



# Urgent Care Evaluation for Snakebite Envenomation

**Urgent message:** Snakebite envenomation is relatively rare, but immediate action upon presentation to the urgent care center—including quick and accurate identification, appropriate care, and sound decisions regarding transfer to the ED—maximizes the chance for optimal outcomes.

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## Introduction

Snake venom poisoning is a complex medical emergency that is seen infrequently, but when encountered requires rapid recognition and urgent management. The following discussion will focus on appropriately identifying snakebites from indigenous venomous species in North America, crotalid and elapid snakes, initiating urgent management prior to the emergency department transfer.

## Epidemiology

In the United States, approximately 45,000 snakebites occur annually, mostly in the southern United States, and typically between May and September when snakes are most active and humans participate in increased outdoor activities.<sup>1-3</sup> The American Association of Poison Control Centers estimates that 7,000-8,000 people are bitten by venomous snakes in the United States annually, including 5-6 fatalities.<sup>4,5</sup> According to the CDC WONDER database, a total of 78 venomous snake fatalities occurred between 1991 and 2007 in the southern U.S., followed by 28 fatalities in the West.

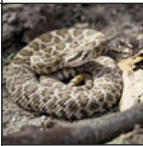





The most commonly encountered venomous species in North America are the pit vipers (Crotalinae subfamily of Viperidae), coral snakes (Elapidae family), and sea snakes (Hydrophidae). Poisonous snakes have been identified in every state except Alaska, Maine, and Hawaii.<sup>1-3</sup> The pit vipers include rattlesnakes, cottonmouths, and copperheads. The coral snakes include the eastern coral snake, Texas coral snake, and the Arizona



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coral snake. Most deaths occur in white males, children, the elderly, and victims to whom antivenin is not given, delayed, or administered in insufficient quantities.<sup>5-6</sup> Zoo personnel and herpetologists are also at higher risk for bites.<sup>2,3</sup>

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Table 1. Pit Vipers vs Coral Snakes—A Comparison						
	Pit vipers			Coral snakes		
Varieties						
	Rattle snake	Cottonmouth	Copperhead	Eastern coral snake	Texas coral snake	Arizona coral snake
Physical characteristics	<ul style="list-style-type: none"> <li>• Pit between each eye and nostril</li> <li>• Triangular-shaped head</li> <li>• Elliptical slit pupils</li> <li>• Two curved fangs folded against the roof of the mouth, with at least three pairs of replacement fangs behind each</li> <li>• Single row of subcaudal plates on the underside, caudal to the anal plate</li> </ul>			<ul style="list-style-type: none"> <li>• Smaller than pit vipers</li> <li>• Colorful, with red, yellow, and black band</li> <li>• Black snouts</li> <li>• Round pupils</li> <li>• To distinguish from harmless snakes: “Red on yellow will kill a fellow; red on black, venom lack”</li> </ul>		
Toxins	Hemotoxic			Neurotoxic		
Envenomation signs and symptoms	<ul style="list-style-type: none"> <li>• Local pain</li> <li>• Swelling</li> <li>• Ecchymosis</li> <li>• Tachycardia</li> <li>• Paresthesias</li> <li>• Vomiting</li> <li>• Confusion</li> <li>• Perioral swelling/paresthesia</li> <li>• Metallic/rubbery taste in the mouth</li> <li>• Muscle fasciculations</li> <li>• Respiratory distress</li> <li>• Anaphylaxis</li> <li>• Consumptive coagulopathy</li> </ul>			<ul style="list-style-type: none"> <li>• Minimal local reactions</li> <li>• Tremors</li> <li>• Marked salivation</li> <li>• Altered sensorium</li> <li>• Systemic symptoms— paresthesias, weakness, ptosis, dysphagia, hyporeflexia, respiratory depression</li> <li>• Seizures</li> </ul>		

**Making the Diagnosis**

**History**

The first step in evaluation is to establish whether a bite is from a snake, another animal, or is not a bite at all (often patients with a MRSA infection will state that they have a skin lesion from a bite wound). Fortunately, most patients will provide a history suspicious for a potential snakebite, such as walking through a field or, if we are lucky, they will actually report seeing a snake. As stated previously, the majority of reported snakebites in the U.S. occur in the southern and western regions. Asking about occupation can also be a big clue; zoo workers, amateur snake collectors, and herpetologists are at higher risk.<sup>2,3</sup> Historically, males, especially when alcohol or mind-altering recreational drug use is involved, have been known to be the majority of incidents (as well as animal-related fatalities).<sup>4</sup>

Since the toxins from these two species vary, the sys-

temic signs and symptoms vary, as well.

