

Copperhead Snake Bites

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Contact Hours: 1.5 (ANCC) and 1.8 (ABN) 1.0 (PHARM) contact hours are valid August 8, 2016 through August 8, 2018.

Target Audience: Registered Nurses, Advance Practice Nurses, health care providers involved in substance abuse treatment.

Purpose: Examine the nursing care of an individual who has sustained a copperhead bite.

Fees: ASNA Member - \$FREE Non-Member - \$15

Instructions for Credit: Participants should read the purpose and then study the activity on-line or printed out. After reading, complete the post-test at the end of the activity and compare your responses to the answers provided, and review any incorrect responses. Participants must complete the evaluation on line and submit the appropriate fee to receive continuing nursing education credit. The certificate of attendance will be generated after the evaluation has been completed. ASNA will report continuing nursing education hours to the ABN within 2 weeks of completion.

Evaluation: Complete at <https://form.jotform.com/62205571946963>

Accreditation:

Alabama Board of Nursing Provider Number ABNP0002 (*valid through April 6, 2021*).

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Snakes in general are probably the most misunderstood wildlife in our environment because people are often simultaneously fascinated and fearful. Venomous snakes are indigenous throughout the United States (US) and the two most common seasons for snakebites injuries are spring and fall. They are most active at night in warmer weather. Roughly there are 125 different species of snakes in the US and only 25 of these are venomous. This number is not exact as nonindigenous snakes (exotic snakes) have been introduced in the pet trade, owners are bitten and some of these have escaped into the environment. In addition there are some exotic snake bites associated with zoo handlers. Overall exotic snakes account for very few numbers of bites. Most reported snakebites occur in the Southwest and that reported number is somewhere around 3,000 bites per year. But reporting



is not mandatory and according to estimates by the U. S. Food and Drug Administration the actual number of bites easily exceeds 8,000/year. However, only 10- 15 (0.2%) of these bites result in death each year. The majority are rattlesnake bites and most of the reported deaths have documented evidence of receiving no medical care or first aid. More individuals die each year from wasp and bee stings than from being bitten by a snake. Snake bite education is important as those that are bitten may suffer extreme pain and debilitating physical losses. Snakebites are a complex medical emergency which includes the local effects around the bite itself and potential damage to every major organ in the body. Even non-fatal bites may cause intense pain and long-lasting or permanent tissue damage. Therefore, this issue is an important nursing concern. Permanent limb disability and even death can be averted by proper assessment and treatment of symptoms.

What is the usual reason individuals are bitten by snakes?

The most common venomous snakes in the US include copperheads, rattlesnakes, cottonmouths/water moccasins, and coral snakes. Nationwide the most common bites are from rattlers in the Southwest, but in the Southeast we see many more copperhead bites. This article will focus on copperhead bites. Many bites are impossible to prevent as when the snake is stepped on or encountered in a wilderness setting. Prevention can lower your risk of being bitten. Do not attempt to capture or kill a snake as 75 - 80% of all bites occur during this activity.

Alabama has 40 species of snakes and only six of these are venomous. Five are classified as crotaline or pit vipers so named by the depression or pit located on both sides of the face between the eyes and the nostril. The pit vipers are the copperhead, three different types of rattlesnakes, and the cottonmouth/water moccasin. The pits are extremely sensitive heat detectors. Blind or blindfolded pit vipers are able to accurately follow prey, usually a rodent, up to six feet in distance. The pupils are vertical and cat-like. Their head is triangle shaped. Their necks are thin but the body is described as heavy. They also have two long hollow, retractable or hinged fangs near the front of the mouth for delivery of the venom. The sixth venomous snake in Alabama is the coral snake. This snake has a thin body and an oval elongated head. They are easily spotted by the series of bright red, yellow, and black bands on their body. The head and snout will always be black. Alabama has several non venomous snakes with this same or similar color combinations. To distinguish between venomous and non venomous type remember the jingle, "red on yellow - kill a fellow, red on black- friend of jack".

Management of snakebites universally follows the guidelines developed by the World Health Organization. They stress, initially keep the patient calm and reassured. The person should also remove anything tight such as clothing or jewelry. WHO states that 70% of all snakebites are by nonvenomous snakes and 50% of all venomous bites are classified as dry bites, that is no venom is injected into the person. Nevertheless dry bites may be painful and terrifying. The first aid goal is to immobilize the affected limb by using either clothing or a splint, and rapid transportation to a hospital. It is preferable for the person not to walk if possible.

ALTHOUGH RECOMMENDED IN THE PAST DO NOT DO THE FOLLOWING FIRST AID MEASURES!!

- make local incisions over the bitten area
- attempt to suction the venom out
- use a tourniquet or tight constriction over area
- place ice on the affected area
- apply electrical shock
- wash the area

All of these actions have been historically utilized but today it is believed this spreads infection, hastens absorption of the venom from the site, and increases bleeding from the site.

