Snake and Spider Bites Clinical Management

Summary These Guidelines provide information for clinicians on the assessment, decision making and clinical management of patients presenting with suspected or confirmed snake bite or spider bite, for those species normally found in NSW.

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NSW Health

Guideline

Snake and Spider Bites Clinical Management

Guideline Summary

These Guidelines provide information for clinicians in relation to the assessment, decision making and clinical management of patients presenting with suspected or confirmed snake bite or spider bite, for those species normally found in NSW.

Key Principles

Snake bite

Consult early with a clinical toxicologist or the NSW Poisons Information Centre before blood results are available for making a clinical decision regarding antivenom administration.

Early antivenom treatment for those with clinical signs or symptoms of envenomation.

Geographical location of where the bite occurred (or likely snake responsible for the bite) is a factor in determining the choice of antivenom or antivenoms. This is to be made in consultation with the NSW Poison Information Centre or a clinical toxicologist. *Note: this does not apply to snake handlers.*

It is recommended that each local health district (district) has an escalation pathway to enable expert toxicology advice where available and a distributing pathway to all district sites.

In the rural and regional setting, existing admission, virtual care, and retrieval processes are to be followed.

In the out-of-hospital setting, any suspected snake bite patient should be transported to the emergency department for ongoing assessment and monitoring. For any collapse secondary to snake bite or any suspected envenomation, the priorities are resuscitation, application of pressure bandage immobilisation (PBI) and rapid transport to a facility that can administer antivenom. As soon as possible, consult the NSW Poisons Information Centre, particularly in rural and remote locations where transport times may be extended.

All patients, regardless of whether there are signs of envenomation, require a facility with on-site pathology and the ability to manage ongoing clinical monitoring, antivenom administration and anaphylaxis management.

Patients and their carers must be informed and kept updated regarding factors that contribute to any treatment decision. This will include risks and benefits of the treatment plan and any consultation with experts.

The Snake Bite Clinical Pathway is a flow chart developed to outline each step in the management of patients who have presented with a suspected snake bite. The flow chart provides a quick reference to these steps and should be used in conjunction with the more detailed information provided in this document.

Spider bite

Funnel-web spider antivenom is to be given to patients exhibiting symptoms. The dose is two vials of antivenom given intravenously (children receive the same dose as adults). Early contact with a clinical toxicologist or the NSW Poisons Information Centre is recommended if advice is required.

Pressure bandage immobilisation (PBI) should be used for funnel-web spider bites.

Symptomatic management is the mainstay of redback spider bite. A pressure bandage will make the pain worse and is not recommended.

All other spider bites only cause minor effects and only require symptomatic treatment.

Revision History

Version	Approved By	Amendment Notes
GL2024_007 June-2024	Deputy Secretary, Clinical Innovation and Research	Revised 2023. Expert panel formed, review of evidence, major changes include: • consult toxicologist early • initial antivenom to be given for any signs or symptoms of envenomation (before blood results) • venom detection kits and redback spider antivenom are no longer recommended.
GL2014_005 March-2014	Secretary / Deputy Secretary / Director General / Deputy Director General	Updated Guideline
GL2007_006 May-2007	Director General	New Guideline

Contents

1. Background

This is the fourth edition of the NSW Snake Bite and Spider Bite Clinical Management Guidelines, first released in 1998. The latest amendments align with the Australian Therapeutic Guidelines for the Management for Snake Bite and Spider Bite.

1.1. About this document

These are the major changes in this edition compared to the Snake Bite and Spider Bite Clinical Management Guidelines 2013 – Third Edition:

- A clinical toxicologist or NSW Poisons Information Centre to be consulted early to determine whether antivenom are to be given.
- Initial antivenom to be given to patients presenting with any signs or symptoms of envenomation (before blood results).
- It is recommended to collect a blood film in all patients with venom induced consumption coagulopathy (VICC) six or 12 hours after the bite.
- It is no longer recommended to swab the wound or use a venom detection kit.
- Redback spider antivenom is no longer recommended as initial treatment. A staged approach using multimodal analgesia is the preferred therapy. If ineffective after one to two hours, discuss with a senior clinician or clinical toxicologist to consider use of antivenom.

1.2. Key definitions

Anaphylaxis	The most severe type of allergic reaction. It should always be treated as a medical emergency. Anaphylaxis is: • any acute onset illness with typical skin features (urticarial rash or erythema/flushing, and/or angioedema) PLUS involvement of respiratory and/or cardiovascular and/or persistent severe gastrointestinal symptoms *OR* • any acute onset of hypotension or bronchospasm or upper airway obstruction where anaphylaxis is considered possible, even if typical skin features are not present.
Antivenom	This is the cornerstone of treatment for any person experiencing systemic envenomation following a snake or spider bite. It acts by binding to and neutralising venom. It does not reverse already established clinical manifestations of venom.

Envenomation	When a snake or spider bite injects sufficient venom to cause clinical effects. Envenomation can cause local effects (like pain or swelling), systemic effects (like nausea, headache or diarrhoea), collapse or other toxin syndromes.
Monovalent antivenom	Antivenom that contains antibodies intended for one specific snake or spider group.
Polyvalent antivenom	Antivenom that contains antibodies to five snake groups − black snake, taipan, death adder, tiger snake and brown snake. This covers most of the clinically important snake groups in Australia and Papua New Guinea. Polyvalent antivenom is a much larger volume (50 mL).

2. Snake Bite

It is estimated that up to 3,000 people are bitten by snakes in Australia every year. Snake envenomation is rare with only a few hundred cases and 1-4 deaths each year in Australia. While snake envenomation is uncommon in Australia, it is often severe and is a medical emergency.

The clinical management of snake bites is primarily focused on determining whether the patient experiences any signs of envenomation, requiring early administration of the appropriate antivenom.

Epidemiology of snake bites

In NSW, most snake bites occur in warmer months, in regional and rural areas. They are often associated with activities such as bushwalking and gardening. Brown snakes are the most common cause of severe envenomation and make up most of the confirmed envenomation in NSW.

Approximately 10% of snake bites occur in snake handlers. This is to be considered when determining the most appropriate antivenom if symptoms of envenomation are present. This is because the type of snake may be different to those normally found in a specific region.

