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Traumatic Injuries

Bites

Most human-associated marine animal bites result from the following circumstances:

- Animal feels threatened
- Humans mistakenly identified as prey
- Humans engaged in spear-fishing or feeding

Marine animals known to bite include:

- Sharks
- Barracuda
- Moray eels
- Triggerfish

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Traumatic Injuries

Bites

Severity depends on

- bite location
- size of animal
- extent of blood loss
- treatment delays

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Traumatic Injuries

Direct Pressure

- **Apply with a gloved hand** to control bleeding
- Use **clean or sterile gauze** to aid
- Continue to **hold** **firm pressure** until bleeding is controlled
- Use **additional gauze** as necessary
  - Do not remove any gauze already in place over wound
- **Bandage** only after bleeding stops
- Seek medical assistance if indicated
  - tetanus booster may be indicated
- **Monitor** for signs of infection
  - of particular concern due to marine bacteria

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Traumatic Injuries

Tourniquets

Should be:

- Utilized only when direct pressure is not effective
- Wide (at least 2" wide if an improvised tourniquet is used)
- Well-padded (6-8 layers of a bandaging material)
- Placed 1-2" proximal to the wound

Mark the injured person's forehead with a *T or TK* and time of placement

DO NOT REMOVE TOURNIQUET

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Traumatic Injuries

Tourniquets

Should ***NOT*** be:

- Placed directly over knees, elbows or other joints. Place the tourniquet 1-2" proximal to the joint.
- Made of wire or rope, narrow, excessively tight or insufficiently padded band as it may cause local damage to tissues in minutes.
- Removed until advanced medical care is available

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Traumatic Injuries

Tourniquets

Other styles

- One style of tourniquet uses a ratcheting mechanism rather than a windlass

- Apply as you would any other tourniquet

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Traumatic Injuries

Hemostatic Dressings

- May be used in conjunction with a tourniquet or wound packing
- Should be used where tourniquets cannot be utilized
- Usually has a wavy blue line in the gauze
- Other dressing material must be removed to allow direct contact of hemostatic agent with bleeding site
- Advise medical personnel a hemostatic agent was utilized

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Traumatic Injuries

Wound Packing

- In the case of penetrating wounds such as propeller injuries or knife wounds,
- bleeding is occurring inside the wound.
  - Direct pressure on the external surface of the wound will not provide pressure at the source of the bleeding.
- For these wounds, dressing material should be packed into the wound
- lateral pressure applied and maintained during the wound packing process.

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Traumatic Injuries

Special Circumstances

Bandaging Joints

When applying bandages across joints, keep the limb in a comfortable position, and try to keep the joint immobilized to minimize further discomfort or bandage displacement.

Eyes

With eye injuries, it may be necessary to cover the injured eye to minimize pain and to provide comfort.

Fold clean gauze over the closed eyelids, then place tape over the eyes with anchors at the forehead and cheek.

Bandage both eyes in a manner that eliminate gaps at edges of bandage to prevent the injured eye from moving with the uninjured eye.

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Traumatic Injuries

Wound infections

Skin is most effective defense against infection.

When breached, allows introduction of

- bacteria
- fungi
- viruses
- other organisms

Source of injury important as organic material increases risk of wound infection and delayed healing.

