TITLE: Summer Emergencies Part 1

TIME REQUIRED: 3 hours

MATERIALS: Easel pad and markers, or board and chalk, Power-Point Projector, computer with internet access (if using video clips). If completing the practical portion under near drowning, you will also need a pool with a shallow end, 1 backboard per 8 students, 1 instructor per 8 students, and a PFD for each student and instructor.

There are several photos available on the following web sites:

www.rattlesnakebite.org/rattlesnakepics.htm - this web site tells the story and has the pictures of a who was bitten by a Rattlesnake
www.venomousreptiles.org/libraries/Snakebite%20Photos/1 - this web site is pictures of bites
www.alltheweb.com – search for pictures – Black Widow bite. Several excellent pictures come up on the first screen showing the black widow spider and well as bites in various stages. The same is true for Brown Recluse Spider Bites.

In addition there are short video clips on “You- tube” which show boating accidents and other water related injuries

References
- “MedDive” by Kathy Work, RN Published by Dive Rescue International
- “Dive First Responder” by Richard A Clinchy III; Published by Mosby Lifeline
- “Emergency Care and Transportation of the Sick and Injured” Andrew N Pollak MD, 9th Edition, Published by AAOS
- “Maryland Medical Protocols for Emergency Services”

MOTIVATION:
Spring has arrived and people have begun to get involved in a variety of outdoor sports and activities that they were unable to do during the cold weather. Along with these activities, there is a risk of illnesses and injuries that people do not face during the colder months of the year. After a long winter, it is necessary for the EMT to refresh their skills to be appropriately prepared for those “summertime emergencies”
OBJECTIVE: (SPO) 1-1:
Given information, resources, and an opportunity for discussion, at the completion of this lesson, the student will be able to list common summertime emergencies, the signs and symptoms of each and will be able to describe the correct treatment for each of these conditions according to acceptable Maryland Practice and Maryland Medical Protocols.

Enabling Objectives

EO: 1 Define drowning and near drowning, list the causes, the factors predicting outcome, and the appropriate rescue/treatment steps
EO: 2 Describe two types of SCUBA related emergencies, the risk factors, the steps of the field assessment and the appropriate treatment steps
EO: 3 Describe the types of lightning strikes, the most common injuries occurring from a lightning strike, and the important considerations for treatment of the patient
EO: 4 Describe the signs and symptoms of black widow, brown recluse, and poisonous snake bites and the treatment for them
EO: 5 Describe the four means the body has of reducing heat, describe the three common heat related emergencies, and the general treatment steps.

Overview

• Drownings
• SCUBA Emergencies
• Lightning Strikes
• Spider and Snake Bites
• Heat Related Emergencies
I. Drownings

A. Definition – the process of experiencing respiratory impairment from submersion/immersion in liquid. (World Health Organization)

1. Drowning - death from suffocation after submersion in water
2. Near Drowning is defined as survival, at least temporarily (24 hours), after suffocation in water.
3. Breath holding syncope - a loss of consciousness caused by a decreased stimulus for breathing. Happens to swimmers who breathe in and out rapidly and deeply before entering the water in an effort to expand their capacity to stay underwater. Swimmer doesn’t feel the need to breathe even after running out of oxygen. (treated the same as drowning/near drowning)

B. Statistics – how big is the problem (CDC)

1. In 2002, over 400,000 people died from drowning worldwide. (webmd)
2. In 2005, there were 3,582 fatal unintentional drownings in the US, averaging 10 deaths/day. 710 people died, from drowning in boating related incidents.
3. Two-thirds of drownings happen in the summer months. 40% occur on Saturday and Sunday. Some 90% occur in fresh water. More than 50% occur in home swimming pools.
4. More than 1 in 3 fatal drowning victims are children 14 years of age and younger.
5. For every 1 child who died in a drowning incident, 4 more received emergency related care for nonfatal submersion injuries.
6. In 2005, of all children ages 1-4 who died, 30% died from drowning.
8. Children under 1 year most often drown in bathtubs, buckets or toilets
9. Children ages 1-4 most often drown in residential swimming pools. Most young children who drowned in pools were last seen in the home, had been out of sight for less than 5 minutes, and were in the care of one or both parents at the time.
10. Children ages 5-14 tend to drown in lakes, ponds, and rivers
11. An estimated 5000 children ages 14 and under are hospitalized due to unintentional drowning-related incidents. 15% die in the hospital and as many as 20% suffer severe permanent neurological damage.

