTMENT SNAKEBITE MANAGEMENT SUPPORTIVE PATHWAY 2025

eswatini antivenom foundation

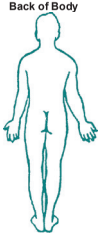
SUPPORTIVE PATHWAY Guideline Only/Not a Substitute for Clinical Judgment

SNAKEBITE TARGETED HISTORY

Body Part Bitten

Front of Body

Back of Body



S YMPTOMS
A LLERGIES
M EDICATION
P AST HISTORY
L AST ORAL INTAKE
E VENTS TO PRESENT

Time Bitten	
Current location of snake	

Description of the snake

- ❑ Dark brown ❑ Blowing sound (Adder) ❑ Characteristic hood & hiss (Cobra)
- ❑ Green in colour ❑ Light brown ❑ Spotted
- ❑ Black ❑ Small head ❑ Large head
- Other:

Type of snake (if known)

Signs & Symptoms

Cytotoxic Bites:
- ❑ Pain ❑ Swelling ❑ Discolouration

Neurotoxic Bites:
- ❑ Metallic Taste ❑ Slurred Speech ❑ Ptosis (Difficulty Opening Eyes)
- ❑ Drowsiness ❑ Weakness ❑ Respiratory Difficulty

Haemotoxic Bites:
- ❑ Bleeding (Bite Site / Anywhere Else) ❑ Other: Specify _____

Previous snakebites	❑ Yes ❑ No Date(s):
Received Antivenom	❑ Yes ❑ No
Abnormal Reaction/ Anaphylaxis after receiving antivenom	❑ Yes ❑ No

(Adapted for Eswatini Medically Important Venomous Snakes - 2025)
(Snakebite Management: Eswatini Antivenom Foundation Guideline – 2018)
(Pathway adapted from Netcare ISOV1 2019)

ALLERGY PROFILE

Any medication allergy?	❑ Yes	❑ No
Have you had antivenom treatment before?	❑ Yes	❑ No
Do you suffer from asthma or hay fever?	❑ Yes	❑ No
Have you had infantile eczema?	❑ Yes	❑ No
Any other allergies, e.g. food (peanuts) or bee stings?	❑ Yes	❑ No
Have you ever been bitten by a snake before?	❑ Yes	❑ No

If any of the answers above are Yes – Prepare for High Possibility of Anaphylaxis

FOCUSED PHYSICAL ASSESSMENT BY TRAUMA TEAM

Assessment should be focused on deciding if a significant envenomation has occurred and differentiating which envenomation syndrome is presenting:

PPS *(Puff Adder, Snouted Cobra, Mozambique Spitting Cobra (**VO**), Rinkhals (**VO**), look for the rate of swelling, progression, discoloration and blistering at the site. (Stiletto snakes/Night adders) - Mild to moderate swelling- cause less swelling with potential local damage but only needs conservative treatment. **(VO) = Venom Ophthalmia***

PW *(Black Mamba)*
- Any neurological sign is a medical emergency as it may lead to respiratory arrest. Early signs are metallic taste, parasthesia, blurred vision with ptosis, difficult speech, and swallowing. Patients may have a "drunk" appearance. Full preparation for intubation and ventilation should be made if any of these signs are present.
- PATIENTS WITH CONFIRMED BLACK MAMBA /NEUROTOXIC BITES MAY NEED ESCALATION TO ADVANCED AIRWAY MANAGEMENT

Bleeding *(Boomslang, Vine Snake)*
- Bleeding may take many hours to develop, thus cautious monitoring is essential.

LOOK OUT FOR MIXED SYNDROMES:

PPS & PW *Snouted Cobra - Predominantly Cytotoxic and Mildly Neurotoxic - Confusing clinical presentation, **Delayed** neurotoxic effects between 16 -24 hours, cautious monitoring is essential. Rinkhals - Predominantly Cytotoxic and Mildly Neurotoxic, (**VO**)*

PPS & B *Puff Adder - Predominantly Cytotoxic and Mildly Haemotoxic - Bleeding or clear fluid at the bite site, rapid pain & swelling, can lead to organ failure, cautious monitoring is essential. **(VO) = Venom Ophthalmia***