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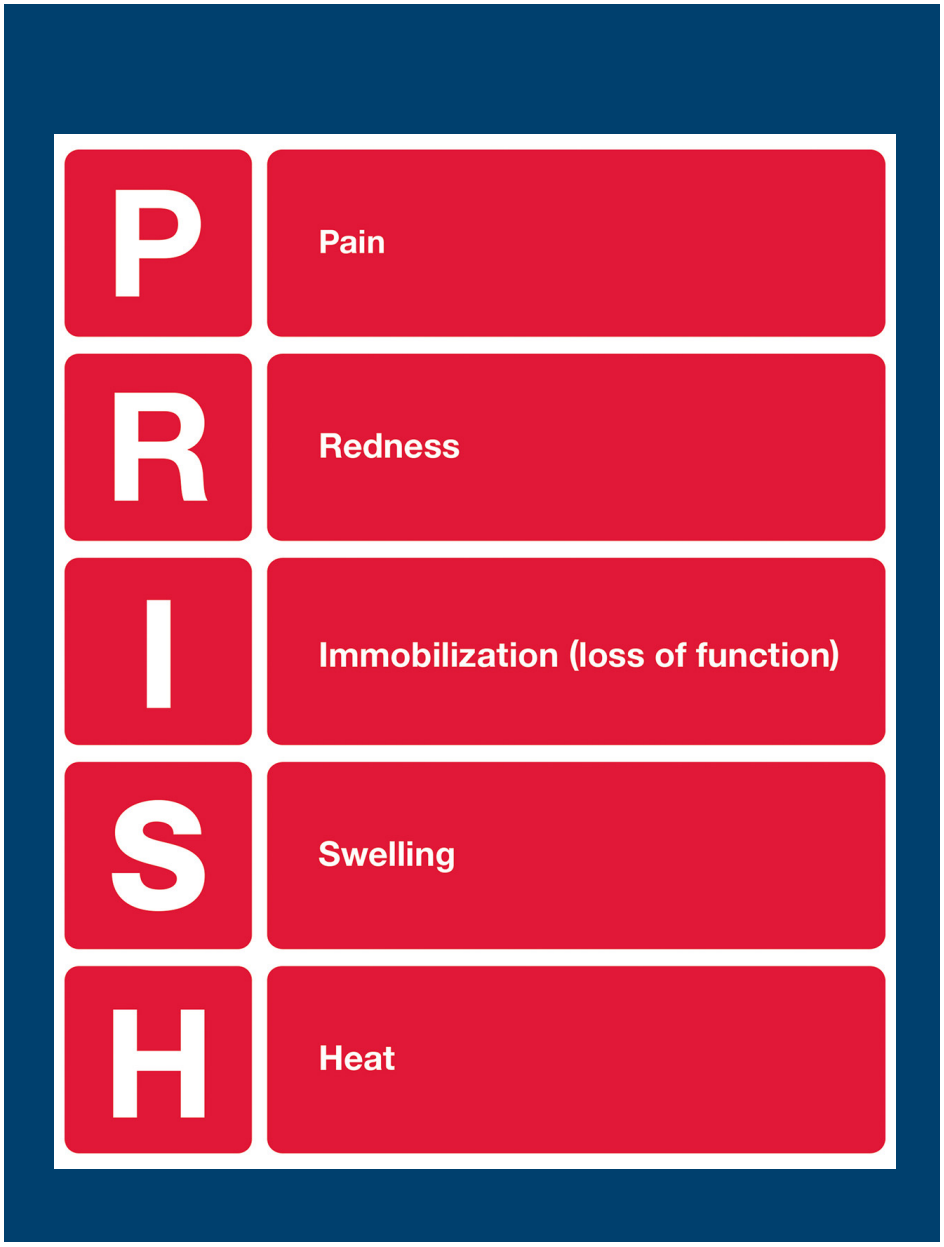

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Traumatic Injuries

Wound infections

Signs of infection appear within hours, days or even several weeks following injury.

- Pain
- Redness
- Immobility (loss of function)
- Swelling
- Heat (elevated warmth of the infected area)

Other signs of infection:

- Pus and yellowish discharge
- Foul smell
- Swollen lymph nodes
- Fever
- Non-healing wounds
- Chills

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Traumatic Injuries

Internal bleeding

Internal bleeding can be a life-threatening condition. It requires immediate medical attention

It often results from blunt trauma, sudden deceleration injuries (such as a car collision), or certain bone fractures (e.g., femur or pelvis).

The following may indicate internal bleeding:

- Rigid or swollen abdomen
- Vomiting or coughing blood
- Blood in urine
- Bloody or tarry stool
- Intense muscle pain
- Difficulty moving the related joints
- Fainting or dizziness
- Low blood pressure
- Signs of shock

To treat the injured person for internal bleeding:

1. Open the airway if needed
2. Activate EMS (if not already activated)
3. Minimize movement of the injured person
4. Apply ice to the affected area (unless the internal bleeding is in the skull)
5. Evacuate to EMS as soon as possible