2.1. Clinical effects

In most snake bites, insufficient venom is injected into the person to cause clinical effects (referred to as a dry bite). When enough venom is injected and causes clinical effects, it is called envenomation.

Envenomation is indicated by local effects (local pain, swelling or bruising), systemic symptoms (nausea, vomiting, headache, abdominal pain, diarrhoea, diaphoresis), collapse, and other major toxin syndromes (Table 1).

Local effects are not a major feature of bites by Australian snakes and do not indicate severity.

They vary from no evidence or minimal signs of bite marks to obvious bite marks, local pain, swelling, or bruising.

They are usually minimal with brown snakes (the most frequently lethal snake), whereas local pain, swelling and bruising are common with black and tiger snake bites.

They may be the only clinical manifestation of bites from some snakes of minor importance such as whip snakes.

The most important clinical effects from systemic envenomation:

Cardiovascular collapse is the leading cause of fatal envenomation. But generally, occurs prior to hospital, often within 30 minutes of the bite.

Venom-induced consumption coagulopathy (VICC) is the most common severe systemic complication. It is the reason for about 75% of cases requiring antivenom treatment. A subset of patients with VICC develop thrombotic microangiopathy, characterised by moderate to severe thrombocytopenia, haemolytic anaemia (with schistocytosis [greater than 1.0% on blood film] i.e., fragmented red bloods cells) and acute kidney injury. This is most common with brown snakes.

Neurotoxicity is less common and takes many hours to develop. Neurotoxicity manifests as a descending flaccid paralysis where ptosis is the most common early sign.

Myotoxicity is less common and results in regional swelling, local or regional myalgia, and rarely acute kidney injury secondary to rhabdomyolysis.

Table 1. Australian snake bites: Manifestations of envenomation*

Clinical syndrome	Characteristics	Associated results
Non-specific clinical symptoms	Nausea, vomiting, headache, abdominal pain, diarrhoea, and diaphoresis	N/A
Local symptoms	Vary from minimal to obvious bite marks, local pain, swelling or bruising	N/A
Sudden collapse	Collapse/syncope that occurs **within an hour of the bite** and often before patients present to hospital. The collapse is associated with hypotension and loss of consciousness, possible cardiac arrest, or seizure. **This occurs with all snakes that cause VICC, most commonly with brown snake bite.**	N/A
Venom-induced consumptive coagulopathy (VICC)	Signs include bleeding from bite wound, venepunctures, rarely haematemesis (vomiting blood) and haematuria (blood in the urine). Activation of the clotting pathway and consumption of important clotting	Activated partial thromboplastin time (aPTT) – high or unrecordable [NB1] **Complete VICC:**

	factors, including fibrinogen, factor V and factor VIII (consumptive coagulopathy) This is a feature of the following snake bites: • Brown snake • Tiger snake • Rough-scaled snake • Taipan. It also applies to the *Hoplocephalus* species: • Broad-headed snake • Pale-headed snake • Stephen's banded snake.	• International normalise ratio (INR) – more than 3.0 or unrecordable [NB1] • D-dimer – very high (e.g., 100 to 1000 times the assay cut-off) [NB2] • Fibrinogen – undetectable **Partial VICC:** • INR – less than 3.0 • D-dimer – high (at least 10 times the assay cut-off, or more than 2.5 mg/L) [NB2] • fibrinogen – low but detectable
Anticoagulant coagulopathy (ACC)	No increased bleeding risk. This is seen in envenomation by black snakes.	INR – sometimes mild-to-moderate elevation aPTT – mild-to-moderate elevation D-dimer and fibrinogen – normal; D-dimer may be high in red-bellied black snake envenoming
Neurotoxicity	A descending flaccid paralysis which classically first involves the eye muscles, e.g., ptosis (droopy eyelids), diplopia (double vision) and/or blurred vision), followed by bulbar muscles, e.g., dysarthria (slurred speech), dysphasia (partial loss of language or communication), dysphagia (difficulty swallowing)), respiratory muscle paralysis and limb paralysis	Neurological observations will demonstrate any changes in an envenomed patient.
Myotoxicity	Local or generalised myalgia (muscle aches and pains) Myotoxicity produces myoglobinuria (urinalysis will be positive for haemoglobin).	The creatine kinase (CK) may be normal on admission and then rapidly rises over 24-48 hours (CK ranges from 1000 units/L in mild cases to greater than 100,000 units/L in severe cases).
Thrombotic microangiopathy (TMA)	TMA is a disorder marked by the formation of blood clots and blood vessel wall damage in the micro-circulation, and it carries a risk of organ damage and failure.	The presence of intravascular haemolysis on blood film, thrombocytopenia and a rising creatinine which may lead to acute kidney injury requiring dialysis.
NB1: 'Unrecordable' means value greater than the limits of measurement; the laboratory should be notified if the result is unrecordable because usually a manual test needs to be done. **NB2**: D-dimer remains high for days; it is useful for diagnosis of snake venom coagulopathy but not for assessing recovery.		

* Adapted from Snake bite, published August 2020, in *Therapeutic Guidelines*.

2.2. Snake bite clinical pathway

The Snake Bite Clinical Pathway is a flow chart that outlines each step in the management of patients who have presented with a suspected snake bite. It provides a quick reference and should be used in conjunction with the more detailed information provided in this document.

2.3. Initial management

2.3.1. First aid – pressure bandage with immobilisation

The first aid for a suspected or confirmed snake bite is pressure bandage with immobilisation (PBI) and immobilisation of the limb and patient. PBI reduces transport of the venom by the lymphatic system but does not impact on venous or arterial circulation.

A broad (10-15 cm) elasticised bandage (preferred rather than crepe) is to be applied over the bite site as soon as possible and then applied distally then proximally covering the whole limb. The bandage should be firm and tight (similar to that used for sprained ankle). You should be unable to easily slide a finger between the bandage and skin.

PBI only works effectively if the patient is fully immobilised. The patient is to be completely immobilised where practical. Consider a limb splint for limb immobilisation. Distal limb circulation observations are recommended where PBI is applied.

