SAEMS
SNAKEBITE STANDING ORDER
Self-Learning Module
PURPOSE

This SAEMS Standing Order Self-Learning Module has been developed to serve as a template for EMS provider training. The intent is to provide consistent and concise information to all providers practicing within the SAEMS Region. The content of the Self-Learning Module has been reviewed by the Protocol Development and Review Sub-Committee, and includes the specific standing order, resource and reference material, and instructions for completing the Self-Learning Module to obtain continuing education credit. One hour of SAEMS continuing education credit may be issued following successful completion of the module.

OBJECTIVES

Upon completion of this learning module, the participant will be able to:

1. Give the criterion for use of the Snakebite Standing Order.
2. List three treatment priorities.
3. List three once-common “treatments” that should NOT be employed in the care of a patient with snakebite.

INSTRUCTIONS

1. Review the accompanying information, Standing Order, and any additional reference material as necessary.
2. Complete the attached posttest and return it to your supervisor or base hospital manager for continuing education credit.
INTRODUCTION

While the vast majority of snakebites in the United States involve nonvenomous species, venomous snakes inflict some 8000 bites per year resulting in eight to fifteen deaths (The University of Arizona College of Pharmacy, 2012). The majority of snakebites in the United States occur in the Southwest, thanks in large part to the size of the rattlesnake population (Citizendium, 2012).

Venomous snakes indigenous to the United States belong to one of two families: Elapidae or Viperidae. The various coral snakes are the only North American elapids. This family of snakes, known for its extremely potent neurotoxic venom, also includes the cobras and kraits found in other parts of the world.

The majority of venomous snakes native to North America belong to the subfamily Crotalinae (pit vipers, comprised of rattlesnakes, cottonmouths, and copperheads) of the family Viperidae. Of these, only the rattlesnake is native to Arizona. Of the 36 known species of rattlesnake, Arizona is home to 13, more than any other state. Of the rattlesnakes native to Arizona, the Western Diamondback is responsible for more bites
and more deaths than any other rattlesnake species in the United States (Arizona Game and Fish Department, 2012), while the Mohave Rattlesnake has the distinction of having the most potent venom and being the only United States rattlesnake with a primarily neurotoxic venom (Bush, 2011).

Less than one percent of snakebites in the United States are by non-native species. The overall number of non-native envenomations is on the increase, however, with 33 occurrences in 1996 and 52 in 2004 (the last year for which statistics are available) (Dorell, 2007). The odds of a patient being bitten by something other than a native pit viper are exceedingly small, but whatever the culprit species, the Snakebite Standing Order may be used in the prehospital care of the patient.

**Venom 101**

Snake venom is actually highly specialized, very toxic saliva. It is composed of enzymes, polypeptides, glycoproteins, and certain low-molecular-weight compounds. Some of these ingredients are among the most toxic biological agents known (Ahmed, et al., 2008). While coral snakes have a primarily neurotoxic venom, crotalid venom (as well as that of several of the non-native elapids) has components that act to some degree on all of the following systems: cardiovascular, respiratory, hematoletic, respiratory, and nervous. Venom composition varies not only between different species, but also within a species depending on the time of year, as well as the snake’s age, geographic location, and diet (Gold, Barish, & Dart, 2004). A good example of venom variation by region within a species is found in the Mohave Rattlesnake. The difference is so distinct there is a venom A and a venom B. The difference between the two is the presence of Mohave toxin in venom A. It is a potent neurotoxin and one of the most lethal venom components found in snakes in the United States. As a result, venom A causes serious neurologic signs and symptoms with only limited local pain, swelling or hematoletic effects, while venom B causes signs and symptoms more consistent with other rattlesnake bites (Bush, 2011).

**Anatomy of a Snakebite**

Snake venom is stored in specialized salivary glands and delivered into the tissue of the bite recipient via either grooved or hollow fangs, depending on the type of snake. Release of venom is a voluntary act and “dry bites” in which no venom is injected do occur.