***CARDIOTOXICITY*: Patients with signs of significant envenomation need to be monitored for cardiovascular complications like hyper- and hypotension, and arrythmias which can occur through a variety of mechanisms.**

***PPS:** Painful Progressive Swelling* ***PW:** Progressive Weakening* ***B:** Bleeding*

Bleeding from the bite site and oropharyngeal area (gums) are often the first signs. The 20-minute Clotting test is positive in these patients.			
Draw a ring around the bite area with a permanent marker pen and record the time inside the drawn ring.			
Monitor every 30 minutes for progression of symptoms and swelling of the area.			
Examine the patient for tooth and fang marks or even tiny scratch (Boom slang or Black Mamba).			
Local Signs	❑ Swelling	❑ Persistent Bleeding	❑ Discolouration / Blistering
	Other		
Systemic Signs	❑ Neurotoxic / Paralysis	❑ Cardiovascular Instability	

20 MINUTE CLOTTING TEST FOR BOOMSLANG, FOREST VINE SNAKE AND OTHER MIXED BLEEDING SYNDROMES - HAEMOTOXIC VENOM

Rapid test of blood coagulability, done at bedside.				
Take a few milliliters of blood by venipuncture and place in a new, clean, dry glass vessel.				
Leave undisturbed at room temperature for 20 minutes	Start Time:		End Time:	
Tilt once to see whether or not the blood has clotted.				
Other more sensitive laboratory tests: prothrombin time (often reported as INR), thrombin and fibrinogen levels, activated partial thromboplastin times and measurement of fibrinogen degradation products and D-dimer concentrations.				
Laboratory investigations to include: urinalysis, full blood count, urea and electrolytes and serum creatinine.				

PATIENTS WITH POSITIVELY CONFIRMED IDENTIFIED BOOMSLANG BITE – DO NOT WAIT FOR ONSET OF VICC

PREHOSPITAL TOURNIQUET IN SITU

If an improvised tourniquet is in place (Do not remove):	**STAGED RELEASE**
Apply **inflatable** BP cuff proximal to the improvised tourniquet.	Deflate BP cuff gradually: 5-10mmHg every 3-5 min.
Inflate BP cuff to 10mmHg above systolic BP.	Continue antivenom infusion (over 30 min).
Start antivenom infusion, **then remove the initial tourniquet (Leaving the blood pressure cuff as the new tourniquet).**	If patient deteriorates: Reinflate BP cuff.
After 15 min post venom administration begin staged release. Monitor for new signs of Neurotoxicity.	Wait 10 min, then restart slow release while continuing antivenom.

SNAKE VENOM OPHTHALMIA - FIRST AID

Immediate irrigation with water or bland solution

MEDICAL PRACTITIONER

Single application of local anaesthetic eye drops (overcome tightly closed eyelids during irrigation)		Instill a single drop of 1:1000 adrenaline Antibiotic Eye Drops / Ointments	
Fluorescein Staining		Mydriatic Drops ONLY if corneal damage	
Slit lamp		Eye pad	
Corneal Erosion		Daily Slit Lamp Examination until cured	

MEDICATION PRESCRIPTION AND ADMINISTRATION

Drug Name	Dose	Route	Site	Time	Signature
Prescribing Dr				**Signature**	

REACTION TO ANTIVENOM		**POSITIVE ANTIVENOM RESPONSE**	
Urticaria		Progression of Swelling Stopped	
Pruritis		Improvement of Neurotoxic Effects within 30 min	
Febrile Reaction		Blood Pressure normalises within 1 hour	
Restlessness / Confusion		Cardiac Arrhythmias improve rapidly	
Bronchospasm		Cardiovascular effects (hypotension, sinus bradycardia) may respond within 10-20 min	
Hypotension		Spontaneous Systemic Bleeding usually stops within 15-30 min	
		Blood Coagulopathy	
Other:			

EMERGENCY CONTACT NUMBER FOR ADVICE

ESWATINI ANTIVENOM FOUNDATION

Thea Litschka-Koen	Tel: +268 7602 5088 Tel: +268 7833 3704	Email: thea@eswatiniantivenom.org
Please refer to your Local Emergency Expert Contacts:		
Notifiable to: Ministry of Health, Eswatini – IDSR System		Report via: www.health.gov.sz