If a patient presents with an inadequate PBI in situ, apply a new PBI over the top. *Do not remove the inadequate PBI.*

PBI must also be applied in a medical facility in all cases of suspected snake bite presenting within four hours. It is to only be removed after administration of antivenom for those envenomed *OR* if clinical assessment and initial *formal laboratory (not point of care machines)* investigations show no evidence of systemic envenomation.

Table 2. Pressure bandage with immobilisation

Step-by-step instructions for pressure bandage with immobilisation
1. Apply a broad 10-15cm elasticised bandage (preferred rather than crepe) directly over the bite site. Do not remove clothing.
2. Wrap the bandage distally and then proximally to cover the whole affected limb. The bandage should be firm and tight. You should be unable to easily slide a finger between the bandage and the skin.
3. Extend the bandage as high as it can go on the limb, covering as much of the limb as possible.
4. Splint the limb, including joints on either side of the bite site. This can be done with an additional bandage starting distally in combination with step 3.
5. Keep the patient and limb still. Distal circulation observations are recommended.

If you need more information, refer to the illustrated guide on how to apply a pressure bandage with immobilisation.

Tetanus management

If the patient has a ‘tetanus-prone’ wound, consider giving a tetanus booster vaccine.

- Diphtheria and tetanus (ADT booster) vaccine is to be given as per the Australian Immunisation Handbook Guide for tetanus prophylaxis in wound management.
- If ADT booster is not available, then diphtheria/tetanus/pertussis (Boostrix) vaccine can be used.

2.3.2. Clinical assessment and diagnosis of envenomation

The priority in assessment of any patient with suspected or confirmed snake bite is to determine whether envenomation has occurred. Any signs of envenomation require antivenom administration. A history of an early collapse in a patient bitten by a snake strongly suggests severe envenomation with a brown snake. Snake bites are not always witnessed and occasionally patients present with coagulopathy following a collapse and no history of a bite.

In the out-of-hospital setting, any suspected snake bite is to be transported to the emergency department for ongoing assessment and monitoring. For any collapse secondary to snake bite or any suspected envenomation, the priorities are:

- resuscitation
- ensuring pressure bandage immobilisation
- rapid transport to a facility that can administer antivenom.

Consult the NSW Poisons Information Centre as soon as possible. This is particularly important in rural and remote locations where transport times may be extended.

A thorough history must be taken from the patient to determine the time and location of the suspected snake bite. This is to include symptoms experienced before arriving at the hospital. It also needs to cover non-specific symptoms, such as nausea, vomiting, headache, abdominal pain, diarrhoea, or sweating.

Clinical examination and investigations are to then focus on determining if the patient is envenomed and what treatment is required. When most patients present with a history of suspected or confirmed snake bite, the type of snake and whether they are envenomed is not clear. The colour of a snake alone is not sufficient to identify the snake type. For example, a ‘brown-coloured snake’ is not necessarily a brown snake.

Examination for snake envenomation syndromes

- *Examine the bite site (if no PBI in situ)* − draining lymph nodes may be painful and support systemic envenomation.
- *Look for evidence of bleeding* − from the bite site, cannula site and occult sites of bleeding, such as gastrointestinal, urinary, or intracranial.
- *Neurological examination* − assess for ptosis (drooping upper eyelid from failure to maintain an upward gaze), ophthalmoplegia (paralysis of eye muscles which may cause blurry or double vision), bulbar weakness (dysarthria, slurred speech caused by neurological damage), dysphonia (disordered sound production), dysphagia (difficulty swallowing), pooling of oral secretions, limb weakness and respiratory muscle weakness.

- *Observation for non-specific signs* − nausea, vomiting, headache, abdominal pain, diarrhoea, and diaphoresis (sweating).

Diagnosis of systemic envenomation from snake bite

Most envenomed patients have multiple clinical or laboratory abnormalities suggesting systemic envenomation.

Clinical evidence of systemic envenomation

- Neurotoxicity
- Myotoxicity
- Coagulopathy
- Acute kidney injury
- Non-specific systemic symptoms, e.g., nausea, vomiting, headache, abdominal pain, diarrhoea, and sweating
- Early cardiovascular collapse, e.g., hypotension, cardiac arrest, unconsciousness, and seizures

Laboratory evidence of systemic envenomation

- International normalised ratio (INR) more than 1.2
- Isolated prolonged activated partial thromboplastin time (aPTT) above normal limits at 35-60 seconds, which may be seen with red-bellied black snakes, and up to 100 seconds for mulga snakes (prior to antivenom administration).
- Early consultation with clinical toxicologist is advised for patients who take anticoagulants prior to suspected snake bite.
- Low or undetectable fibrinogen concentration
- Raised quantitative D-dimer (greater than 2.5 mg/L). If it is greater than 1.5 mg/L within two hours, it should be repeated. However, repeat testing when other coagulation studies are done is not required if first D-dimer is normal.
- Rising serum creatine kinase (CK) concentration. If CK is raised early, consider other causes before bite.
- Evidence of thrombotic microangiopathy − thrombocytopenia, red cell fragments or schistocytes on blood film, raised serum lactate dehydrogenase concentration often followed by acute kidney injury.
- Raised white cell count

2.3.3. Initial investigations

Investigations to diagnose envenomation

All patients with suspected snake bite require a full set of investigations on admission.

Regardless of whether they are clinically envenomed or are asymptomatic, the investigations and observations are to be performed at regular intervals. Refer to Snake Bite Clinical Pathway to monitor for signs of envenomation.

Table 3. Investigations to diagnose envenomation

Baseline blood tests to support diagnosis	Time
• Full blood count (FBC) and blood film • Coagulation studies (INR, aPTT, fibrinogen, D-dimer) • Electrolytes, urea and creatine (EUC), liver function test (LFT), CK, lactate dehydrogenase (LDH)	Initial assessment

Onsite pathology

All patients, regardless of whether there are signs of envenomation are to be transferred to a site which has on-site pathology and the ability manage anaphylaxis.

If laboratory-based services are unavailable, blood samples must be taken and *transferred with the patient*. The pathology laboratory are to be notified that the request is in relation to a snake bite to enable early notification of abnormal blood results.

Best practice for investigations

Point of care testing (PoCT) for INR or D-dimer are not to be used to assess suspected snake bite patients.