12. The majority of children who survive (92%) are discovered within 2 minutes following submersion and most children who die (86%) are found after 10 minutes. Nearly all who require CPR die or are left with severe brain injury.

13. Males are 4 times more likely than females to die from unintentional drowning in the US

14. 9 out of 10 of the people who drowned in boating accidents were not wearing a PFD (Personal Flotation Device)

15. Alcohol use is involved in up to half of adolescent and adult deaths associated with water recreation.

16. For persons with seizure disorders, drowning is the most common cause of unintentional injury death, with the bathtub as the site of highest drowning risk.

17. 19% of drowning deaths involving children occur in public pools with certified lifeguards present.

C. Drowning Causes

1. Alcohol consumption
2. Boating accidents
3. Child abuse or neglect
4. Diving accidents
5. Falling through ice
6. Fatigue
7. Illegal drug use
8. Inability to swim
9. Muscle and stomach cramps
10. Scuba diving accidents
11. Seizure, stroke, and heart attacks while victim is in the water

D. Instinctive Drowning Behavior
1. Immediately prior to submerging, the behavior of the individual is purely instinctual. The drowning non-swimmer is almost totally consumed by their panicked drive to breathe and to keep their head above water, they cannot hear, see, react to instructions, or call out for help.

   a. Therefore a drowning non-swimmer will not be able to reach out to grab a ring buoy or line whereas a distressed swimmer may be able to do that.

E. Mammalian Dive Reflex

1. Occurs when victims have been suddenly and rapidly submerged in cold water (less than 70 degrees). The colder the water the better the chance of survival without brain damage in submersions lasting more than 5 minutes.

2. The body responses shut off blood circulation to most parts of the body except the heart, lungs, and brain, allowing the small amount of oxygen left in the body to be transported to the areas needing it the most.

3. Children are more likely to have a strong mammalian dive reflex

F. Physiology

1. Inhaling small amounts of water, fresh or salt, can severely irritate the larynx, sending the muscles of the larynx and the vocal cords into spasm called laryngospasm.

   a. This happens to a mild degree when a small amount of liquid is inhaled. Normally the person will cough and choke for a few seconds and the problem is relieved.

   b. In water submersion, the pt’s lungs cannot be ventilated because of significant laryngospasm. Hypoxia occurs and the patient becomes unconscious. When this happens the larynx relaxes and if the patient is still in the water, more water may enter the lungs. In 85% to 90% of cases significant amounts of water enter the lungs of the drowning victim.

G. Factors predicting outcome

1. Age- the younger the person the better the outcome
2. Health- the fewer the medical problems the better
3. Length of submersion- the shorter the better
4. Water temperature- the colder the better
5. Water quality – the cleaner the better
6. Associated injury- the fewer injuries the better
7. Treatment- the sooner, the better.
8. About 70% of near-drowning victims recover completely, 25% die, and 5% survive with permanent brain damage.
9. About 1 of 20 people who are rescued die from a complication of the drowning including: Lung infection (pneumonia), heart rhythm irregularities, salt and water imbalance, kidney failure, and neurological damage from a lack of oxygen.

H. Rescue/Treatment
1. REACH - If possible reach the victim from the shore.
2. THROW- Throw an object to the patient. (in the case of a non-swimmer, the person will probably not be able to grab the object)
3. ROW- Use a boat if available (wear an appropriate PFD)
4. GO- Go to the person only if you are trained in lifesaving techniques and have the appropriate equipment.
5. Maintain a high suspicion of a spinal injury
   a. If a possible spinal injury is present:
      1) Protect the c-spine
      2) Rotate the patient to a face up position maintaining spinal alignment
      3) Perform rescue breathing if patient is not breathing
         a) While in the water, place the patient on a backboard (Strongly recommend that this technique be practiced in a shallow pool before actual use on a real patient)
         b) Remove patient from water and continue appropriate care.
         c) Abdominal Thrusts are contra-indicated unless the patient has a FBAO
         d) All near drowning victims should be transported even if they appear to be uninjured or appear to have recovered.
II. SCUBA Related Emergencies

A. Decompression Physiology- as a diver ascends, the pressure exerted on him decreases and results in a decrease in the amount of nitrogen in the air he is breathing. This causes higher levels of nitrogen in the tissues than in the lungs. The nitrogen in the tissues is carried in the veins back to the lungs to be exhaled. If a diver ascends too fast, the rate of nitrogen release is also too fast. The gas comes out faster than it can be eliminated. The end result can be bubble formation, which may produce symptoms in the diver. They may also have “silent bubbles” which can also cause harm to the diver. The bubbles may remain stationary or may be carried to somewhere else in the system.