When are copperhead snakes most active?

Copperhead bites are not as serious as other pit vipers. The bites are usually limited to local tissue destruction. The venom is not as toxic as compared to other pit vipers and in general they do not inject very much venom. Their appearance is dark, chestnut-brown or reddish-brown crossbands and each crossband is shaped like an hourglass, dumbbell, or saddlebag. These crossbands are on a background color which is lighter brown, tan, or salmon. These saddlebags are wider on the sides of the body and more narrow in the center of the back. The crossbands have darker margins and lighter center areas. The top of the head is coppery-red to yellow and their sides are paler. A baby copperhead's tail is yellow whereas the adult tail is black to darkish green or brown. These snakes are right at home in the suburbs. The favorite habitat will include both sunlight and cover. In the spring and fall copperheads tend to be out during the day but in the summer they are nocturnal - especially on a warm humid evening after a rain. Their favorite food is mice and rodents and they play a pivotal role in keeping the rodent population regulated. The bigger the snake the longer the fangs and they often bite the victim more than once. A copperhead is ovoviviparous which means they bear live young. A copperhead snake is born with venom and able to bite. The young are 5-6 inches in length at birth and an adult is usually 2-3 feet in length and occasionally 4 feet in length. The female can store sperm from the fall to spring to ensure a more hospitable environment for birth. Copperheads have an interesting courtship and mating process which can last up to 8 hours. During the process the male copperhead produces a pheromone which makes the female unattractive to other males. The venom of a young copperhead is more virulent than that of an older snake. Copperhead snakes are most active when the temperature is between 72 and 85 degrees Fahrenheit. They will seek cover in temperatures below 50 or above 95 degrees Fahrenheit. A copperhead will hunt alone and when hibernating will return to the same den year after year. Copperhead snakes are gregarious often sharing the den with rattlesnakes and black rat snakes. A little over half of the bites occur on the hand because people try to pick them up or attempt to capture them. Bites cause immediate intense pain

described as hitting thumb with a hammer or by being stung by a number of wasps. There will be edema and bruising which will progress up the limb. The venom is hemolytic, thus it destroys red corpuscles and releases hemoglobin into the surrounding tissue. Small animals (rats - their favorite prey!) bleed to death after being bitten. The coagulopathy is usually not a concern with people. However the reversal of the systemic symptoms which will be noted in the emergency room include numbness; tingling of the face, mouth or scalp; nausea and vomiting; chills; abdominal cramping and a rapid heart rate (due to pain) are a priority. As the healing progresses local tissue damage is quite common as well as loss of mobility of the joint near the bite. Thus the focus of nursing care is supportive after the effects of the envenomation is contained.

Describe assessment of the severity of the envenomation.

Once hospitalized the treatment plan includes immediate evaluation of airway, breathing, circulatory status and consciousness. Provide oxygen, start an intravenous drip of normal saline or Ringers Lactate with a large bore needle. This will be followed by an exact history and a physical examination. Determine if the person has actually been bitten and if so, was it a snake or another type of wildlife. Obtain a description of the snake and it is best not to bring the snake to the emergency room because crotalinaes or pit vipers can continue to bite and deliver venom well after death. If the snake is transported to the emergency room it is preferable to have the head separated from the rest of the body and the head transported in a bite proof container. When the assessment determines that the person has been bitten or envenomated the severity of the bite needs to be established in order to determine an exact treatment plan including the amount of antivenin.

Severity is assessed as follows:

- No envenomation - absence of a local or systemic reaction and may or may not have fang marks.
- Mild envenomation - moderate pain, moderate local edema (0 - 15 cm), ecchymosis, erythema, no systemic reactions, and fang marks.
- Moderate envenomation - severe pain, moderate local edema (15 - 30 cm), ecchymosis, erythema, systemic weakness, anemia, nausea, vomiting, sweating, syncope, thrombocytopenia, and fang marks.
- Severe envenomation - severe pain, severe local edema (>30 cm), ecchymosis, erythema, hypotension, paraesthesia, pulmonary edema, respiratory failure, and fang marks.

Following the determination of the severity of envenomation, the bite area should be cleansed thoroughly with soap and water and if on a limb measure, mark, and record the limb circumference above and below the bite. The progression of the edema should be reevaluated every 15 minutes - again measuring and marking the area proximal to the bitten area until the progression of the swelling has ceased. The affected extremity should be placed in a soft splint for at least 24 hours. Assess for lymph nodes draining the affected limb. In the case of extreme swelling monitor digital

pulses. In extreme swelling a compartment syndrome may develop but this is very rare and never seems to be noted with copperhead bites.

