Emergency department

Management of snakebite (Victoria)

This flowchart should be read in conjunction with:

- *Suspected snakebite clinical pathway (Victoria)*
- *Snakebite envenomation clinical pathway (Victoria).*

Patient presents with potential snakebite

Observe in critical care area. Insert IV line and take bloods
Ensure pressure bandage immobilisation (PBI) has been applied pending assessment
Assess for evidence of envenomation (see 'Clinical assessment guide' in *Suspected snakebite clinical pathway*)
Swab bite site but **do not** test at this stage (see 'Role of snake venom detection kits')
If unsure, contact a clinical toxicologist (Poisons Information Centre 13 11 26)

Is there evidence of envenomation?

YES

Evidence of envenomation

See *Snakebite envenomation clinical pathway*

- Resuscitate
- Consult a clinical toxicologist (Poisons Information Centre 13 11 26)
- Prepare to manage anaphylactoid reaction
- Give antivenom
- Release pressure bandage immobilisation **after** antivenom

- Monitor, investigate for, and treat complications
- Repeat bloods 6 hours post antivenom
- Repeat bloods 12 hours post antivenom

Admit for observation and monitoring of progress

NO

Suspected snakebite

See *Suspected snakebite clinical pathway*
Assessment of initial bloods (INR, APPT, CK, fibrinogen, D-dimer, FBE, EUC)

Clinical or laboratory evidence of envenomation?
If unsure, contact a clinical toxicologist (Poisons Information Centre 13 11 26)

YES

NO

Sequence of repeated neurological examinations and blood tests.
Please see *Suspected snakebite clinical pathway* for details.

Clinical or laboratory evidence of envenomation?
If unsure, contact a clinical toxicologist (Poisons Information Centre 13 11 26)

YES

NO

Discharge in daylight hours

The Emergency Care Clinical Network (ECCN), Department of Health and Human Services, Victoria, convened an expert reference group to update the *2013 Snakebite clinical pathway*. This document is one of two documents relating to the management of snakebite.
The expert reference group included the following clinical toxicologists and experts in management of snakebite:
Dr Shaun Greene (Victorian Poisons Information Centre), Prof. Bart Currie, Prof. Andis Graudins, Prof. Geoff Isbister, Dr Chris Nickson, A/Prof. Bill Nimorakiotakis, Mr Jeff Robinson, Prof. Anne-Maree Kelly and Dr Debra O'Brien (chair).
These materials have been endorsed by ECCN steering group members.

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Notes for practitioners

Scope

This flowchart and notes **only** apply to suspected community-acquired snakebites in patients who are not snake handlers. Specific advice regarding bites in snake handlers and from exotic snakes should be obtained from a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

A. Blood tests

1. Initial blood tests: coagulation screen (INR, APPT, fibrinogen), FBE and film, CK, EUC, quantitative D-dimer

2. Serial blood tests in all patients: coagulation screen (INR, APPT, fibrinogen), FBE and film, CK, EUC, quantitative D-dimer

Note: Point-of-care tests are **not** appropriate. Point-of-care devices give false negative results in venom-induced consumptive coagulopathy for INR and D-dimer.

B. Role of snake venom detection kits

The choice of antivenom is based on the clinical syndrome and local geographical patterns of snake distribution.

Snake venom detection kits can be useful, but in inexperienced hands they can have significant rates of snake misidentification, false positives and false negatives. **The results should not override clinical and geographical data.** If unsure, discuss with a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

Most venomous snakebites in Victoria are from tiger or brown snakes, and both may present with an initial coagulopathy on blood testing. As a result, it may be appropriate to administer one vial each of brown and tiger snake antivenom if envenomation is evident and a person who is experienced in using and interpreting a venom detection kit is not immediately available.

Given the narrow range of snakes involved and interpretation issues with snake venom detection kits, it is reasonable to exclude snake venom detection kit analysis from clinical pathways. This is, however, a decision for local health services.

If health services decide to use a snake venom detection kit, it can be used in the following pathway: *Snakebite envenomation clinical pathway* > 'early decision making' > 'choice of antivenom', along with a strong recommendation that the results are discussed with a clinical toxicologist. Use the swab and diluent provided in the kit or use a dry cotton swab and allow to dry.

It is strongly recommended that all cases of envenomation are discussed with a clinical toxicologist to guide treatment (including choice of antivenom) and follow-up healthcare after discharge (for example, Poisons Information Centre 13 11 26).

D. Location of care

1. Patients with a suspected snakebite

All patients with a suspected snakebite should be managed in a facility with access to antivenom, critical care facilities and a 24-hour laboratory for blood tests. If these criteria are not met, inter-hospital transfer may be required, even for asymptomatic patients.