Syndrome Venom Type	PPS/PW Syndrome Mixed Cytotoxic & Neurotoxic Venom	PPS Syndrome Cytotoxic Venom	PW Syndrome Neurotoxic Venom	B Syndrome Haemotoxic Venom
	Rinkhals (**VO**) (Spitting Cobra), Snouted Cobra (Non-Spitting Cobra)	Puff Adder, Mozambique Spitting Cobra (**VO**), Rinkhals (**VO**), Snouted Cobra, Stiletto Snakes, Night Adders	Black Mamba	Boomslang (SAVP Monovalent), Vine Snake (No antivenom). Puff Adder (Mildly Haemotoxic): (Polyvalent)
Supportive Treatment	Protect airway, IV fluids Analgesia	IV fluids Elevate limb Analgesia	Protect airway, BVM, ETT, SGA, Ventilation, IV fluids	IV fluids Blood or Blood component therapy
	Analgesia: Paracetamol, Ketamine (Analgo-sedation)* ***NOT Aspirin or non-steroidal anti-inflammatory medicines*			*# Heparin, anti-fibrinolytic are of no value and may be dangerous*
Severe envenomation anticipated	Drowsiness, Nausea, Vomiting, Vertigo, Mild pyrexia, Dyspnoea, General weakness.	Severe pain, Swelling > 5cm/hour; Swelling to elbow or knee by6 hours. Swelling of wholelimb in 12 hours. Bleeding abnormalities	Metallic taste; Profuse sweating; Paraesthesia; Excessive salivation; Shortness of breath; Difficulty swallowing; Ptosis; Perioral Numbness; Fasciculation	Fang punctures do not stopbleeding; Severe headaches; Dizziness; Fainting; Convulsions NB: 20min clot test
ANTIVENOM ADMINISTRATION	- Insert IV line (not same limb) - Pretreatment: Predose of Adrenaline 0,25mg (quarter ampoule) subcutaneous on either thigh, abdominal wall or forearm - Doctor to administer antivenom - No test dose required			
Antivenom may be needed to treat life over limb	Rinkhals (**VO**), Snouted Cobra	Puff Adder, Mozambique Spitting Cobra (**VO**), Rinkhals (**VO**), Snouted Cobra	All species	Boomslang
Antivenom Type	**Polyvalent - Administer antivenom as:** Cannulate IV (not on same limb) **DILUTION:** Dilute each vial just before administration. Do not prepare multiple doses in advance. Reconstitute each vial with 10 ml of the provided sterile water. (10 ml of reconstituted powder) **ADMINISTRATION:** 1. Slow IV push:1st vial: administer **10 ml over 2 minutes**, monitoring vital signs and adverse reactions. 2. If no adverse effects, administer remaining vials at **1 vial per minute** until all doses are given. 3. Monitor vitals and patient response after **every** dose. 4. **INFUSION:** Add **prescribed** dose of **antivenom** in 200 ml NACL, infuse no more than **30 minutes** without test dosing. **Paediatric Caution:** Adjust fluid volumes to **prevent fluid overload** during antivenom infusions. Monitor vitals and assess frequently. 5. Steroids or Antihistamines should **NOT** be given routinely prior to antivenom administration. 6. **Antivenom Dosage:** The upper limit is not **fixed**. Doses may exceed 10 vials based on severity. Adjust as clinically indicated.		**Polyvalent** *Atropine Neostigmine Cobras only (Snouted Cobra)*	**Monovalent** IV push 1 ampoule/min **OR** diluted 50/50 in isotonic fluid infused over 15-30 minutes
Starting dose of Antivenom IV	**Rinkhals (VO):** 30 – 80 ml (3 – 8 Vials)	**Puff Adder, Mozambique Spitting Cobra (VO):** 30 – 80 ml (3 – 8 Vials)	**Black Mamba, Snouted Cobra, Rinkhals (VO):** 40 – 120 ml (4 – 12 Vials)	**Boomslang:** 10 – 20 ml (1 – 2 Vials)
Additional Antivenom	Monitor progression of swelling hourly. If swelling continues administer 2 additional ampoules of AV untilswelling stops		Monitor neurological symptomsclosely. If there is no improvement after 30 minutes, administer an additional 4 vials. Repeat as necessary	If the blood remains in-coagulable 6 hours afterthe first antivenom dose, repeat dosage, until blood coagulability is restored

Patient should be monitored for signs of reactions and anaphylaxis
Look for urticaria, itchiness, bronchospasm and monitor BP every 3 minutes for hypotension with continuous O2 saturation monitoring.