- There are many cases of false negative INR results in patients with severe VICC.
- Similarly, the point of care D-dimer result can be normal with severe VICC.

It is important to make sure that small laboratories are not using PoCT testing.

Snake venom detection kits are not recommended for use in NSW in the management of snake bites. This is because testing is associated with higher rates of false positive results, mostly due to operator error.

1. *Application of PBI*
2. *Rapid Clinical Assessment*
3. *Seek Advice – Contact clinical toxicologist or NSW Poisons Information Centre (13 11 26) to discuss treatment decisions.*

2.4. Early advice, escalation and transfer

2.4.1. Poisons information or clinical toxicologist

A Clinical Emergency Response System (CERS) *assist* may be considered in smaller facilities. In this circumstance, early consultation with a clinical toxicologist is highly recommended to help with a risk assessment and inform decisions relating to the next stages in care. For more information about the deteriorating patient, refer to the NSW Health Policy Directive *Recognition and management of patients who are deteriorating* (PD2020_018).

2.4.2. Facilities with limited onsite services

All patients, regardless of whether there are signs of envenomation, require a facility with on-site pathology and ability to manage ongoing clinical monitoring, antivenom administration and anaphylaxis management.

If envenomation is possible a clinical toxicologist of the NSW Poisons Information Centre (*13 11 26*) is to be contacted to discuss the administration of antivenom before blood results are obtained.

Early contact with ambulance or retrieval for transfer as per local CERS processes is recommended − as soon as a patient is displaying any symptom of envenomation.

- The ambulance, retrieval or NSW Poisons Information Centre will liaise about treatment and transfer.
- *Do not wait until the patient is ready for transfer* to contact retrieval as this may result in lengthy delays.

If a patient presents to a facility with no on-site pathology, whether there are signs of envenomation or not, all patients are to have:

- PBI applied
- antivenom administered prior to transfer, if indicated. Discuss with poisons information centre or clinical toxicologist, if required
- pathology taken.

Patients are to be transferred to a facility with formal laboratory-based pathology and ability to manage anaphylaxis for further management and observation. Transfers are to include:

- the patient's blood samples
- notifying the pathology laboratory that the request relates to a snake bite to enable early notification of abnormal blood results
- clinicians must be made aware of the risk for anaphylaxis post antivenom administration.

The highest risk for an anaphylactic reaction to antivenom is the one hour immediately post administration. If a patient is being transferred within this hour, clinical staff should be equipped to manage anaphylaxis in transit to the larger facility.

2.5. Treatment

2.5.1. Non-envenomed patient

If initial laboratory studies are normal and there is no clinical evidence of envenomation, the pressure bandage can be removed in a critical care area under the direction of a medical or nurse practitioner.

This can be done either in person or virtually (where antivenom is available) and the patient can be observed carefully. Evidence of envenomation will usually develop rapidly within an

hour post-removal of the bandage if it is going to occur. This is due to the PBI acting as a dam, preventing systemic venom distribution via the lymphatic system.[15]

Disposition of non-envenomed patients

Patients with suspected snake bite must be admitted for 12 hours for observation and clinical monitoring.

Ongoing investigations

If the laboratory results are abnormal (see Table 6) **OR** neurotoxicity develops within 12 hours of the suspected bite, this indicates the patient is envenomed and requires treatment.

Table 4. Serial bloods − baseline normal and patient asymptomatic

Serial bloods if baseline normal and patient asymptomatic	Time − post bite
Coagulation studies (INR, aPTT, fibrinogen, D-dimer) CK	1 hour post PBI removal 6 hours post bite 12 hours post bite

Refer to Snake Bite Clinical Pathway for further information.

Discharge

The patient must be observed for 12 hours from the time of the bite if they are not envenomed.

If the laboratory results are abnormal **OR** neurotoxicity develops within 12 hours of the suspected bite this indicates the patient is envenomed and requires treatment.

In a patient with no clinical signs of envenomation, if laboratory studies conducted at six hours after bite and 12 hours after bite show no evidence of abnormalities, and the patient is feeling well, discharge home is appropriate without follow up.

2.5.2. Envenomed patient

Treatment of a patient experiencing systemic envenomation following a snake bite is focused on early antivenom administration with supportive treatment of signs and symptoms and then management of major complications.

The ongoing management of a patient who has experienced snake envenomation can only occur in a hospital with a laboratory that can do serial pathology testing (Table 5).

Antivenom treatment should still be given to obviously envenomed patients in smaller hospitals where anaphylaxis can be managed (without laboratory results and prior to retrieval).

Early recognition of patients who require definitive care is important. Early contact with ambulance or retrieval is to be made to allow inclusion in consultation with clinical toxicologists and planning for transfer.

Disposition of envenomed patients

All envenomed patients who receive antivenom are to be admitted for ongoing monitoring in a facility with on-site pathology capacity. All patients, regardless of whether there are signs of envenomation should be transferred to a site that has on-site pathology and the ability manage anaphylaxis.

Ongoing investigations for envenomed patients

The tests for the envenomed patient have two primary functions, to:

- detect new complications of envenomation
- understand when things begin resolving in the patient.

Laboratory investigations

Once a patient is identified as experiencing signs of envenomation, several other laboratory tests are to be ordered to monitor for complications of envenomation.

Table 5. Repeat laboratory tests for confirmed envenomed patients

Serial bloods – if signs of envenomation	Time – post bite
FBC Coagulation studies (INR, aPTT, fibrinogen, D-dimer^) EUC (including creatinine) and CK	6 hours (post bite) 12 hours (post bite) 24 hours (post bite) (36-48 hours) if needed
Patients with VICC should have blood film and lactate dehydrogenase (LDH) at the 6-hour or 12-hour post snake bite. ^D-dimer should only be used in the first 6 hours, or for the first 2 tests only.	