In some asymptomatic cases, it may be acceptable not to transfer if a laboratory INR can be performed in another hospital laboratory that can provide results within three hours. This is a matter for local hospital protocols. If unsure, discuss with a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

2. Continuing care for patients with evidence of envenomation

Care of an envenomed patient needs to be in a facility with close nursing observation, access to a critical care area, access to 24-hour laboratory facilities and access to medical cover. Some patients may require inter-hospital transfer. An emergency observation unit may be appropriate. These are local health service decisions.

All cases of envenomation should be discussed with a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

Emergency department

Suspected snakebite clinical pathway (Victoria)

This clinical pathway **only** applies to suspected community-acquired snakebites in patients who are not snake handlers. Specific advice regarding bites in snake handlers and from exotic snakes should be obtained from a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

Clinical assessment guide

Circumstances, symptoms and examination on their own are not indicators for antivenom. Consider all aspects when assessing for evidence of envenomation.

The following table details information that should be sought when assessing if envenomation has occurred.

Assessing for evidence of envenomation

Circumstances	Symptoms	Examination
• Confirmed or witnessed bite versus suspicion that bite *might* have occurred • Are there multiple bites? • When? • Where? • First aid? • Past history? • Medications? • Allergies?	• Headache • Nausea or vomiting • Abdominal pain • Blurred or double vision • Slurring of speech • Muscle weakness • Respiratory distress • Bleeding from the bite site or elsewhere • Passing dark or red urine • Local pain or swelling at the bite site • Pain in lymph nodes draining the bite area • Loss of consciousness and/or convulsions	• Evidence of a bite or multiple bites; swab for venom but **do not** test (see 'Role of snake venom detection kits') • Evidence of venom movement (e.g. swollen or tender draining lymph nodes) • Neurotoxic paralysis (ptosis, ophthalmoplegia, diplopia, dysarthria, limb weakness, respiratory distress) • Coagulopathy (bleeding gums, prolonged bleeding from venipuncture sites or other wounds, including the bite site) • Muscle damage (muscle tenderness, pain on movement, weakness, dark or red urine indicating myoglobinuria)

Treat as envenomed if there is:

- neurotoxic paralysis (for example, ptosis, ophthalmoplegia, limb weakness, respiratory effects)
- coagulopathy (for example, blood not clotting, INR > 1.3, prolonged bleeding from wounds and venepunctures)
- history of unconsciousness, collapse, convulsions or cardiac arrest.

Go to ***Snakebite envenomation clinical pathway*** and seek advice from a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

Possible evidence of envenomation

There are a number of relative indications for antivenom that require expert interpretation.

Early discussion with a clinical toxicologist (for example, Poisons Information Centre 13 11 26) is **strongly recommended** in the following instances to determine if antivenom is required:

- any patient with significant symptoms (especially headache and vomiting) or any patient who appears systemically unwell
- any abnormality of INR, APTT, fibrinogen, D-dimer, full blood count (leucocytosis, evidence of thrombotic mircoangiopathy) or CK > 1,000 IU/L.

See overleaf for **Management of suspected snakebite**.

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Management of suspected snakebite

If unsure at any stage, seek advice from a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

		Tick if completed
ASSESSMENT OF INITIAL BLOODS	**Clinical or laboratory evidence of envenomation: INR > 1.3, CK > 1,000 IU/L, raised APTT, reduced fibrinogen, elevated D-dimer**	
	Likely to require antivenom: go to *Snakebite envenomation clinical pathway* and seek advice from a clinical toxicologist (e.g. Poisons Information Centre)	
	No clinical or laboratory evidence of envenomation	
	Release pressure bandage immobilisation (PBI)	
	1 hour post removal of pressure bandage immobilisation • Neurological exam • Repeat bloods: INR, APPT, fibrinogen, CK, FBE, EUC, quantitative D-dimer	
STAGE 2	**Clinical or laboratory evidence of envenomation**	
	Go to *Snakebite envenomation clinical pathway* and seek advice from a clinical toxicologist (e.g. Poisons Information Centre)	
	No clinical or laboratory evidence of envenomation	
	6 hours after time of suspected bite • Neurological exam • Repeat bloods: INR, APPT, fibrinogen, CK, FBE and film, EUC, quantitative D-dimer	
STAGE 3	**Clinical or laboratory evidence of envenomation**	
	Go to *Snakebite envenomation clinical pathway* and seek advice from a clinical toxicologist (e.g. Poisons Information Centre)	
	No clinical or laboratory evidence of envenomation	
	12 hours after time of suspected bite • Neurological exam • Repeat bloods: INR, APPT, fibrinogen, CK, FBE, EUC, quantitative D-dimer	
STAGE 4	**Clinical or laboratory evidence of envenomation**	
	Go to *Snakebite envenomation clinical pathway* and seek advice from a clinical toxicologist (e.g. Poisons Information Centre)	
	No clinical or laboratory evidence of envenomation	
	Criteria for discharge (do not discharge overnight) • Normal neurological exam • Normal bloods: INR, APPT, fibrinogen, platelet count, D-dimer, CK and renal function at 12 hours after time of suspected bite	

Name: Signature: Date:

Emergency department

Snakebite envenomation clinical pathway (Victoria)

This clinical pathway **only** applies to community-acquired snakebites in patients who are not snake handlers. Specific advice regarding bites in snake handlers and from exotic snakes should be obtained from a clinical toxicologist (for example, Poisons Information Centre 13 11 26).