1. Effects of Bubble Formation
   a. Pressure on nerves – causing pain
   b. Pressure on and obstruction within blood vessels, causing circulation problems
   c. Air can pass into coronary arteries, resulting in a heart attack, or to the brain causing the diver to have a stroke
   d. Pressure on tissues, causing damage to the cells
   e. Release of a fatty substance from the cells which coats the bubble and makes it stronger
   f. Leakage of fluid from the blood vessels, making the blood thicker
   g. Platelets and debris cling to the bubble, making it a more solid like clot object.
   h. Bubbles can continue to grow even though the diver has reached the surface

2. Risk Factors for Bubble Formation (air embolism)
   a. Dehydration – this is one of the major contributors to bubble formation. Dehydration causes a loss of plasma in the blood which causes the blood to become thicker.
   b. Poor physical conditioning, Increasing age (over 30), Obesity – impairs the body’s ability to transport oxygen and eliminate waste products
c. Temperature extremes – if the diver becomes overheated before or after a dive, they have an increase in breathing and circulation. This causes the body to absorb more nitrogen than normal. The diver will also absorb more nitrogen if he/she is cold. Hypothermia slows the heart rate, reducing the body’s ability to rid the excess nitrogen.

d. Physical exertion – Heart rate and respirations increase sending more nitrogen to the tissues. Strenuous exercise after a dive increases the risk of bubble formation.

e. Injuries – swelling from sprains and strains reduces circulation and reduces nitrogen elimination.

f. Previous decompression sickness

g. Gas retention (CO2 buildup)

h. Driving up a mountain or flying in an unpressurized airplane that climbs too rapidly. This risk decreases after 24-48 hours.

3. Areas of the body affected by Decompression Sickness or Air Embolism

a. Most common- skin, joints, spinal cord

b. Severe cases involve- heart, lungs, and brain

4. Signs and Symptoms of decompression sickness or air embolism

a. Skin- itching, rashes, swelling, discoloration

b. Pain- joints, shoulder blades, low back, abdomen, shooting pain down arms and legs, may come and go or be relieved by oxygen administration. Abdominal pain may be severe in decompression sickness cause the person to double over (bends)

c. Neurological - numbness, tingling, burning, weakness or paralysis or arms &/or legs, difficulty swallowing or speaking, hearing or visual problems, extreme fatigue, headache

d. Cardiopulmonary – chest pain, SOB, irregular pulse, severe coughing, shock, cardiac arrest

e. Misc- nausea, vomiting, lack of coordination and balance, difficulty walking, jerking eye movements, hearing loss

B. Pulmonary Barotrauma can be caused by a very small pressure change.

1. Most common causes are rapid ascent, or panic

2. Risk Factors
a. Colds
b. Lung infections
c. Lung diseases - asthma, emphysema, and bronchitis

3. Types of pulmonary barotraumas
   a. Pneumothorax
   b. Tension pneumothorax
   c. Subcutaneous emphysema
   d. Air embolus in the heart

       1) Person appears as if they are having a heart attack

   e. Cerebral embolus

       1) Sudden and dramatic onset (average less than 1 minute after ascent)
       2) May appear to be suffering from a stroke

C. Rapid Field Exam for dive emergencies

   1. Mental Status – do they know who they are and where they are?
   2. Is their speech understandable?
   3. Vision - can they see clearly?
   4. Can they move all extremities normally?
   5. Can they hear?
   6. Do they have normal sensation in all body parts?
   7. Is muscle tone normal?
   8. Are vital signs normal?
   9. Air embolisms normally occur immediately after a dive, whereas decompression sickness may not occur until several hours later.

D. Treatment

   1. Aeromedical transport may be appropriate for patients with barotraumas
   2. For additional information concerning SCUBA injuries contact DAN (the diving alert network via EMRC 1-800-648-3001
   3. Patients with air embolism or decompression sickness should be transported in a left lateral recumbent Trendelenberg position.
III. Lightning

A. Lightning injuries are an unusual form of trauma.

B. Incidence and Risk Factors

1. Lightning causes over 1000 injuries annually in the US and accounts for more deaths (approximately 60-70 per year) than tornadoes, hurricanes and earthquakes (emedicine).

2. Seventy to 80 percent of persons who are struck by lightning will survive.

3. The majority of lightning related deaths and injuries occur between May and September, are more common in the southern and northeastern United States. The most common days are Saturday, Sunday and Wednesday. The most common time of day is from noon to 6pm.