Table 6. Investigations to reflect complications arising in envenomed patients

Serial tests	Reflects	Comment
EUC	Acute kidney injury	Usually, won't rise for many hours
CK	Myotoxicity	Usually, won't rise for many hours CK lags behind the clinical muscle injury by up to 24 hours Severe myolysis is associated with CK levels greater than10,000 IU/L
Urinalysis − positive for blood	Myoglobinuria	
Lactate dehydrogenase (LDH)	Haemolysis in thrombotic microangiopathy	Should be requested in all patients with VICC To be requested at first bloods after antivenom administration
Blood film	Thrombotic microangiopathy	Should be requested in all patients with VICC To be requested at first bloods after antivenom administration

Supportive treatment

In addition to administration of antivenom, the management of patients experiencing systemic envenomation following snake bite are to include supportive treatment of associated signs and symptoms.

This may include:

- administration of oxygen therapy
- intravenous fluid therapy
- pain management
- antiemetics.

Complications of envenomation

Major complications of envenomation are uncommon and occur more often in patients with delayed presentations or delayed antivenom. These are the major complications and related treatment of envenomation.

Major bleeding can occur in any patient with VICC. The treatment is the same as for any patient with a severe coagulopathy. If there is major bleeding, patients may need clotting factor replacement, usually fresh frozen plasma, surgical intervention (e.g., embolisation, neurosurgery) and supportive care. Pre-emptive clotting factor replacement is not indicated.

Thrombotic microangiopathy can occur in any patient with VICC. There is no specific treatment. Hemodialysis is sometimes required for severe acute kidney injury. There is no evidence to support the use of plasmapheresis.

Rhabdomyolysis: myotoxicity may result in very high creatine kinase (greater than 100,000U/L) but this rarely results in acute kidney injury. There is no specific treatment.

Severe neuromuscular paralysis involving bulbar and/or respiratory muscles. Patients sometimes require ventilation. There is no specific treatment.

Discharge

Patients with mild neurotoxicity or uncomplicated myotoxicity can be discharged based on resolution of clinical features and normalised laboratory investigations. The median time to recovery of uncomplicated VICC (INR less than 2) is 24 to 48 hours post bite. Acute kidney injury from thrombotic microangiopathies (TMA) may take many days or weeks to resolve, and some patients have residual kidney impairment.

2.5.3. Snake bite antivenom

Antivenom is the cornerstone of treatment for any person experiencing systemic envenomation following a snake bite. Antivenom is a mixture of hyperimmune globulins and other proteins obtained from the serum of animals, mostly horses but also sheep, goats and rabbits, that have been immunised with the venom of a snake.

Before administering antivenom, clinicians are advised to contact a clinical toxicologist or the NSW Poisons Information Centre (13 11 26) to support clinical decision making.

Mechanism of action

Antivenom binds to and neutralises snake venom. It does not reverse already established clinical manifestations of snake venom. Recovery is determined by the body's ability to recover, e.g., to synthesise new clotting factors to reverse VICC. Further antivenom will not speed up these processes and carries increased risk of complications.

Optimal timeframe for administration

Early administration of antivenom is recommended if there is evidence of systemic envenomation − preferably within two hours of the snake bite. This can prevent or limit neurotoxicity, myotoxicity, and acute kidney injury. The earlier antivenom is administered, the more effective the therapy.

Table 7. Antivenom administration recommendation according to time post snake bite

Time post snake bite	**Within 6 hours**	**Between 6-12 hours**	**After 12 hours**
Action	**Antivenom recommended** for signs of envenomation	Decision to give antivenom should be made in **consultation with a clinical toxicologist**.	Antivenom is **not recommended**
Rationale	The earlier antivenom is administered following a snake bite, the better the outcomes.	May be some benefit from antivenom administration	The benefit of antivenom is minimal.

Adverse reactions

Previous treatment with antivenom is not a contraindication to administering antivenom.

Premedication with adrenaline, antihistamines and corticosteroids is **not recommended**.

Cutaneous hypersensitivity reactions occur in 20% of cases of antivenom use. They are more common with polyvalent antivenoms (large volume to administer).

Severe anaphylaxis with hypotension occurs in 5% of patients given antivenom. Specific advice about the management of anaphylaxis can be found at the Australian society of clinical immunology and allergy.

Before administering antivenom, clinicians are advised to contact a clinical toxicologist or the NSW Poisons Information Centre (13 11 26) to support clinical decision making.

2.5.4. Selection of antivenom

The two classes of antivenom are:

monovalent − contains antibodies intended for one specific snake group, for example tiger snake antivenom or brown snake antivenom

polyvalent – contains antibodies to five snake groups, black snake, taipan, death adder, tiger snake and brown snake. This covers most of the clinically important snake groups in Australia and Papua New Guinea*.

* *Polyvalent antivenom vial is a much larger volume (50 mL*).

The type of snake that is responsible for the bite is a factor in determining the type of antivenom given and the type of snake associated with geographical location. Identifying the snake must only be done by experts. Snake handlers may be able to assist in the identification. However, Australian snakes have overlapping shapes, sizes and colours and non-expert identification is generally incorrect.

Geographical location of snake bite and antivenom selection

This map uses green and grey shading to show how the location of the patient displaying signs of envenomation influences the treatment.

- In green-shaded area (east of the Darling River) and exhibiting clinical features of envenomation, give one vial of brown and one vial tiger antivenom.
- In grey-shaded area and exhibiting clinical features of envenomation, give one vial of polyvalent antivenom.
- Recently, there have been rare sightings of taipans in Northern NSW outside of their previously known geographical regions. This may necessitate the administration of polyvalent antivenom in rare cases in this region. This should be discussed with a clinical toxicologist or the NSW Poisons Information Centre.

2.5.5. Snake collectors and snake handlers

Geographical location of snake bite and antivenom selection Geographical location of snake bite

Snake collectors may have snakes in captivity that are uncommon, rarely bite or do not occur in the wild in that part of NSW, e.g., Collett's snake, death adders and taipans. Polyvalent

antivenom should be used in these cases. It is equally effective and safe as the relevant monovalent antivenoms.

Snake handlers may be reluctant to have antivenom as there is a belief that they are more likely to have an anaphylactic reaction to the antivenom than the general population. This is not correct, although they do have a much higher risk for venom anaphylaxis. However, snake handlers often have strong opinions about snake bite and antivenom treatment.

It is important to ensure that all discussions about risks and benefits should be made in consultation with the patient and must be documented in the clinical notes.