Coral snakes have several curved, grooved fangs that are small and fixed in place. They deliver their venom by hanging on and chewing. As a result, up to fifty percent of coral snake bites are “dry” (Balentine, 2012). Happily, Arizona or Sonoran coral snakes are shy and docile and rarely bite. In fact, there are no recorded deaths resulting from bites by the Arizona coral snake.
Crotalids, on the other hand, have a pair of long, curved fangs in the front of their mouths. These fangs are hollow, much like hypodermic needles, and fold back inside a membranous sheath when the mouth is closed. Behind these fangs are at least three pairs of replacements that move forward to replace fangs that are broken or shed throughout the life of the snake. This design allows delivery of a significant quantity of venom into the tissues of the bite recipient in a split-second strike. Compared with the coral snakes, crotalids have a smaller percentage—about twenty-five percent—of “dry” bites (Gold, Barish, & Dart, 2004).

Who Gets Bitten
The typical snakebite patient in the U.S. is a male between 17 and 27 years of age. Ninety-five percent are bitten on an extremity (Gold, Barish, & Dart, 2004). Approximately forty percent of bites in the United States occurred when the person bitten was attempting to catch a wild snake or was handling a venomous “pet.” Forty percent of those had an alcohol level of at least 0.1% (Wikimedia Foundation, Inc, 2013).

Signs and Symptoms
The signs and symptoms exhibited by a patient after snakebite depend on several factors, including the quantity of venom in the tissues, the type of snake/venom, the size and age of the patient, and the number and location of bites (Ahmed, et al., 2008). Early, intense pain suggests the patient has received a significant envenomation. Unfortunately, the converse is not necessarily true—it is possible to have a significant envenomation with little or no local pain or swelling. Swelling with some envenomations may be delayed as long as one hour. Other possible local signs and symptoms include bite marks, swelling, paresthesia, redness, bruising or blistering. Systemic effects may include weakness, dizziness, nausea, vomiting, and hypotension (Daley, 2012). Hemotoxic effects may include red cell, platelet and clotting factor destruction, resulting in anemia, thrombocytopenia, and coagulopathies. This may cause bleeding, both at the site and diffusely. Capillary permeability is altered allowing leakage of plasma and other proteins, causing tissue edema. Severe cases may have pulmonary edema as well. Significant envenomations may cause severe organ and tissue damage resulting in permanent disability and death if treatment is not initiated soon enough. Due to many individuals’ responses to snakes and being bitten by them, even dry bites and bites by nonvenomous snakes may result in such systemic symptoms as nausea, vomiting and syncope (Gold, Barish, & Dart, 2004). Nonvenomous bites can also cause local tissue damage that may be complicated by
one or more retained teeth or bacterial infection, including tetanus. All snakebites should receive medical attention, whether or not the patient shows signs of envenomation.

**IMPLEMENTING THE SNAKEBITE STANDING ORDER**

The Snakebite Standing Order should be used on all patients bitten by one or more snakes, whether symptomatic or asymptomatic. As previously mentioned, significant envenomations may occur without evidence of severe symptoms initially and symptom onset may be delayed as long as one hour. Evaluation and treatment should not wait until the onset of symptoms because by that time severe damage may already have occurred. Despite the complex and varied nature of snake venom and the potentially long and intensive medical care necessary for definitive treatment of a snakebite, emergency care of the snakebite patient can be distilled down to some very important Dos and Don’ts.

**DO:**

Note the estimated time the bite occurred. The speed with which effects progress is an indicator of severity of envenomation and this helps guide treatment (Gold, Barish, & Dart, 2004).

Remove any tight clothing, watches, bracelets, rings, or other jewelry from all extremities and neck. Local edema is common and diffuse edema is possible and can result in a loss of blood flow if the items are allowed to remain. It is safer and easier to remove those items before swelling occurs.