Pit vipers (rattlesnakes, cottonmouths, and copperheads) have venom which is hemotoxic, with symptoms that may include local pain, swelling, ecchymosis, and systemic symptoms of tachycardia, paresthesias, vomiting, and confusion.

Coral snakes (eastern coral snake, Texas coral snake, and the Arizona coral snake), have venom which is neurotoxic, with less severe local reaction but systemic symptoms which can include paresthesias, weakness, ptosis, dysphagia, hyporeflexia and respiratory depression.

**Physical Exam**

If a positive identification is not possible, the diagnosis of snake envenomation involves physical findings consistent with snakebite plus evidence of tissue injury which can manifest as local tissue injury, hematologic abnormality, or systemic effects. The most common

Table 2. Do's and Don'ts of Snakebites	
<b>The Do's of Snakebites</b>	<p><b>Do secure safety</b></p> <ul style="list-style-type: none"> <li>• Following a bite, the victim should be moved to a safe distance and from harm</li> <li>• If the snake has been captured, place in a canvas bag</li> <li>• Keep the patient warm. Rest is also important</li> </ul> <p><b>Do support ABCs</b></p> <ul style="list-style-type: none"> <li>• Focus initially on supporting airway, breathing, and circulation. Establish an IV on the contralateral side and consider supplemental oxygen administration</li> </ul> <p><b>Do initiate pretreatment</b></p> <ul style="list-style-type: none"> <li>• Remove rings, watches, and constrictive clothing</li> <li>• Immobilize the affected extremity in a functional position below the level of the heart</li> <li>• With severe pain, consider acetaminophen or opiates, as opposed to NSAIDs or aspirin due to potential hematologic effects from crotaline snake bites<sup>3,9</sup></li> <li>• Update tetanus prophylaxis</li> <li>• Wash with soap and water</li> </ul> <p><b>Do early transport</b></p> <ul style="list-style-type: none"> <li>• Symptoms may be delayed, and many patients will require prolonged observation and possibly antivenom</li> </ul>
<b>The Don'ts of Snakebites</b>	<p><b>Do NOT tourniquet extremity</b></p> <ul style="list-style-type: none"> <li>• There is little support for arterial tourniquets due to risk of complications with limb ischemia             <ul style="list-style-type: none"> <li>– Instead, place a constriction band (ie, a broad, flat band applied to occlude superficial veins and lymphatic glands). This technique has been shown to delay systemic absorption of venom<sup>8</sup></li> </ul> </li> </ul> <p><b>Do NOT perform incision and suction</b></p> <p><b>Do NOT use cryotherapy</b></p> <p><b>Do NOT use electric-shock therapy<sup>2,3</sup></b></p> <p><b>Typically, antibiotic therapy is not necessary</b></p>

soon follow. Within 60 minutes, edema as well as erythema emerges both proximal and distal to the bite site. Over the next several hours, ecchymosis, lymphangitis, or hemorrhagic bullae may develop—and, in some severe cases, edema can involve an entire limb, causing a compartment syndrome.

Some specific systemic effects to crotaline envenomation are variable, but include perioral swelling/paresthesia, a metallic or rubbery taste in the mouth, muscle fasciculations, respiratory distress, anaphylaxis, and consumptive coagulopathy. The absence of any of these manifestations for a period of over 8 to 12 hours indicates a “dry bite.”

Coral snake venom is unique because the major component is neurotoxic and typically does not cause local injury. A coral snakebite may cause little to no pain but may cause tremors, marked salivation, as well as altered sensorium. The neurologic signs are usually cranial nerve palsies such as ptosis, dysarthria, dysphagia, dyspnea, and seizures. Similarly, the onset of clinical manifestations may be delayed up to 12 hours<sup>3</sup>.