ANAPHYLAXIS – STOP INFUSION!!
Follow **ANAPHYLAXIS PROTOCOL: Epinephrine (IM), ABCDE**, Corticosteroids, Antihistamines, Monitor, Escalate.

(**VO**) = Venom Ophthalmia

(Adapted for Eswatini Medically Important Venomous Snakes - 2025)
(Blaylock, 2005) and see also Muller et sal SAMJ 2012 – use of Atropine and Neostigmine
(Snakebite Management: Eswatini Antivenom Foundation Guideline – 2018)
(Pathway adapted from Netcare ISO V1 2019)
SUPPORTIVE PATHWAY Guideline Only/Not a Substitute for Clinical Judgment

SUPPORTIVE PATHWAY Guideline Only/Not a Substitute for Clinical Judgment

CONCLUSION: A VISION FOR THE FUTURE

Together We Heal, Together We Thrive
The fight against snakebite envenomation requires constant innovation and collaboration. As healthcare providers, **YOU** play a pivotal role in saving lives and ensuring that snakebite victims receive the best possible care. These **CONSENSUS GUIDELINES** serve as a guide to empower you, offering practical solutions that can make a profound difference in patient outcomes.

A Future of Excellence in Snakebite Care
The guidelines within these pages are a vision for a future where snakebite management is swift, standardized, and effective. By embracing these principles, you contribute to shaping the future of care for those affected by venomous bites, ensuring better outcomes and advancing the field.

"Medicine is a science of uncertainty and an art of probability." – William Osler
This quote highlights the complexity and dynamic nature of medicine, reinforcing the need for adaptability and ongoing learning, particularly in fields like emergency snakebite care.

Acknowledgments
We extend our deepest thanks to the experts, clinicians, and organizations whose invaluable contributions made this **SYMPOSIUM** possible. Your dedication to advancing snakebite care is the foundation upon which this work is built. To the healthcare professionals applying these guidelines, your compassion and expertise are transforming the future of patient care.

Thank you for your continued commitment to saving lives and improving patient outcomes.
– THEA LITSCHKA KOEN AND THE ESWATINI ANTIVENOM FOUNDATION TEAM

A Closing Prayer

'May our hands be guided by compassion and wisdom, Healing with humility and honoring the dignity of all we serve. Let our actions reflect the trust placed in us, And may we continue to grow in knowledge, Bringing comfort and hope to those in need.' AMEN

ESWATINI

E – Evaluate & stabilize ABCs
S – Secure IV/IO access & start fluids
W – Watch for signs of SYNDROMIC envenomation
A – Administer antivenom if indicated
T – Treat and Stabilize, administer supportive care
I – Immobilization of limb & assess for compartment syndrome
N – Notify & escalate care if needed
I – Incorporating these steps ensures comprehensive care, improving **BEST PATIENT** outcomes for snakebite patients."

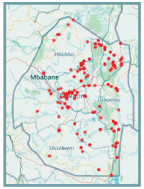
The Consensus Guidelines Compendium was meticulously compiled and designed by **Maqshuda Kajee** for **The Eswatini Antivenom Foundation,** with specialised consultation from field authorities, reflecting a commitment to excellence in snakebite care. A special thanks to **Dr. Christoff Bell** for his unwavering support and dedication, which has been instrumental in this endeavour. **– Thea L. Koen**

POLYVALENT ANTIVENOM SPECIES


© Neville Ganes

BLACK MAMBA
(Dendroaspis polylepis)

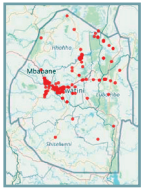
- **Distribution:** Eswatini
- **Colour:** Dark Olive, greyish brown, gunmetal grey
- **Length:** 2.8-3.2m up to 4.5m
- **Venom:** Highly Neurotoxic
- **Syndrome:** PW
- **Venom Effects:** Progressive Weakness & Paralysis with or without minor swelling