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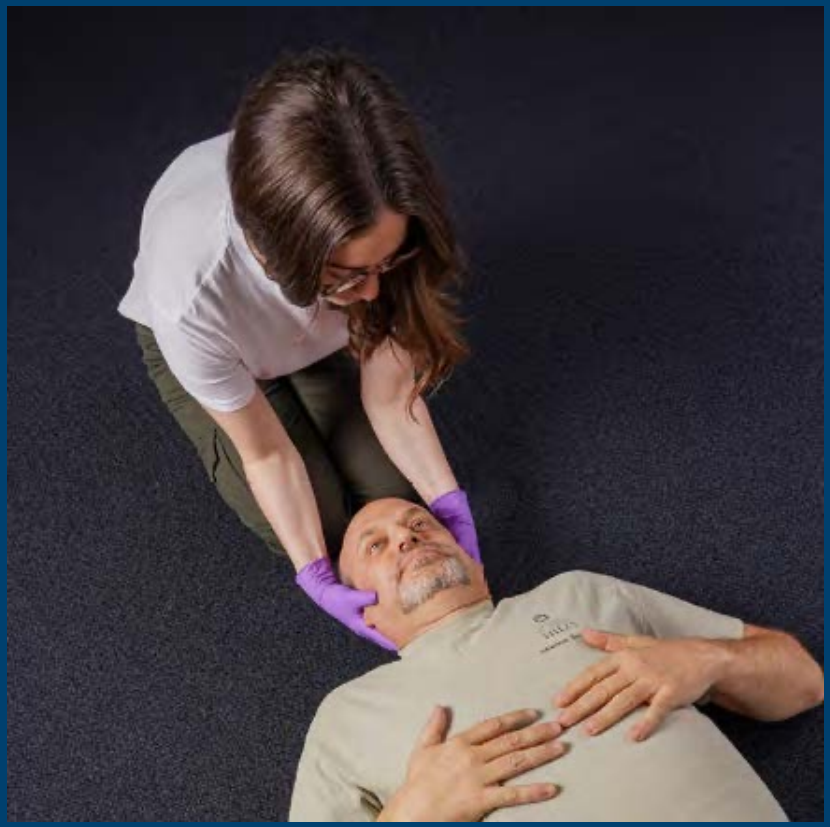

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Traumatic Injuries

Spinal Injury Management

If the injury mechanism is such that you suspect a spinal injury, your primary duty to the injured person is to deal with any immediate threats to their life.

Perform CPR if necessary. If CPR is not necessary, your role is to keep the injured person calm and still.

Activate EMS if you have not done so.

Kneel at the person's head

Place your hands on both sides of the person's head to keep them

immobile.

Do not attempt to straighten or realign the head unless the airway is compromised.

Be sure to talk to and reassure the person as you wait for EMS to arrive.

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Traumatic Injuries

Amputations

Sometimes a trauma involves the removal of a part of the body. Amputation injuries could range from a finger getting pinched in the hinge of a dive boat ladder to the severing of an entire limb.

With an amputation, control bleeding as necessary using the techniques

Be ready to treat for shock or provide CPR if necessary.

If the amputation is **incomplete** and the skin, muscle or tendons are still attaching the body part, immobilize it using a splint and bulky gauze. Never detach an incomplete amputation.

If the amputation is **complete**, attempt to preserve the parts, no matter how damaged they appear to be.

Wrap them in saline-moistened gauze, seal them in a plastic bag and place it in a container with ice.

Do not place the amputated part directly on or in the ice.

Ensure the amputated part is transported with the injured person.

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Traumatic Injuries

Open Chest Wound

Sometimes the injured person has a severe injury to their chest. Trauma to the chest can lead to a condition called pneumothorax, in which a leak in the lung causes air to collect.

In diving this can be caused by rapid ascent or breath-holding during ascent.

Sometimes this trauma generates a hole in the chest wall that allows air exchange between the chest cavity and the outside air.

Use an **occlusive dressing –** cover the wound with clear plastic and tape on three sides. This makes a flap for exhaled gas to escape.

If clear plastic is not available, use foil, a (clean) garbage bag, or a commercially available product like HyFin©.

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Traumatic Injuries

SKILLS

Control of External Bleeding

Applying a Tourniquet

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Seafood Poisoning

Occurs when food or water is contaminated with certain bacteria, parasites, viruses or toxins.