Immobilize the affected extremity in a functional position and elevate above the level of the heart. Elevation may conflict with the recommendations of some authors, but our local experts, in the course of caring for thousands of snakebite patients, have found that limiting edema through elevation is of greater benefit than attempting to reduce or slow spread of the venom by keeping the extremity in a neutral or dependent position. Conversely, movement of a bitten extremity has been shown to significantly enhance the absorption and spread of venom, and limiting movement is of proven benefit (Balentine, 2012).

Marking a line and the time at the proximal edge of swelling or discoloration with an indelible pen and then reevaluating every 15-30 minutes helps track progression and severity of envenomation (Gold, Barish, & Dart, 2004)

Initiate an IV of NS at KVO in an unbitten extremity. Hypotension and tachycardia may occur, especially with significant envenomations, and fluid boluses should be used to treat signs of shock (Bush, 2011).
Contact medical direction for unusual or concerning events. Patient deterioration would warrant a medical direction consultation. Additionally, while the Standing Order should be used for all snakebites, medical direction should be contacted in the event of a bite by an exotic snake, as a specific antivenin may be required (Ahmed, et al., 2008).

DO NOT apply any constricting bands, tourniquets, or ice. These can interfere with blood flow to the extremity and cause additional tissue damage (Balentine, 2012). If a tourniquet or constricting band was placed by someone on scene prior to EMS arrival, the EMS provider should contact medical direction for guidance regarding its management.

DO NOT apply suction of any kind to the wound. It does not remove any appreciable quantity of venom and may increase tissue damage (Balentine, 2012).

DO NOT wrap the extremity. Australian elapids have a neurotoxic venom that causes little or no tissue damage at the wound site, so wrapping bitten extremities with a compression bandage in the prehospital setting is done there to try to slow absorption of the venom (Ahmed, et al., 2008). More than ninety-nine percent of snakebites in Arizona are delivered by rattlesnakes and tissue damage is common. Wrapping the extremity will likely interfere with blood flow to the extremity and do more harm.

DO NOT attempt to catch the snake. Cro-Fab antivenin works for all rattlesnake venom and rattlesnakes are the culprit in practically all Arizona snakebites. Additionally, attempting to capture the snake would delay transport to definitive care while putting personnel at risk for snakebite themselves. Even if the snake has been caught or killed, it should not be transported, as even dead snakes may bite reflexively and there is no benefit the snake would provide that outweighs the risk to healthcare providers (The University of Arizona College of Pharmacy, 2012).

DO NOT give the patient alcohol to drink. Ethanol by mouth is a vasodilator and will likely enhance the spread of venom through tissues (Balentine, 2012).
SNKEBIT E STANDING ORDER

Initiate immediate supportive care:

- Secure and maintain airway
- Obtain vital signs
- O₂ to keep sat > 90%
- Cardiac monitor (if available)

INCLUSION

Symptomatic or Asymptomatic Snake Bite

Special Notes:

1. There is no need to bring the snake to the hospital. This practice increases the risk of secondary bites and can delay transport. In Arizona all rattlesnake envenomations are treated with the same antivenin. There is no antivenin for Arizona coral snakes.

2. Clinical effects of snakebites range from mild local reactions to life-threatening systemic reactions, depending on the species and size of the snake involved, the location of the bite(s), the volume of venom injected, and the age, size, and health of the victim. Children are more likely to suffer significant morbidity and mortality because they receive a larger envenomation relative to body size.

ORDERS

- Note estimated time bite occurred
- Prepare for immediate transport, do not delay until onset of symptoms
- Remove all watches, rings, jewelry, etc.
  - Not just from affected limb
- Immobilize affected extremity
- Elevate to reduce swelling
- Do NOT wrap extremity
  - NO constricting bands or ice
  - NO suction to the bite
- Ensure immobilization device or dressing does not result in constriction due to swelling
- Mark the edge of any discoloration and write the time on the line.
- Initiate IV NS in unaffected extremity
  - Maintain IV at rate to keep line open
  - 20 cc/kg bolus for hypotension
  - Reassess patient after each bolus
- Contact medical direction for:
  - Allergic reaction
  - Deterioration in patient condition
  - Management of a tourniquet placed prior to EMS arrival.
SUMMARY
Snakebite is a complex medical condition with effects that may range from minimal to life-threatening. The care the patient receives has the potential to significantly affect the patient’s outcome, for better or worse. Several interventions that once were in vogue have been shown to increase morbidity. The goal of prehospital care is prompt transport to definitive care while avoiding things that increase venom absorption or tissue damage.
POSTTEST