Table 8. Selection of antivenom

Snake bite type	Antivenom	Comment
Unidentified snake bite causing VICC or in Eastern NSW	One vial of **monovalent tiger snake antivenom** AND one vial of **monovalent brown snake antivenom** **Two vials in total**	This will also cover red-bellied black snake and all snake groups that cause VICC, except taipan.
Expert identification of brown snake	One vial of **brown snake antivenom**	
Definite red-bellied black snake bite Expert identification of tiger snake	One vial of **monovalent tiger snake antivenom**	
Likelihood of mulga, taipan, or death adder envenomation Suspected death adder envenomation with isolated neurotoxicity Suspected taipan, death adder or mulga snake bites in snake handlers Suspected mulga snake bite based on location and nonspecific systemic symptoms, e.g., nausea, vomiting, headache, abdominal pain, diarrhoea, with or without anticoagulant coagulopathy	One vial of **polyvalent antivenom**	Death adder, mulga or black snake and taipan antivenoms are all large volume (greater than 10 mL) All these snakes account for only a small proportion of severe envenomation in Australia. The administration of polyvalent antivenom is unlikely to be a higher risk than three large monovalent antivenoms volumes. Stocking and use of polyvalent for envenomation, rather than keeping three rarely used monovalent antivenoms, is recommended.

Storage and handling of antivenom

When transporting and storing antivenom it is essential that the *cold chain*, i.e. the need to store between 2-8 degrees Celsius, be maintained. Any significant rise in temperature may adversely affect the potency of antivenom. Equally, freezing of antivenom may also adversely affect potency. Refer to Vaccine storage and cold chain management for details about cold chain management in NSW.

2.5.6. Antivenom administration

Dosing or dilution

Different antivenom vials have different amounts, with polyvalent antivenom having the greatest volume.

It is *important to note the volume in the vial* at hand.

Table 9. Snake antivenom administration

Population	Dosing and dilution	Preparation	Administration
Adults	*It is important to note the volume in the vial at hand to achieve correct dilution.**	Dilute antivenom before use in a 1:10 **dilution** of sodium chloride 0.9% or Hartmann's solution. A volume of 500 mL is recommended for ease of administration.	Administer as an IV infusion over 15 minutes. Maximum volume of 5 mL/kg
Children and people who require lesser volumes	*It is important to note the volume in the vial at hand to achieve correct dilution.**	Dilute antivenom before use in a 1:5 dilution of sodium chloride 0.9% or Hartmann's solution.	Administer as an IV infusion over 15 minutes. Maximum volume of 5 mL/kg
* The volume of antivenom can also vary between different batches of the same type, for example: polyvalent can vary from 28-50 mL tiger snake antivenom can vary from 9-12 mL brown snake antivenom can vary from 4-9 mL.			

For further advice on administration refer to Australian Injectable Drug Handbook Snake Antivenom.

Antivenom side effects

Hypersensitivity reactions − be prepared to treat anaphylaxis

Hypersensitivity reactions to antivenoms occur in approximately 18-25% of patients in Australia. Urticaria and rash are the most common reactions. A severe anaphylaxis occurs in around 3-7% of patients in Australia receiving antivenoms.

To manage a hypersensitivity reaction, temporarily stop the antivenom and contact the NSW Poisons Information Centre or your local toxicologist for advice.

If **anaphylaxis** is suspected, administer intramuscular adrenaline. Refer to Anaphylaxis − (ASCIA) for further information.

Serum sickness

Serum sickness is experienced in about a third of patients given antivenom. It is characterised by flu-like symptoms, fever, myalgia, arthralgia, and rash occurring 4-14 days post antivenom.

Serum sickness is to be treated with corticosteroids:

Adult: prednisolone 25 to 50 mg orally, daily for up to seven days

Child: 0.5 mg/kg up to 25 mg orally, daily for up to seven days

2.5.7. Antivenom stock

Time to antivenom is an important factor in successful patient outcomes. Therefore, the decision to stock any antivenom should be based on a review of risks, facilities past usage and other practical considerations, such as the distance between smaller and larger emergency departments.

A district-wide plan for antivenom stocks and transport is recommended to support timely access to necessary antivenoms, as required. Determination of antivenom stock requirements are to be decided at a regional level in collaboration with local critical care clinicians.

These decisions can be made either for a whole local health district (districts) or specialty health network (networks) or specific regions within a district. This allows the local context to be considered. The decision to stock antivenom locally is important as retrieval may not stock antivenoms and will need access to locally available antivenom stock.

Larger hospitals should also carry additional stock depending on local guidelines.

The Poisons Information Centre NSW can assist in decisions about stock requirements.

All NSW hospitals with the intention of treating snake bites are to follow these recommendations for stocking of antivenom.

One vial of brown snake antivenom – everywhere in NSW

One vial of tiger snake antivenom – east of the Darling River

One vial of polyvalent snake antivenom. The decision to stock polyvalent snake antivenom needs to be determined by the district and is to be strategically located between smaller facilities and accessible by retrieval, if possible. It is best to administer it within three hours of the snake bite.

*NB***:** Black snake and death adder antivenoms are not required if polyvalent antivenom is available.

Life Saving Drug Register

The Life Saving Drugs Register (LSDR) for NSW public hospitals provides indicative stock holding information of life saving drugs, including antivenoms and antidotes, in hospitals. It includes their location within the hospital and hospital contact details so that this information can be shared with other hospitals within NSW. The LSDR is available in a digital format with stock-on-hand information automatically updated daily.

iTRACC

iTRACC is a database developed in response to a demand for a statewide overview of critical care assets and service provision. Its primary purpose is to support high-level decision makers in the management of critically ill or injured patients across NSW public hospitals. iTRACC does this by:

- allowing users to search for blood products, antivenom, antidotes and lifesaving drugs, interventional cardiology services, trauma services, radiology services and stroke service
- providing road, helicopter and fixed-wing times and distances from a location (i.e., where a patient is) to the service (e.g., stroke service) or asset (e.g., brown snake antivenom).

Only groups responsible for providing high-level critical care advice within the NSW healthcare system can access iTRACC. This includes the Aeromedical Control Centre (NSW Ambulance), NSW Poisons Information Centre, critical care advisory services and telestroke clinicians.