Seafood may taste and smell normal

The three primary food-borne syndromes:

- Ciguatera
- Tetrodotoxin poisoning (or tetrodotoxism) - TTX
- Scombroid fish poisoning (also known as histaminoid syndrome)

NOTE: Most of these toxins are heat-stable

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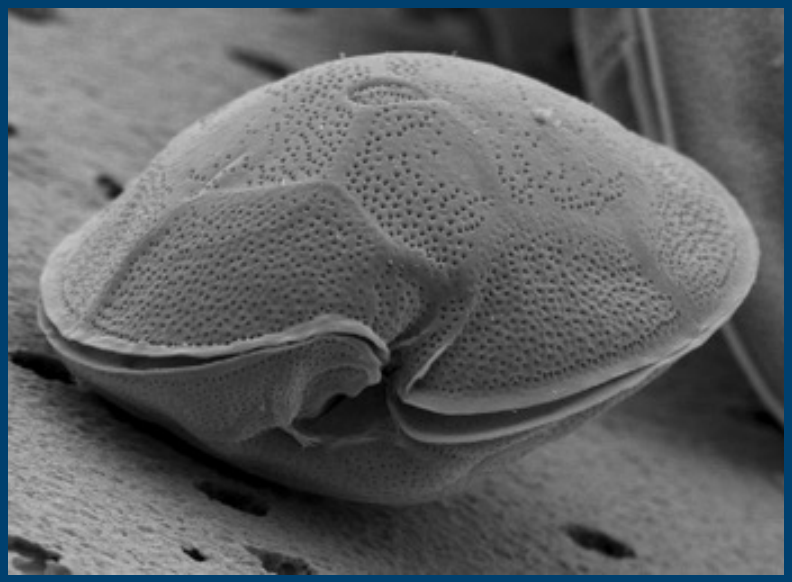

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Seafood Poisoning

Ciguatera

Serious but rarely fatal self-limited disease

Principally affects the gastrointestinal and neurological systems (sometimes the heart)

Caused by ingestion of various species of tropical reef fish.

Fish species commonly associated with ciguatera:

- Barracuda
- Snapper
- Moray eels
- Grouper
- Parrotfish
- Triggerfish

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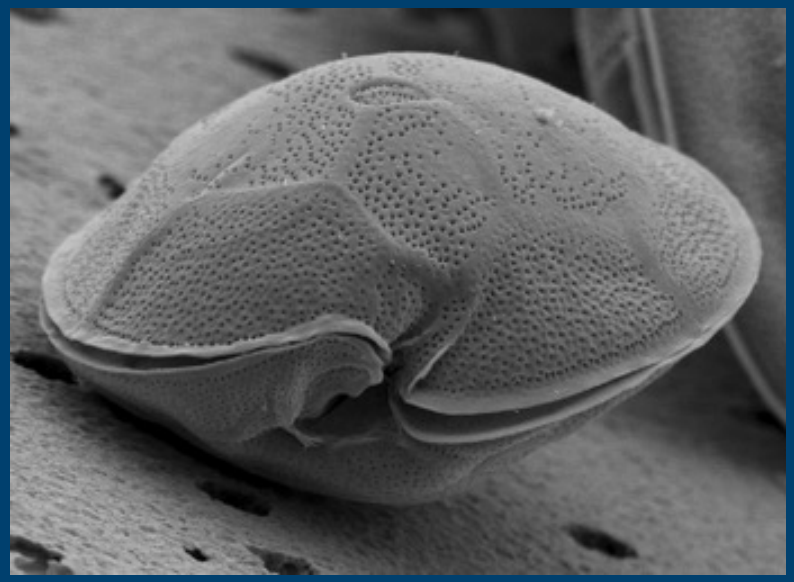