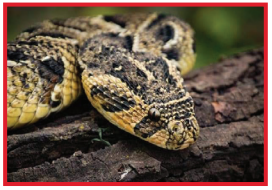



© Neville Ganes

SNOUTED COBRA
(Naja annulifera)

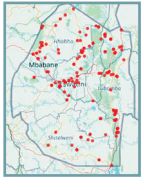
- **Distribution:** Eswatini
- **Colour:** Yellowish brown with a yellow belly, or black & cream bands
- **Length:** 1.8-2.5m
- **Venom:** Predominantly Cytotoxic & Mildly Neurotoxic
- **Syndrome:** PPS & PW
- **Venom Effects:** Painful Progressive Swelling, Progressive Weakness & Paralysis




© Neville Ganes

PUFF ADDER *(Bitis arietans)*

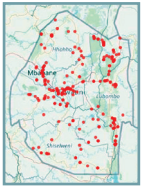
- **Distribution:** Eswatini
- **Colour:** Colour varies, V-shaped markings down the back pointing towards the tail
- **Length:** 0.9-1.2m up to 1.4m
- **Venom:** Predominantly Cytotoxic & Mildly Haemotoxic
- **Syndrome:** PPS & B
- **Venom Effects:** Painful Progressive Swelling & Bleeding




© Nick van der Walt

MOZAMBIQUE SPITTING COBRA
(Naja mossambica)

- **Distribution:** Eswatini
- **Colour:** Brown with an orange/salmon belly & black bands on the neck
- **Length:** 1.2-1.6m
- **Venom:** Cytotoxic
- **Syndrome:** PPS
- **Venom Effects:** Painful Progressive Swelling

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RINKHALS
(Hemachatus haemachatus)

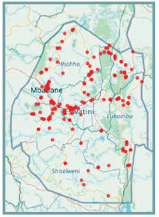
- **Distribution:** Eswatini
- **Colour:** Black, brown or olive with white throat bands or black & yellow/orange body bands with yellow throat bands
- **Length:** 1.0-1.5m
- **Venom:** Predominantly Cytotoxic & Mildly Neurotoxic
- **Syndrome:** PPS & PW
- **Venom Effects:** Painful Progressive Swelling, Progressive Weakness & Paralysis

MONOVALENT ANTIVENOM SPECIES


© Nick van der Walt

BOOMSLANG
(Dispholidus typus)

- **Distribution:** Eswatini
- **Colour:** Grey, Brown, Green, Red, Blue, Green with Black "bands", black backs with yellow bellies
- **Length:** 1.5-2.0m
- **Venom:** Haemotoxic
- **Syndrome:** B
- **Venom Effects:** Bleeding



OTHER VENOMOUS SPECIES

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


© Neville Ganes

VINE SNAKE
(Thelotornis capensis)

- **Distribution:** Eswatini
- **Colour:** Cryptically coloured resembling a stick
- **Length:** 1.2-1.5m
- **Venom:** Haemotoxic
- **Syndrome:** B
- **Venom Effects:** Bleeding


© Neville Ganes

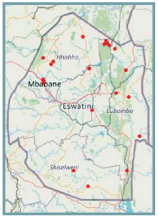
RHOMBIC NIGHT ADDER
(Causus rhombeatus)

- **Distribution:** Eswatini
- **Colour:** Dark brown Rhombic markings on the back. Body colour varies from light grey to brown Characteristic "V"shape marking on the head
- **Length:** 1.40-60cm, max 1m
- **Venom:** Cytotoxic
- **Syndrome:** PPS
- **Venom Effects:** Moderate local swelling & pain


© Tyrone Ping

BIBRON'S STILETTO
(Atractaspis bibronii)

- **Distribution:** Eswatini
- **Colour:** Body brown to blackish, belly may be white
- **Length:** 40-60cm, max 98cm
- **Venom:** Cytotoxic
- **Syndrome:** PPS
- **Venom Effects:** Moderate swelling with potential of causing local tissue necrosis



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ESWATINI ANTIVENOM FOUNDATION
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EAF COMMUNITY SNAKE RESCUE

SAVING LIVES SAVING LIMBS

PHOTO CREDIT: Neville's Snake and Reptile Rescue and Nathan Jordan Photography
Boomslang *(Dispholidus typus) by Neville Ganes*
Black Mamba *(Dendroaspis polylepis) by Nathan Jordan*