Name: ___________________________________ Agency: __________________________

Date____________________

1. A single antivenin effectively treats all rattlesnake envenomations.
   a. True
   b. False

2. Rattlesnake venom composition may vary depending on such factors as the age of the snake, its environment, and its diet.
   a. True
   b. False

3. Which of the following is a priority in the care of a snakebite patient?
   a. Application of a constricting band
   b. Capturing the snake
   c. Removing constricting clothing, rings, watches, bracelets, etc.
   d. Wrapping the affected area

4. Sonoran coral snakes are a significant cause of snakebite mortality.
   a. True
   b. False

5. Which of the following is NOT recommended in the care of snakebite patients?
   a. Immobilization of the bitten extremity
   b. An IV of NS, at KVO unless the patient is hypotensive
   c. Rapid transport to an emergency department
   d. Beer

6. Early intense pain is an indicator of significant envenomation.
   a. True
   b. False
7. It is possible to have a significant envenomation without pain or marked swelling.
   a. True
   b. False

8. Serious symptoms may be delayed for as long as one hour.
   a. True
   b. False

9. Whether symptomatic or asymptomatic, all snakebite patients should receive medical attention.
   a. True
   b. False

10. The Western Diamondback is a shy, docile snake that rarely bites.
    a. True
    b. False

11. Which of the following should be placed on the affected extremity after snakebite?
    a. A splint
    b. Suction
    c. A constricting band
    d. Ice
    e. All of the above

12. You arrive at the scene of a rattlesnake bite. A helpful bystander applied a tourniquet to the affected extremity approximately ten minutes prior to your arrival. Your possible courses of action include
    a. Remove it
    b. Leave it in place
    c. Contact medical direction
    d. Document presence or absence of pulses
    e. b and d
    f. c and d

13. You arrive at a patient’s house and he tells you he was bitten approximately five minutes ago by his “pet” cobra. You should:
    a. Implement the Snakebite Standing Order
    b. Contact medical direction
    c. All of the above
    d. None of the above
14. Your patient is an 18-year-old male who was drinking in the desert with friends and was bitten by an unknown snake when he tried to capture it. He has two obvious punctures on his right hand with significant swelling, pain and ecchymosis in the hand and forearm. You are en route to the nearest emergency department and have started an IV of NS in his left arm. The patient becomes lethargic and you discover his BP is 80/36. According to the Snakebite Standing Order you should:
   a. Give a fluid bolus
   b. Give naloxone
   c. All of the above
   d. None of the above

15. During your initial assessment of a snakebite patient you use a pen and write the time and a line on the patient’s arm showing the proximal edge of swelling/discoloration. In 15-30 minutes you repeat the process. You are doing this because:
   a. The Snakebite Standing Order says you should
   b. It helps the ED physician gauge the progression of the venom’s effects
   c. Both of the above
   d. You like drawing on patients
   e. None of the above
**EVALUATION**

Please answer the following questions by marking the appropriate response:

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<th>Question</th>
<th>Lowest</th>
<th>Worst</th>
<th>Least</th>
<th>4</th>
<th>Highest</th>
<th>Best</th>
<th>Most</th>
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<tbody>
<tr>
<td>1. To what extent did this module meet your needs?</td>
<td>1</td>
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<td>2. There was a balance between theoretical and practical information.</td>
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<td>3. The time required was appropriate to the content.</td>
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<td>4. The module increased my knowledge and understanding of the topic.</td>
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<td>5. References or audiovisuals were adequate.</td>
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<td>6. Overall, this program was worthwhile.</td>
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7. Additional comments: ___________________________________________________

______________________________________________________________