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Seafood Poisoning

Ciguatera

Signs and symptoms

- Abdominal pain and gastroenteritis
- Nausea, vomiting
- Diarrhea

Common neurological signs and symptoms

- Numbness and tingling
- Lack of muscle coordination (ataxia+)
- Vertigo

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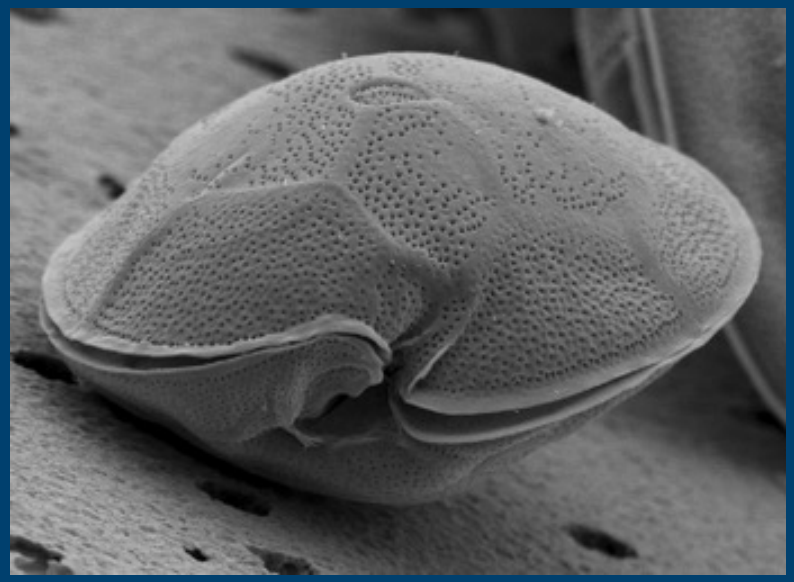

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Seafood Poisoning

Treating Ciguatera

- Treatment is aimed at symptom control.
- Correct possible dehydration.
- Support compromised heart or pulmonary function.
- Seek medical evaluation.

No effective treatment or specific antidote for ciguatera

The best course of action is prevention through:

- Education
- Avoidance of seafood in endemic or suspected areas.

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Seafood Poisoning

Tetrodotoxin poisoning (TTX)

(aka tetrodotoxism)

- Strong neuromuscular blocking agent
- Produces one of the most serious forms of poisoning.
- Water-soluble and heat-stable

Symptom onset ranges between 30 minutes to a few hours following ingestion.

Fish species associated with TTX include:

- Pufferfish/Porcupine fish
- Ocean sunfish
- Triggerfish

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Seafood Poisoning

Tetrodotoxin poisoning (TTX)

(aka tetrodotoxism)

Initial symptoms

- Numbness of the lips and tongue
- A sense of lightness or floating
- Moderate gastrointestinal symptoms
  - — Upper abdominal pain
  - — Nausea
  - — Vomiting
  - — Diarrhea

Second-stage symptoms

- Increasing paralysis
  - — May initially manifest as difficulty walking

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Seafood Poisoning

Tetrodotoxin poisoning (TTX)

(aka tetrodotoxism)

Final-stage symptoms

- Complete muscular paralysis (includes smooth muscle)
  - — Survivors describe having full consciousness but with the complete inability to move and absence of all neurological reflexes

Treating TTX

- Management symptomatic and supportive.
- Mechanical ventilation may be necessary due to the person's inability to breathe on his or her own.

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Seafood Poisoning

Scombroid Fish Poisoning

(histaminoid syndrome)

Caused by ingestion of fish containing high levels of histamine.

Often confused with seafood allergy,

- the source (histamine) comes from the fish itself rather than from the person.

Fish species associated with scombroid include:

- Tuna
- Mahi-mahi
- Mackerel
- Anchovies, sardines, herrings

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Seafood Poisoning

Scombroid Fish Poisoning

(histaminoid syndrome)

Symptom onset

- Rapid; commonly seen 10 to 30 minutes after ingestion

Symptoms

- Facial flushing
- Manifests in the face, neck and upper chest
- Itchiness
- Eye irritation

Symptoms in severe cases

- Headaches
- Abdominal cramps
- Bronchospasm
- Vomiting
- Hypotension
- Diarrhea
- Chills

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Seafood Poisoning

Treating Scombroid Fish Poisoning

Symptomatic treatment

— Antihistamines such as diphenhydramine (e.g., Benadryl)

— In cases of severe bronchospasm or hypotension, epinephrine may be indicated but rarely required.

NOTE: Since histamine is not being released as a result of an allergic reaction, corticosteroids are ineffective.

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Seafood Poisoning

Prevention of Seafood Poisoning

- Immediately store fresh fish in coolers/ice containers
- Store away from direct sunlight
- Maintain storage temperature below 40°F (4.4 °C)

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Life Threatening Complications

Anaphylactic Shock

Severe allergic reaction may occur subsequent to envenomations.