Basic laboratory tests will usually include a CBC and platelet count, INR, aPTT, fibrinogen, fibrin degradation products, creatinine, and electrolytes. A urine analysis will be needed to evaluate for hemolysis. Some emergency departments will also obtain a chest x-ray, EKG, and a CPK. Some, if not all of these tests need to be reevaluated following each dose of antivenin. Depending a patient's history a tetanus booster may be needed. Antibiotics are rarely administered. In all cases poison control should be contacted. The patient may need a tetanus booster if their immunization is not up to date.

Patients are usually placed in ICU but can be monitored on any unit where careful observation is available. This careful observation is essential as the onset of serious symptoms may be delayed. These individuals will be in profound pain treated most often with morphine and usually nauseated often treated with ondansetron (Zofran). Patients need reassurance that they are not going to die. Copperhead bites are not fatal just very, very painful. By remaining calm the progression of the symptoms may be minimized.

Children and the elderly are especially vulnerable to snakebites. Children because they have less body mass but receive the same amount of venom as an adult. Often the elderly are in poorer health and do not have the necessary reserves to combat the detrimental effects of the venom.

Describe the role of the antivenom.

Most individuals are treated with the antivenom and all pit vipers bites are treated with the same antivenom. The drug lessens the symptoms but individuals who do not receive it also survive. The antivenom prevents continued effects of the venom and does not undo prior damage. It is given to save limb function, not save the patient's life. In this country two different types are available. The older version is Antivenin (Crotalidae) polyvalent or ACP and it is made from horse serum. It has a high number of allergic complications following administration. The other drug is Crotalidae Polyvalent Immune Fab(Ovine) or CorFab. It is made from sheep serum globulin. There are fewer allergic reactions. The size of the person has no impact on the amount of antivenom administered. The amount of antivenom is dependent on the degree of envenomation. ACP is most effective when administered within a four hour window following envenomation. The intravenous route is preferred for fast assimilation into the body and to reduce the pain at the injection site as it is very painful when administered intramuscular. The usual dosage for minimal envenomation is two to four 10 ml vials and up to 15 or more vials for severe envenomation. The usual initial recommended dose for CorFab is four to six vials intravenously. After completion of the initial dose observe the patient carefully for at least an hour to determine if the envenomation is being controlled. This will be assessed by reduction of local symptoms and coagulation, as determined by laboratory tests, returning to normal. If progress is not noted an additional four to six vials is usually administered. Once the initial control is achieved the

patient is usually administered an additional two vial dosage every six hours up to 18 hours again depending on symptoms noted. CorFab is most effective when administered within six hours of the bite.

Antivenoms are extremely expensive due to a number of factors. One being that there is poor data on the actual number of snakebites which leads to difficulty in estimating actual needs. Distribution is an issue due to limited supply. And many manufacturers have stopped producing antivenoms and vaccines in general so there is no competition in production as only one to two companies make antivenom in the US. The antivenom also has a short shelf life. The cost varies from \$2300/vial to \$27,000+/vial depending on the area of the country where you live and available supply. (NOTE: insurance does not pay \$27,000 and the price is negotiated as with all medicines/treatments.) Some individuals opt not to take the antivenom due to cost.

With both antivenom medications reconstitute as directed by the product manufacturer. Initially the intravenous solution should be administered very slowly for at least the first 10 minutes all the while assessing for adverse reactions. If no adverse reactions occur increase rate as determined by the physician or the institution's established protocol. It is imperative to monitor the patient carefully both during the infusion and following. A person's condition may deteriorate from mild to severe symptoms very quickly due to damage that cannot be reversed. This rapid change may occur with or without antivenom treatment.

After the intravenous fluids are completed the patient's wound, joint mobility, muscle strength, and ongoing psychosocial support becomes paramount. Wound care is accomplished by keeping area clean and covered with a sterile dressing. Sometimes there are blebs and/or necrotic tissue which may be debrided. Nursing care involves monitoring for serum sickness anywhere from few days to a few weeks. These include arthralgias, fever, rash or symptoms of the flu. If severe it is treated by tapering doses of a steroid such as prednisone. Even when patients are reminded that remaining calm reduces the spread of the venom and people just don't die from copperhead bites, they are still anxious and fearful. They and their families/significant others need much reassuring. Before going home they need to know the symptoms of serum sickness which may develop later in recovery. The nurse can share that with copperhead bites the usual prognosis is 8 days of pain, 11 days of extremity edema, and 14 days of missed work and a full recovery is expected.

What are preventative measures?