Other labs and tests can be helpful in diagnosis of a snake envenomation but may be outside the scope and resources of some urgent care centers. Quick recognition and early transport to a definitive care medical facility is imperative to the recovery of the victim.

reaction to a snakebite is a sense of impending doom, with other early symptoms including nausea, vomiting, and weakness. Systemic effects may include tachycardia, tachypnea, hypotension, and altered mental status. It may be difficult initially to differentiate these systemic manifestations from autonomic reactions related to the terror and impending doom.

Crotaline snake venom has several enzymatic properties that contribute to the venom's deleterious effects on the body. These proteins cause damage to the vascular endothelium and cell membranes, leading to edema, erythema, or ecchymosis.

Immediately after the bite, physical manifestations may only include two small punctures, but pain will

**Diagnosis**

The confirmation of a snakebite is based on the presence of fang marks and a consistent history. The first step will be differentiating a venomous snakebite from a nonvenomous snakebite.

The easiest method is positive identification of the snake through physical description of a sighting, or a physical sample (alive, dead, or parts and pieces). Note that recently killed or decapitated snakes retain their bite reflex for several minutes after death of the snake; therefore, capture is not as important as safety. With recent technology, taking a photograph of a snake with camera phones may be a better means of identification rather than capture.<sup>2,3,6</sup> Interestingly, even with correct iden-

tification of the venomous snake, about 25% of all pit viper bites and 50% of all coral snakebites do *not* result in envenomations; this is referred to as a “dry bite.” Therefore, clinical manifestations of envenomation may not become apparent; this highlights the importance of proper identification and, eventually, observation.<sup>2,3,7</sup>

Pit vipers (crotalids) have distinguishing features to help identify them from nonvenomous snakes; one is in the name, which is the heat-sensitive foramen (pit) between each eye and nostril. These pits have heat receptors that guide the direction of the strike by sensing the location and presence of warm-blooded prey or predators. Other features include the triangular-shaped head and elliptical slit pupils. If one is able to take a closer look at the snake, the two curved fangs are folded against the roof of the mouth with at least three pairs of replacement fangs behind each. On the underside, there is a single row of subcaudal plates caudal to the anal plate.<sup>2,3</sup>

Coral snakes (elapids) are typically smaller and more colorful with a combination of red, yellow, and black bands. Typically, the coral snakes in the U.S. will possess black snouts and round pupils<sup>3</sup>. A number of harmless snakes in the United States can mimic the coral snake, which has given rise to a rhyme “red on yellow will kill a fellow; red on black, venom lack.”

See **Table 1** for an overview of the differences between pit vipers and coral snakes.

## Clinical Features

### Prehospital/Urgent Care Management

The primary focus in the urgent care setting will be providing important first aid measures to assist and not harm the victim’s chances of recovery. This can be simply organized in a list of do’s and don’ts (**Table 2**).

### Indications for Transfer

Indications for transfer from the urgent care setting include the following:

- With a confirmed recent bite by a poisonous snake, patients should be transferred to the emergency department for observation and consideration of antivenom.
- Patients with systemic symptoms should be considered for emergent transfer per EMS.
- With diagnostic uncertainty, consider transfer for observation and further evaluation.
- Prior to transfer it is important to document:
  1. Time of snakebite

2. Circumferential measurements at the site of the envenomation
3. Demarcation of the swelling and erythema with a marker (to monitor progression)<sup>3</sup>

## Expected Emergency Department Treatment

The mainstay of treatment for all venomous snakebites includes continuous aggressive supportive care, as well as consideration of antivenom. Often, the poison center will be contacted, or consultation with a physician experienced in bites of venomous snakes will be arranged. If the patient remains hemodynamically stable with minimal symptoms, they will likely be observed for 8 hours and then discharged.

For each venomous snake, there is a corresponding antivenin. Crotalidae Polyvalent Immune Fab (FabAV) is used in the United States for crotaline envenomations.<sup>3</sup> A unified treatment algorithm for crotaline snakebites was established in 2011.<sup>10</sup> Unfortunately, the North American coral snake antivenin has been discontinued since 2008; therefore, coral snakebite victims should be admitted for 24–48 hours of observation due to delayed symptoms of envenomation which are not easily reversible.

## Conclusion

Snakebite envenomation may have life-threatening consequences, but is simplified by proper identification and appropriate initial management, including removal of constricting objects and clothing, immobilization, and consideration of transfer. Avoid tourniquets, incision and suction, cryotherapy, or electric shock. ■

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