It is recommended clinicians familiarise themselves with the facility and/or nearest facility capabilities and available resources. Using the LSDR is the most efficient way to determine the nearest antivenom supplies.

3. Spider Bite

Spider bites occur more commonly in the warmer months of the year.

There are 35 funnel-web spider species. The majority of funnel-web spider bites have been reported in Sydney, the Central Coast and Newcastle. Although bites and deaths have been reported as far away as Wauchope in Northern NSW. Funnel-web spider envenomation is rare, but it can cause severe and potentially life-threatening neurotoxicity. There is an effective antivenom available.

Redback spiders are found all over NSW. Redback spider envenomation (latrodectism) is not life-threatening even to infants and children. No deaths have been reported since the mid-1950s. While redback spider envenomation can be very painful, there is evidence that the use of antivenom does not change outcomes. Its use is no longer supported in NSW as part of routine management.

3.1. Initial management

Pain or discomfort occurs in almost every spider bite and the absence of pain suggests the patient has not been bitten. Other local effects may include:

- fang marks
- bleeding
- local erythema (red rash caused by injured or inflamed blood capillaries).

Hypersensitivity reactions have not been reported following spider bites. These are more commonly seen after bees, wasps, or ant bites. Secondary infection is also rare (< 1%) with spider bites.

It is common for people to suspect spider bite without observing a spider biting them. Definite spider bites are managed in one of three clinical pathways:

Big black spider

This includes potential bites by funnel-web spiders, but also trapdoor spiders, mouse spiders and other large, primitive spiders (mygalomorphs). All bites by big black spiders in eastern Australia should be managed as suspected funnel-web spider bites for the first four hours after being bitten.

Redback spiders

Most people can identify a redback spider with reasonable accuracy.

Other spiders

Bites by all other Australian spiders only cause minor effects. If a patient has not been bitten by either a big black spider or redback spider they can be reassured because no major envenomation will occur.

Some patients present with skin lesions or necrotic ulcers they attribute to a spider bite. The diagnosis and investigation should include consideration of infective, immunological, inflammatory, vascular, and neoplastic aetiologies.

Tetanus management

If patient has a 'tetanus-prone' wound, consider giving a tetanus booster vaccine.

- Diphtheria and tetanus (ADT booster) vaccine are to be given as per the Australian Immunisation Handbook Guide for tetanus prophylaxis in wound management.
- If the ADT booster is not available, the diphtheria/tetanus/pertussis (Boostrix) vaccine can be used.

3.2. Big black spider bite (including funnel-web)

Clinical features and diagnosis

A funnel-web spider bite is potentially rapidly lethal. It is to be treated as an acute medical emergency. The bite is usually painful and fang marks are present in most cases. The clinical features arise from excessive activity of the autonomic and peripheral nervous system.

The majority of funnel-web spider bites do not result in significant illness and do not require antivenom. Less than 15% of bites develop envenomation.

Evidence of systemic envenomation from funnel-web spider bite

Table 10. Summary of the clinical effects of severe funnel-web spider envenomation

Clinical syndrome	Characteristics
Autonomic excitation including cholinergic and catecholaminergic effects	Generalised diaphoresis (excessive sweating) and piloerection (goosebumps) Hypersalivation, lacrimation (secretion of tears) Hypertension, bradycardia, or tachycardia Miosis (pupil constriction) or mydriasis (dilated pupils)
Neuromuscular and sensory excitation	Fasciculations (brief, spontaneous contraction or twitch in a muscle): characteristically tongue fasciculation Paraesthesia Muscle spasms
Other severe effects	Decreased Glasgow Coma Scale (GCS) Multiorgan failure Pulmonary oedema Hypotension (later sign)
Non-specific systemic symptoms	Agitation Abdominal pain Nausea, vomiting Headache

3.2.1. Management

First aid

The first aid for funnel-web spider bite is the same as for snake bites − pressure bandage with immobilisation and immobilisation of the patient. The patient is to be completely immobilised where practical. Consider a limb splint for limb immobilisation. PBI reduces transport of the venom by the lymphatic system but does not impact on venous or arterial circulation.

A broad (10-15 cm) elasticised bandage (preferred rather than crepe) should be applied over the bite site as soon as possible and then applied distally then proximally covering the whole limb. The bandage must be firm and tight, similar to that used for sprained ankle. You should be unable to easily slide a finger between the bandage and skin.

If a patient presents with an inadequate PBI in situ, apply a new PBI over the top – do not remove the inadequate PBI.

In hospital management

All suspected or confirmed funnel-web spider bites are to be observed for at least four hours after the bite and two hours after the removal of the PBI.

The bandage and immobilisation are to remain in situ until the patient has been transferred and assessed in hospital. The bandage is to only be removed in a critical care area under the direction of a medical officer or nurse practitioner if antivenom is available and when there is no evidence of envenomation based on clinical examination.

If the patient is envenomed, the bandage can be removed after antivenom has been administered. All patients treated with antivenom are to be admitted and monitored for 12-24 hours, until the symptoms of envenomation have resolved.

Investigations

No routine investigations are recommended to diagnose envenomation following funnel-web spider bite.

However, if there is evidence that the patient is experiencing catecholamine induced cardiomyopathy − initially extreme hypertension that progresses to hypotension and tachycardia − the following tests are to be undertaken:

- troponin
- ECG
- echocardiogram (if patient becomes hypotensive).

Supportive treatment

Respiratory failure is usually due to pulmonary oedema and may require emergency resuscitation and assisted ventilation. Non-invasive, invasive ventilation and positive end-expiratory pressure (PEEP) may assist in severe cases.

Atropine may be useful if cholinergic features are marked and antivenom is not immediately available.

Severe hypertension may occur. Sedation is the most appropriate first-line treatment as it will not exacerbate other features of poisoning.

3.2.2. Spider bite antivenom

Antivenom treatment is the priority in funnel-web bite envenomation. It is only indicated in patient with signs of severe envenomation, which is unlikely to occur later than two hours post bite. Adverse reactions to antivenom are rare with funnel-web antivenom.

If funnel-web envenomation is possible (e.g., early symptoms after a spider bite) contact a clinical toxicologist or the NSW Poisons Information Centre (13 11 26) to discuss administration of antivenom.