Snake	Coagulopathy	Neurotoxicity	Myotoxicity	Systemic symptoms	Cardiovascular effects	TMA	Antivenom
Brown	VICC	Rare and mild	–	< 50%	Collapse (33%) Cardiac arrest (5%)	10%	Brown
Tiger	VICC	Uncommon	Uncommon	Common	Rare	5%	Tiger
Red-bellied black	Anticoagulant	–	Uncommon	Common	–	–	Tiger

VICC = venom-induced consumptive coagulopathy (abnormal INR, fibrinogen very low, D-dimer high)
Anticoagulant = APPT 1.5–2.5 × normal ± minor elevation INR; D-dimer and fibrinogen usually normal
TMA = thrombotic microangiopathy (TMA); fragmented red blood cells on blood film, thrombocytopenia and a rising creatinine

EARLY DECISION MAKING

Discuss with a clinical toxicologist (e.g. Poisons Information Centre 13 11 26)

There are a number of relative indications for antivenom that require expert interpretation.
Early discussion with a clinical toxicologist is **strongly recommended** in the following instances to determine if antivenom is required:

- any patient with significant symptoms (especially headache and vomiting) or any patient who appears systemically unwell
- any abnormality of INR, APTT, fibrinogen, D-dimer, full blood count (leucocytosis, evidence of TMA) or CK > 1,000 IU/L.

Indications for antivenom: seek advice from a clinical toxicologist (e.g. Poisons Information Centre 13 11 26)

- Neurotoxic paralysis (e.g. ptosis, ophthalmoplegia, limb weakness, respiratory effects)
- Coagulopathy (e.g. unclottable blood, INR > 1.3, prolonged bleeding from wounds and venepunctures)
- History of unconsciousness, collapse, convulsions or cardiac arrest

Choice of antivenom: seek advice from a clinical toxicologist (e.g. Poisons Information Centre 13 11 26)

If there is a delay in contacting a clinical toxicologist and there is clear indication for antivenom, administer one vial of tiger snake antivenom and one vial of brown snake antivenom.
All cases of envenomation should be discussed with a toxicologist to guide treatment and appropriate disposition.

ACUTE MANAGEMENT

	Tick if completed
Prepare to manage anaphylactoid reactions	
• Critical care area with monitoring • IV line in situ • Further IV fluids available • Adrenaline available	
Preparation and administration of antivenom	
• Dilute in 100–500 mL of isotonic saline • Administer over 15–30 minutes • Release pressure bandage immobilisation **after** antivenom has been administered	

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		Tick if completed
ONGOING CARE	**Monitor progress: seek advice from a clinical toxicologist (e.g. Poisons Information Centre 13 11 26)**	
	Monitor, investigate for, and treat complications such as occult bleeding, electrolyte abnormality (e.g. hyperkalaemia, developing renal impairment).	
	6 hours post antivenom: INR, APPT, fibrinogen, D-dimer, EUC, CK and FBE and film If not improving/unsure, seek advice from a clinical toxicologist (e.g. Poisons Information Centre).	
	12 hours post antivenom: INR, APPT, fibrinogen, D-dimer, EUC, CK and FBE If not improving/unsure, seek advice from a clinical toxicologist (e.g. Poisons Information Centre).	
	Note: Coagulopathy may not begin to improve until about 12 hours. Persistent coagulopathy is not an indication for additional antivenom. Seek advice if concerned. Use of blood products (e.g. fresh frozen plasma) may be considered in an actively bleeding patient but should be discussed with a clinical toxicologist (e.g. Poisons Information Centre).	
	Daily thereafter until resolved: INR, APPT, fibrinogen, D-dimer, EUC, CK and FBE.	

	Location	**List criteria**	
ADMISSION	ED observation unit		
	Ward		
	ICU/HDU		
	Transfer		

DISCHARGE	**Criteria for discharge during daytime (do not discharge at night): seek advice from a clinical toxicologist (e.g. Poisons Information Centre 13 11 26)**	
	Uncomplicated myotoxicity and mild neurotoxicity Once clinical features are resolving and blood tests are normalising at least 12 hours post antivenom	
	Venom-induced consumptive coagulopathy (VICC) INR, APTT, creatinine and platelet count normalising	
	Discharge advice	
	Explanation of the risk of serum sickness (~30%) characterised by flu-like symptoms, fever, myalgia, arthralgia and rash developing 4–14 days post antivenom	
	Letter to GP including advice regarding recognition and treatment of serum sickness	
	Note: Disposition criteria – Each health service should decide its own disposition criteria, taking into account resources, expertise and clinical risk. These should be clearly documented in the pathway.	

Name: Signature: Date:

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