Diving First Aid for Professional Divers (DFA Pro)

Version 3.0

DFA Pro

Introduction

- Introductions
  - DFA Pro Instructor & Staff
  - DFA Pro Provider Candidates
- Diving First Aid for Professional Divers Provider Registration Form
- Statement of Understanding
- DAN Membership Form
- Other Administrative Procedures
- Course Logistics

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Course Overview

- Developed *for individuals who dive or support divers* as part of their occupational or volunteer activities
- Also available to divers as well as non-divers
- Meets ILCOR/AHA *2020 Guidelines* for Resuscitation
- Written to *comply with Occupational Safety and Health Administration* regulations (OSHA)
- Assumes *injured divers have been removed from the water and all gear removed*
- Requires *retraining every two years* (more often if required by other regulations)

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Course Section Topics

- Duty of Care and Emotional Stress
- Basic Sciences and DCI
- Dive Emergency Preparation
- Response and Assessment
- Oxygen First Aid in Scuba Diving Injuries
- Cardiopulmonary Resuscitation
- Secondary Care
- First Aid for Hazardous Marine Life Injuries
- Final Assessment and Review

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Duty of Care

Duty of care is an obligation imposed on an individual or organization or provide assistance to someone in an effort to prevent unreasonable loss or harm.

Obligation to provide care

- First-aid Responder has no legal obligation to provide care
  - Some jurisdictions may have an obligation to notify authorities that someone is in need of medical care
- You may have an organizational obligation to respond

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Duty of Care

ALWAYS ask permission before rendering aid of any kind

- State “My name is _____. I am a first-aid provider. May I help you?”
- A parent or guardian must consent to provide care if the person requiring assistance is a minor
- Providing care without permission can lead to legal vulnerability

Responsive person must give permission

Permission is assumed if unresponsive

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Emotional Stress

- **Anxiety is normal**
- **CPR does not always work**
  - Even when coupled with advanced cardiac care
- Participate in a **Critical Incident Stress Debriefing**

  &/OR
- **Seek counseling** rather than blame yourself
  - You did not do anything wrong
  - You did not make the condition worse

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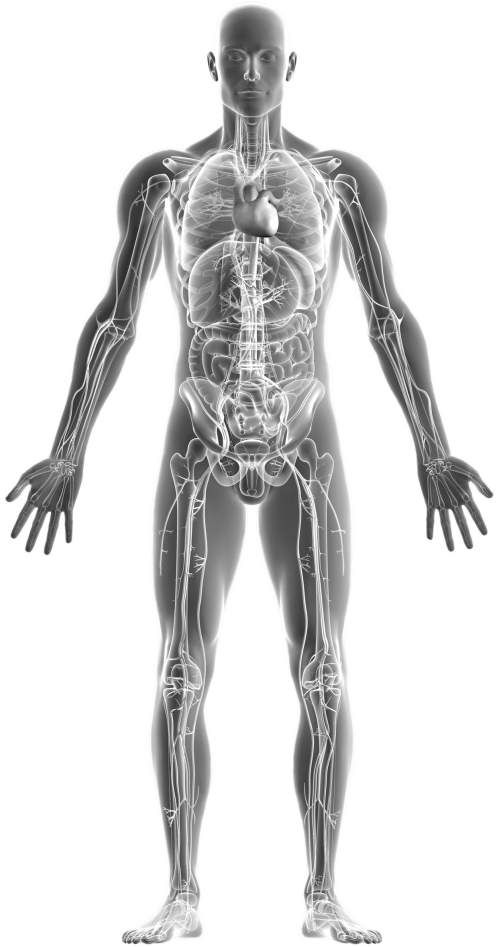

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Basic Science and Decompression Illness

- Anatomy and Physiology
  - Respiratory System
  - Circulatory System
  - Nervous System
  - Digestive System
- Atmospheric Gasses
- Decompression Illness