Signs and symptoms (mild/moderate)

- Generalized itching (pruritis)
- Bloodshot, puffy eyes
- Facial swelling (eyes, lips)
- Localized or diffuse swelling
- Localized redness, raised rash (hives)

Signs and symptoms (severe)

- Airway narrowing
- Respiratory distress
- Cardiac arrest

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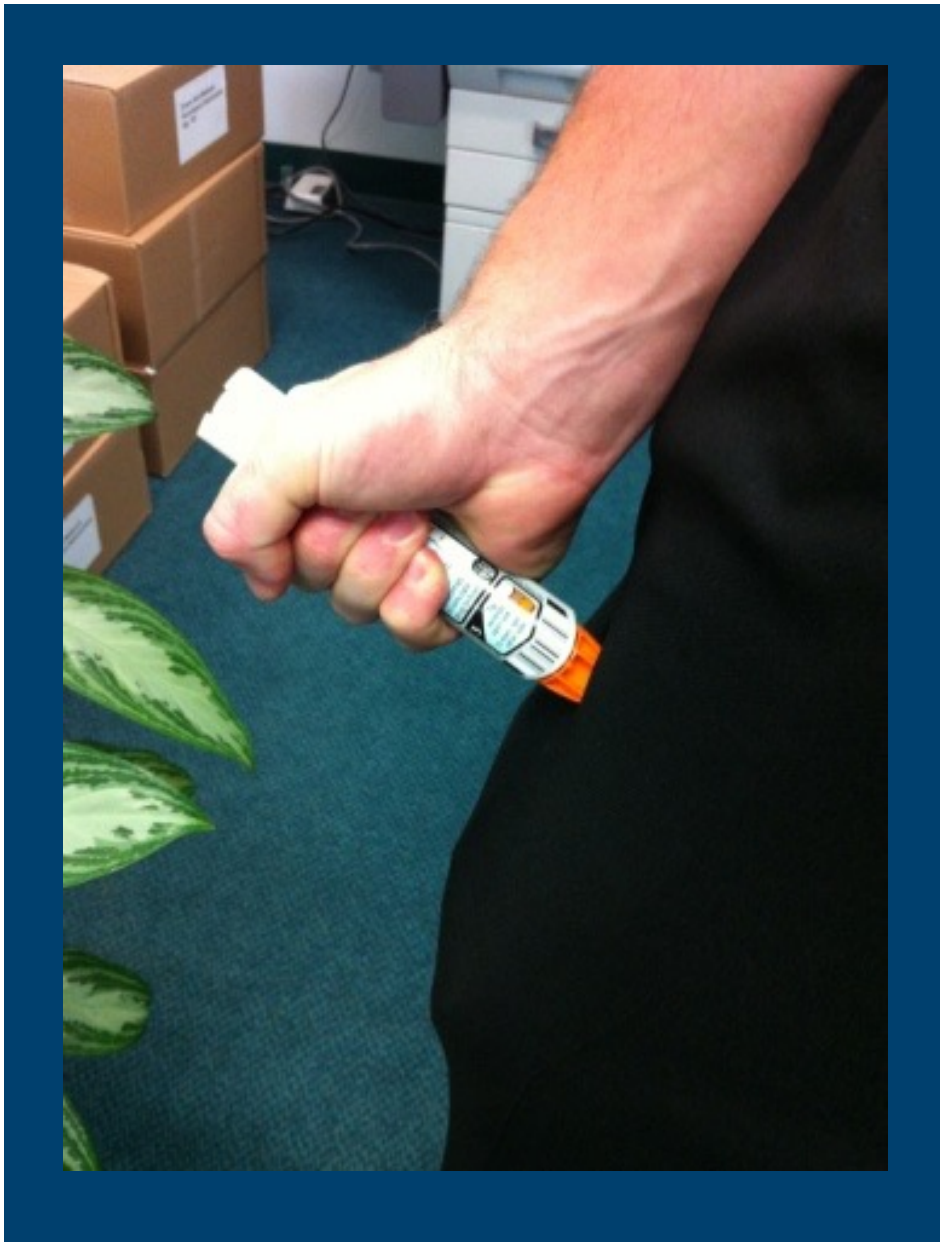

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Life Threatening Complications

Treating Anaphylactic Shock

- This is a medical emergency – ***alert emergency medical services immediately***
- Assist the injured person with administration of allergy medications
  - If prescribed for them personally.
- If airway narrowing or difficulty breathing is present, consider use of an epinephrine auto-injector
  - if prescribed for the injured person.
- Monitor airway and breathing.