While the patient and their families are available it is a good idea to review snakebite prevention tactics for the future. These concepts should be shared - wear shoes, don't run with headphones (or at least have one earbud out) on the trail, leave snakes alone, stay out of tall grass unless you wear heavy boots and long pants and if moving through tall grass poke the ground with a long stick before stepping out to scare any snakes away. Keep hands and feet out of areas you cannot see. If you see a snake leave it alone or walk around it as a snake can strike up to half its length. Do not let children play in vacant, weed-infested lots. If at all possible use tongs when moving

firewood, brush or lumber as this is an environment where snakes live. Illuminate the area with a flashlight at night at home, camp sites, hiking trails, etc. as snakes are more active at night in the warmer months. It is preferable to sleep on a cot, if camping in snake infested areas. In the summer months especially in times of drought, be very carefully around any water source whether it is trickle, swimming pool, or lake as these are favorite hiding places for snakes. Outside air conditioning units elevated off the ground sometime have trickles of water beneath and thus great hiding places for snakes to spend the day. It is also a good idea to be familiar with the types of snakes in area.

Case study:

Kathryn lives in the outer reaches of the suburbs on about 3 acres of land. The rear of the house faces a moderate sized lake which has many fish, an unknown number of turtles, and a few water moccasins. There are two areas between the house and the lake. One immediately behind the house, is a beautifully landscaped garden and between it and the lake is a planted wildflower garden. The wildflowers are all indigenous to central Alabama. At the side of the house is a large boxwood cultivated to hide the garbage cans and shield the bathroom window. Kathryn has never seen a snake in garden; however, the family dachshund has killed a few and left the remains on the door step. About 8:00 PM on a warm June evening Kathryn went outside without shoes near the boxwood. She did not have a flashlight - the moon was bright and she said, "I knew where I was going". All of a sudden she felt intense pain which was described as, "Felt like I stepped on a wasp nest". She saw nothing and heard nothing - just pain and burning. Her response was, "Wasp nests are not on the ground, I have been snake bitten". She described a sense of calm knowing she would not die but needed immediate help. A neighbor was called and within 15 minutes she was receiving treatment in the emergency room. As Kathryn left her house for the emergency room she heard the dog and recognized the bark - he was killing the snake. In fact a neighbor brought the dead copperhead to the emergency room. On assessment four different sets of fang marks were noted on the dorsal surface of her foot. While in the emergency room she remained calm rather much of a surprise to the personnel. Her reaction was thinking how inconvenient on a Friday night, I had other plans for this evening. She described intense pain and nausea which was not treated until they had communicated with poison control and she had received two vials of the antivenom intravenously. The swelling continued. Kathryn described having a new set of black marks placed on her ever increasing leg every 15 minutes. She was transferred to ICU. More vials of antivenom were obtained and administered. In all she received 10 vials (at a cost of \$27,000/vial). The swelling progressed upward to "about half way up my thigh". The hospitalization lasted two days and once home she was unable to walk for one week due to intense pain from the swelling when weight bearing. Although sent home on pain medicine it was only taken for a day or two. The swelling took one month to recede. The muscles in her leg were sore the entire time. About three weeks following the snakebite she developed what she described as the flu. She contacted Poison Control and was told that this was serum sickness. She took no medicine for the serum sickness. This occurred about two months ago and today she is

symptom free. Kathryn believes it was her attitude that made the difference, "I never got upset, never felt my life was in danger".

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Select the one best answer and compare to correct answers provided. If you score an answer incorrect go back to text to confirm answer(s).

1. The most common snake bite in the US is from
 - a. Rattlesnakes
 - b. Copperheads
 - c. Coral snakes
 - d. None of the above

2. Pit vipers sense prey by
 - a. smell
 - b. heat
 - c. sight
 - d. movement

3. Copperhead venom is
 - a. neurotoxic
 - b. hemolytic
 - c. both neurotoxic and hemolytic
 - d. neither neurotoxic or hemolytic

4. Copperheads are most active during what temperature ranges?
 - a. 60 and 70
 - b. 70 and 80
 - c. 80 and 90
 - d. 90 and 100

5. Basic laboratory tests following a snakebite will usually include
 - a. CBC and LDH
 - b. Creatinine and Lipid profile
 - c. Arterial blood gases and EKG
 - d. Platelet and UA

6. All individuals with pit viper bites are treated with the same antivenom.
 - a. True
 - b. False

7. Children are prescribed less antivenom than adults due to their body mass.
 - a. True
 - b. False

8. Antivenom
 - a. is only effective if administered within two (2) hours of the bite

- b. retroactively can repair some of the damaged tissue if given within two (2) hours of the bite
- c. prevents continued effects of the venom
- d. Both b and c

9. After an extremity has been marked the site should be evaluated every ____ minutes.

- a. 10
- b. 15
- c. 20
- d. 25

10. A focus of nursing care once the swelling has stabilized is

- a. evaluation of blood sugars
- b. assess EKG changes
- c. maintain adequate fluid intake
- d. treating the wound

1	2	3	4	5	6	7	8	9	10
A	B	B	B	D	A	B	C	B	D