4. Males are 4.6 times more likely to be killed and 5.3 times more likely to be injured by lightning than females.

5. Highest age groups are people younger than 16, and adults aged 26-35 years.

C. Lightning general information

1. Lightning can strike as far as 10 miles ahead of a thunderstorm, before the rain starts, or while the sky is still clear. At least 10% of lightning hits when blue sky is visible.

2. 90% of lightning is cloud to cloud, only about 10% of lightning strikes are from cloud to ground.

3. Three factors predispose to a lightning hit: height of an object, isolation, and “pointiness”, which is not a factor with people.

4. The energy from a lightning strike may flow through a person but most of the energy flashes around the person’s body surface. Entry and exit wounds are not common with lightning injuries.

D. Lightning can injure people in 5 ways

1. Direct strike (3-5% of injuries)- most serious type of hit, uses the person’s body as part of the pathway for the current flow. Often the pathway through the body goes through the head.

2. Side splash from another object (30% of injuries).

3. Contact voltage from touching an object that is struck (1-2% on injuries)
4. Ground current effect as the energy spreads out across the surface of the earth when lightning hits a distance away from the person (40-50% of the injuries)

5. Upward leader that does not connect with the downward leader to complete a lightning channel (20-25% of injuries)

6. People can be hit by lightning while talking on a hard wired telephone.

E. Possible injuries

1. Less than 1/3 of people hit by lightning have burns.

2. 70% will have a loss of consciousness for some period and 90% will have confusion or amnesia.

3. Internal burns are rare

4. Cardiac and respiratory arrest – lightning acts as a huge defibrillator sending the heart into momentary asystole.

5. Vascular spasm - temporary paralysis, mottling

6. Autonomic Nervous System Damage - dizziness, hypertension, GI problems, impotence

7. Neurological damage – sleep disturbance, personality changes, seizures, learning disabilities, headaches, nausea, attention deficit

8. Chronic pain

9. Blunt force trauma from falls, or being thrown by muscle contractions.

10. Tympanic membrane rupture is common. Hearing loss and ringing in the ears are common.

11. Eye injuries – cataracts, retinal tears, macular holes

F. Treatment

1. Scene safety is a major concern. The provider is at high risk for being struck from lightning as well. Safe evacuation should be considered

2. Establish an airway

3. An AED can be considered, however many of these patients will be in asystole rather than v-fib seen with electrocutions.

4. Immobilization should considered because of risk of blunt trauma

5. Treat injuries as indicated
IV. Bites and Stings

A. Black Widow spider prefers dry, dim places around buildings, in woodpiles and among debris. They are found in every state except Alaska.

1. Symptoms
   1) *Site may become numb and the patient may not recall being bit, but most will cause localized pain and muscle spasms.*
   2) *A bite in the abdomen may cause such severe pain that the patient may be misdiagnosed with an acute abdomen.*
   3) Dizziness, sweating, vomiting, rashes
   4) *Tightness in the chest and difficulty breathing may develop within 24 hours*
   5) Severe cramps
   6) Rigid abdomen
   7) Most symptoms subside over 48 hours.

2. Brown Recluse spiders tend to live in dark areas, corners of unused buildings, under rocks and in woodpiles. In cooler areas it moves indoors to closets, drawers, cellars, and old piles of clothing.
   a. The bite causes severe local tissue damage
   b. Symptoms
      1) *Bite is not usually painful at first but becomes painful within hours*
      2) Swelling, tenderness
      3) Area of bite may become pale, mottled, or cyanotic with a small blister.
      4) Over next several days dead skin, fat and debris will form in the skin
      5) A large ulcer will develop unless treated promptly

3. Snake bites
   a. Statistics and General Information
      1) *In the United States there are approximately 40,000-50,000 snake bites reported annually, with about 7000 caused by poisonous snakes. There are only about 15 fatalities each year.*
      2) *There are approximately 115 different species in the US with 19 of them being venomous.* These include:
rattlesnake, copperhead, cottonmouth, water moccasin, and coral snake.