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Life Threatening Complications

Cardiogenic Shock

Refers to a reduction in the heart's ability to circulate blood to the brain and vital organs.

Causes include:

- heart attack (myocardial infarction)
- unstable arrhythmias
- envenomations, especially box jellyfish

Note: stonefish venom may

- have vascular effects causing hypotension
- result in decreased blood flow to brain and vital organs

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Life Threatening Complications

Cardiogenic Shock

Signs and Symptoms

- Hypotension (low BP)
- Pale /Cool /Clammy skin
- Cold hands and feet
- Severe shortness of breath
- Weak pulse
- Altered mental status
- Nausea/Vomiting
- Chest pain that radiates to the arms, shoulder, neck or back
- Unconsciousness
- Cardiac arrest

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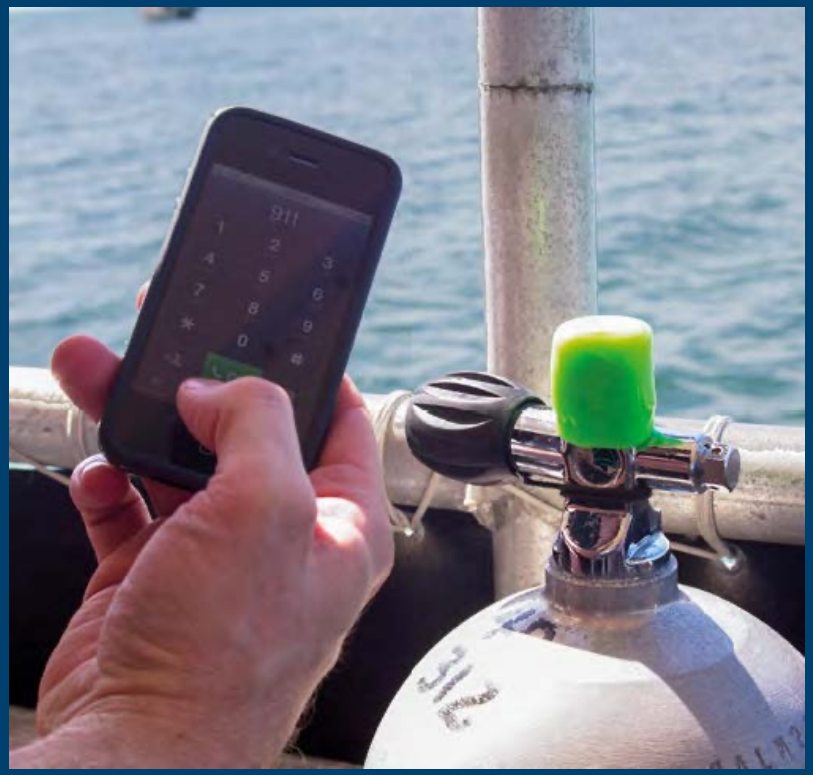

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Life Threatening Complications

Treating Cardiogenic Shock

- This is a medical emergency – ***alert emergency medical services immediately***
- Have the person lie down on their back or in a position of comfort
- Check for signs of circulation – if absent begin CPR
- Keep the person warm and comfortable

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Life Threatening Complications

Hypovolemic Shock

Decrease in circulating blood volume

- results in a deficiency of blood supply to vital organs.

Blood loss is secondary to internal or external bleeding.

Signs and Symptoms

- Anxiety or agitation
- Confusion
- Rapid breathing
- Unconsciousness
- Pale / cool / clammy skin
- Generalized weakness
- Decreased urine output