All patients, regardless of whether there are signs of envenomation, require a facility with ability to manage ongoing clinical monitoring, antivenom administration and anaphylaxis management.

3.2.3. Antivenom administration

Table 11. Funnel-web antivenom administration

Population	Dosing and dilution	Preparation	Administration
Funnel-web spider antivenom dose is two vials. The dose is the same for adults and children.			
Adults	Reconstitute the vials with 10 mL of water for injection. Swirl gently until completely dissolved. It may take up to 10 minutes. The solution is slightly opalescent to colourless.	Dilute dose in 100 mL of sodium chloride 0.9% or Hartmann's solution.	**Infuse slowly** and monitor for adverse effects, such as erythema, urticaria, hypotension, and bronchospasm. If there are no adverse reactions, increase infusion to be given over **20 minutes**.
Children and people who require lesser volumes	Reconstitute the vials with 10 mL of water for injections. Swirl gently until completely dissolved. It may take up to 10 minutes. The solution is slightly opalescent to colourless.	Dilute the dose in 10 mL/kg or 100 mL of sodium chloride 0.9% or Hartmann's. **May be diluted to 1 in 5 if required.** Children require the same amount of antivenom as adults − only the volume of diluent may be reduced, if necessary.	**Infuse slowly** and monitor for adverse effects, such as erythema, urticaria, hypotension, and bronchospasm. If there are no adverse reactions, increase infusion to be given over **20 minutes**.
Further doses of antivenom are not usually required. If the patient does not respond to the first dose, seek advice from a clinical toxicologist or the NSW Poisons Information Centre.			

For further advice on administration, refer to Australian Injectable Drug Handbook funnel-web spider antivenom.

Complications of envenomation

In severe envenomation, severe hypotension may occur as a result of catecholamine myocardial injury and inotropes may be indicated.

Atropine and benzodiazepine can be used **after** the administration of antivenom to manage any persistent cholinergic or catecholaminergic symptoms.

- A Clinical Emergency Response System (CERS) assist may be considered in smaller facilities. If this is the case, it is highly recommended to consult with a clinical toxicologist to assist in making a risk assessment of the next stages of care.
- Early contact with ambulance or retrieval is recommended − as soon as a patient is displaying symptoms of complications of envenomation.
- Ambulance, retrieval, or the NSW Poisons Information Centre will liaise regarding treatment and transfer.
- *Do not wait until the patient is ready for transfer* to contact retrieval as this may cause lengthy delays.

Disposition

All patients treated with antivenom are to be admitted and monitored for 12-24 hours until the symptoms of envenomation have resolved.

Patients who do not show severe signs or symptoms may be discharged after four hours has passed since the time of the bite, and at least two hours post removal of pressure bandage.

3.3. Redback spider bite

In most cases, the diagnosis is made based on the history of a bite by a redback spider and the clinical effects. The bite site is often red, painful and the pathognomonic finding is localised diaphoresis (sweating).

Redback spider envenomation is characterised by pain − localised, radiating, and regional. Local pain increases over an hour or two and may radiate up the limb. The pain is usually severe enough to interfere with normal activities. The duration of effects varies with only moderate pain for a few hours in some cases to severe persistent pain for 2-5 days.

Redback spider envenomation is not fatal. Non-specific systemic effects, such as nausea, vomiting, headache, malaise, and lethargy are common.

3.3.1. Management

First aid

First aid for redback spider bite includes:

- cleaning the bite site with antiseptic and covering it with an adhesive dressing or light dressing
- application of an ice pack or heat pack to provide local symptom relief. The decision for either heat or ice pack depends on what is available, and if a patient prefers warm or cool.

- A pressure bandage should **not be** applied as it will make the pain worse.

Supportive treatment

Pain from a redback spider bite can be severe and treatment focuses *on managing pain and discomfort***.** Multimodal analgesia may be required and include paracetamol, ibuprofen, opioids, clonidine, and patient-controlled analgesia.

Topical local anaesthetic creams applied to the bite site may provide some symptom relief. They have been used to improve pain following a spider bite. Evidence is minimal for this treatment but could be trialled if topical anaesthetic is readily available.

To manage diaphoresis (excessive sweating), suggest the patient change clothing as required. Or consider providing an extra sheet or towels for the patient to lie on. These can be easily changed and may increase comfort.

Antivenom treatment

Redback spider antivenom is no longer recommended in NSW as initial treatment following a bite. Treatment for suspected redback spider bite is aimed at addressing symptoms, focusing on adequate analgesia. If analgesia is ineffective after 1-2 hours post administration, redback spider antivenom may be used at a senior clinician's discretion, preferably with advice from a clinical toxicologist.

Seek advice from a clinical toxicologist or the NSW Poisons Information Centre (13 11 26) to discuss treatment decisions, if required**.**

At the time of publication, redback spider antivenom is not listed for use on the NSW Medicines Formulary. Refer to NSW Health Policy Directive Approval Process for Medicines and Their Use (PD2022_056) for guidance on the use of medicines not listed on the NSW Medicines Formulary via the Individual Patient Use approval pathway. Local governance should determine whether this agent should be stocked.

The risks and benefits of antivenom are to be discussed with the patient and family, due to the self-resolving and non-lethal nature of redback spider envenomation and associated risks of antivenom.

Disposition

The patient must be discharged when their pain is adequately managed, and they are asymptomatic. They will require analgesic medications for up to five days and this is to be provided on discharge.

4. Clinical Advice and Resources

- NSW Ambulance − NSW Aeromedical Control Centre
  Adults – call 1800 650 004
- Newborn and Paediatric Emergency Transport Service
  Neonates and children − call **1300 362 500**
- NSW Poisons Information Centre
  The centre provides advice on the management of snake bite and spider bites.
  Call: **13 11 26**

Interfacility transfers policies

- Adult Critical and Specialist Care Inter Hospital Transfer
  NSW Paediatric Clinical Care and Inter-hospital Transfer Arrangements

Other useful links

- Australian Injectable Drugs Handbook
- Australian Immunisation Handbook
- ITRACC: Information system for trauma, retrieval and critical care
- Life Saving Drugs Register