3) Most snake bites occur between April and October.
4) Most bites tend to involve young men who have been drinking alcohol

b. Signs and Symptoms

1) Noticeable bite
2) Pain and swelling in the area of the bite
3) Rapid Pulse and labored breathing
4) Progressive general weakness
5) Vision problems
6) Nausea/vomiting
7) Seizures
8) Drowsiness or unconsciousness

c. Treatment

1) Identify markings
2) Place distal and proximal constricting bands (allowing arterial flow) for poisonous snake bite to an extremity
3) Assist patient experiencing moderate to severe allergic reaction symptoms or mild symptoms with a history of life threatening allergic reaction with the patient’s prescribed or the EMS service’s Epinephrine auto injector or patient’s prescribed albuterol.
4) If the snake is dead and if it is practical, deliver it with it’s head intact. Dead snakes still bite - Patient and provider safety must be given a high priority.
5) Immobilize extremity
6) Apply cool packs for pain relief only

V. Heat related Emergencies
A. How the body excretes excess heat – The human body likes to maintain a temperature very close to 98.6 degrees. In order to maintain this temperature the body must be able to rid itself of excess heat. The first response of the body is to move heat to the surface where it can be more easily dissipated into the atmosphere. The body does this by sending more blood to the skin surface causing the blood vessels to dilate. Once the body uses several mechanisms to help it rid the excess heat:

1. Convection - loss of heat when moving air picks up the heat and carries it away. A good example of convection is when we blow on hot food to cool it down.
2. Radiation – when heat is emitted from the body into the atmosphere without the help of moving air currents. Most radiant heat is lost through the head and neck.
3. Conduction – dissipation of heat into a solid object or liquid rather than into the air. An example of this would be when you step into a tub of cool water. The body loses heat 25 times faster in water than in air.
4. Evaporation – evaporation of sweat can help rid the body of heat. A healthy person can sweat several quarts in an hour but they can’t keep it up for very long before dehydration sets in. As water on the skin evaporates the body temperature is lowered. Effective evaporation of sweat decreases greatly at 60% humidity.

B. Heat Cramps –

1. Most likely to affect people working or exercising in extreme heat. When a person sweats heavily they lose both fluids and salt.
2. Signs and Symptoms
3. cramps ranging from tingling in extremities to severe excruciating pain in the legs and abdomen.
4. patient may feel faint and nauseated but remains alert,
5. Skin pale, cool, and moist

C. Heat Exhaustion

1. Likely to occur in elderly, people who are dehydrated, and people taking diuretics
2. Signs and Symptoms
   a. Can come on gradually or suddenly
   b. Headache, weakness, faintness, nausea, vomiting
   c. Slight disorientation
D. Heat Stroke

1. Heat stroke is the least common but the most deadly of all the heat related emergencies. It occurs when the temperature regulating mechanisms of the body are overwhelmed, and excess heat builds up in the body, causes the body temperature to quickly climb to levels of 105 degrees F. and over. Temperatures as high as 108 degrees have been reported.

2. People at high risk include – elderly, debilitated, people with chronic illnesses such as heart disease and diabetes, alcoholics, obese people and newborns. Heat stroke can also be exercised induced as seen in athletes and military personnel.

3. Signs and Symptoms –
   a. Confusion or coma
   b. Hot dry skin (25% will still have moist skin)
   c. High body temp
   d. Rapid pulse or arrhythmia
   e. Blood pressure may be normal or low
   f. Rapid respirations
   g. Seizures

E. Treatment

1. Remove Patient from hot environment
2. Cool patient as appropriate. In heat stroke aggressively cool patient and place in semi-fowlers position.
3. If patient is fully conscious and not nauseated, five electrolyte rich fluid if available

Summary
Given information, resources, and an opportunity for discussion, at the completion of this lesson, the student will be able to list common summertime emergencies, the signs and symptoms of each and will be able to describe the correct treatment for each of these conditions according to acceptable Maryland Practice and Maryland Medical Protocols.
Review

Drownings
• Give the definitions for drowning and near-drowning
• List several causes for drowning
• Describe “instinctive drowning behavior”
• Describe “mammalian dive reflex”
• List several factors predicting outcome
• List the steps of rescue/treatment for the victim

SCUBA Emergencies
• List the effects of Bubble formation
• List the risk factors for bubble formation
• List the signs and symptoms of decompression sickness
• Describe the steps of a rapid field exam for dive emergencies
• List the treatment steps

Lightning
• Describe the ways that lightning can injure people
• List the possible injuries from lightning strikes
• Describe the treatment for lightning injuries

Bites and Stings
• Describe the signs and symptoms of a black widow bite
• Describe the signs and symptoms of a brown recluse bite
• Describe the signs and symptoms of a poisonous snake bite
• Describe the general treatment steps for these bites

Heat Emergencies
• Describe how the body normally rids itself of excess heat
• Describe heat cramps
• Describe heat exhaustion
• Describe heat stroke
• List the treatment steps for heat related emergencies