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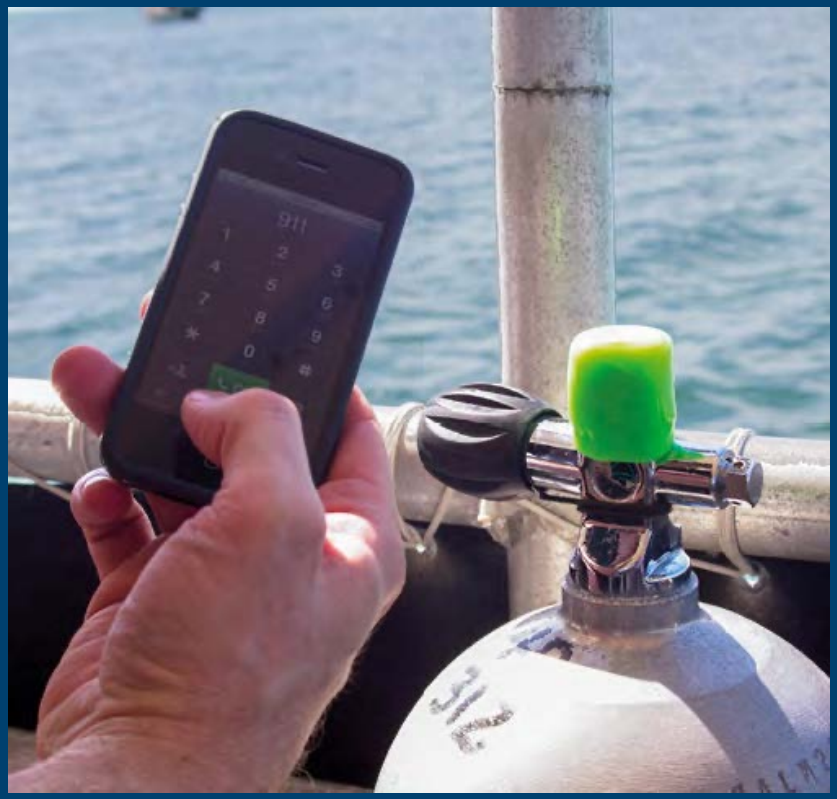

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Life Threatening Complications

Treating Hypovolemic Shock

- This is a medical emergency
  – ***alert emergency medical services immediately***
- Attempt to stop all external bleeding with direct pressure
- Have the person lie down on their back
- Check for signs of circulation
  – if absent begin CPR
- Keep the person warm and comfortable

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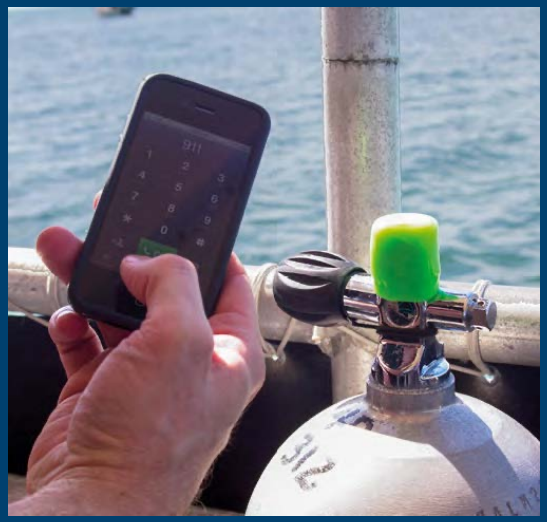

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Life Threatening Complications

SKILLS

Severe Allergic Reaction

Shock Management

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Avoiding Marine Life Injuries

Tips to reduce risk of hazardous marine life injuries:

- Practice perfect buoyancy control
- Plan your dive and know what hazardous marine life is present.
- Pack a first-aid kit.
- Wear appropriate exposure protection including hood, gloves and boots were permitted.
- Shuffle your feet and wear thick-soled boots when entering the water in sandy or muddy bottoms.
- Streamline your body and equipment

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Avoiding Marine Life Injuries

Tips to reduce risks (continued):

- Improve awareness of your surroundings.
- When taking pictures underwater, avoid using the reef for stabilization.
- Be passive in your interactions with marine life.
- Avoid picking up shells. Some hazardous marine animals live inside and may defend their territory.
- Avoiding carrying speared fish when diving in areas populated by sharks and other predatory marine life.
- Look up and around as you slowly ascend.
- Avoid fish that are known to be potentially poisonous.

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Course Summary

Prevention is key
    including **safe diving habits**
Prompt action is important
    even with simple injuries
Priorities of Care should be constantly considered
    conditions can change for the worse
Activate EMS for any incident requiring urgent care
    contact **DAN** for dive specific assistance
Monitor even non-life threatening injuries for changes

Maintain skills, **Review** knowledge components,
Renew training at least every two years

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Thank you so much for taking the DAN Diving First Aid for Professional Divers course.

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