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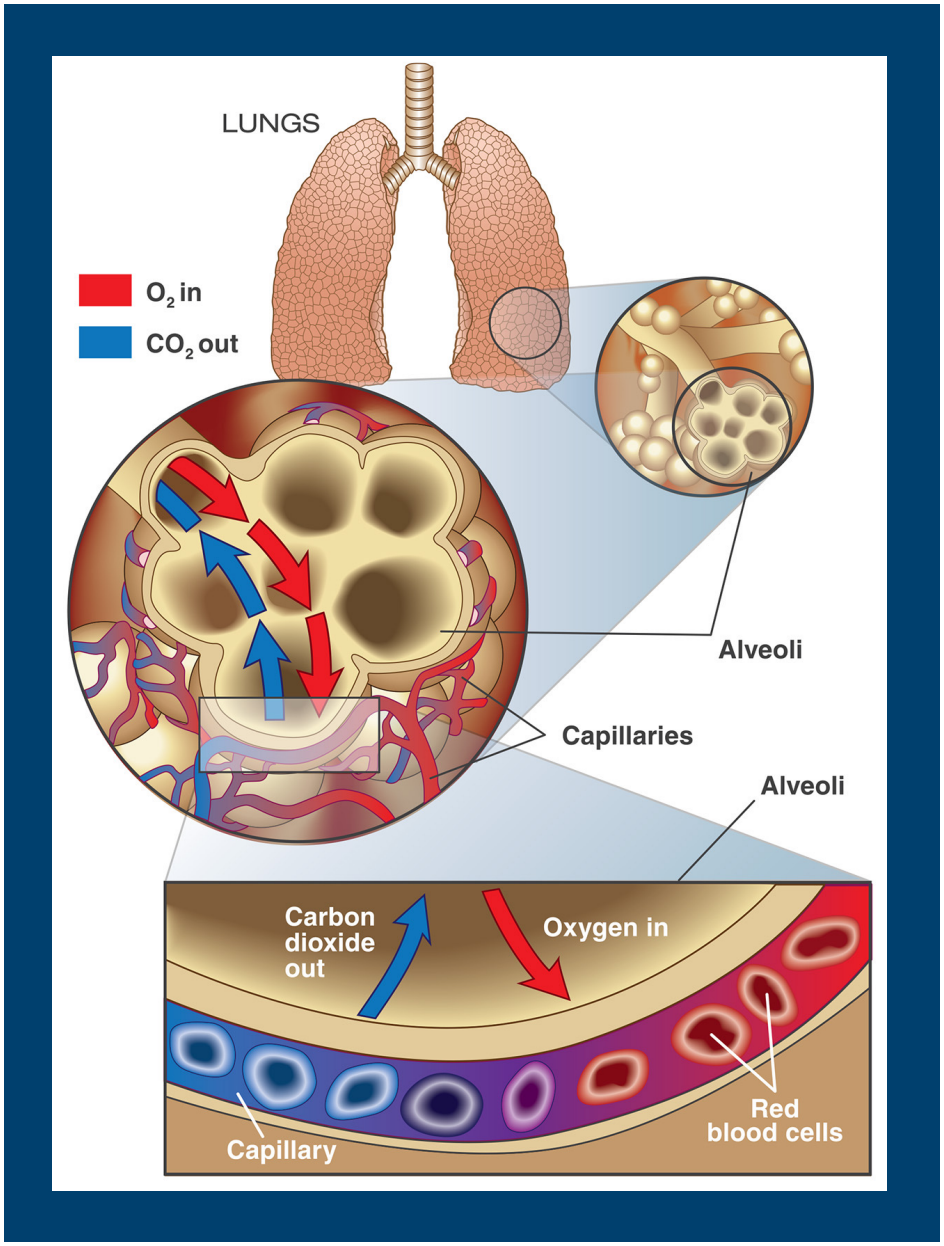

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Respiratory System

Oxygen is essential for life and required for cellular function

- **Hypoxia** is oxygen deficiency
- **Anoxia** is the absence of oxygen

Respiratory system provides the interface between the atmosphere and the bloodstream for gas exchange

- Intake of oxygen
- Removal of CO_2

Respiratory system is comprised of the upper airway (mouth, nose, pharynx), the trachea, and the lungs

- The smallest structures are the alveoli

Pulmonary gas exchange takes place at the alveolar-capillary membrane

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Circulatory System

Circulatory System includes the heart and blood vessels

Primary function is pumping blood, transporting oxygen and nutrients to tissues and removing waste products

Arteries
carry blood from the heart to the body tissues

Veins
carry blood from the body tissues back to the heart

Capillaries are the smallest blood vessels where nutrients and waste products are exchanged at the tissue cellular level

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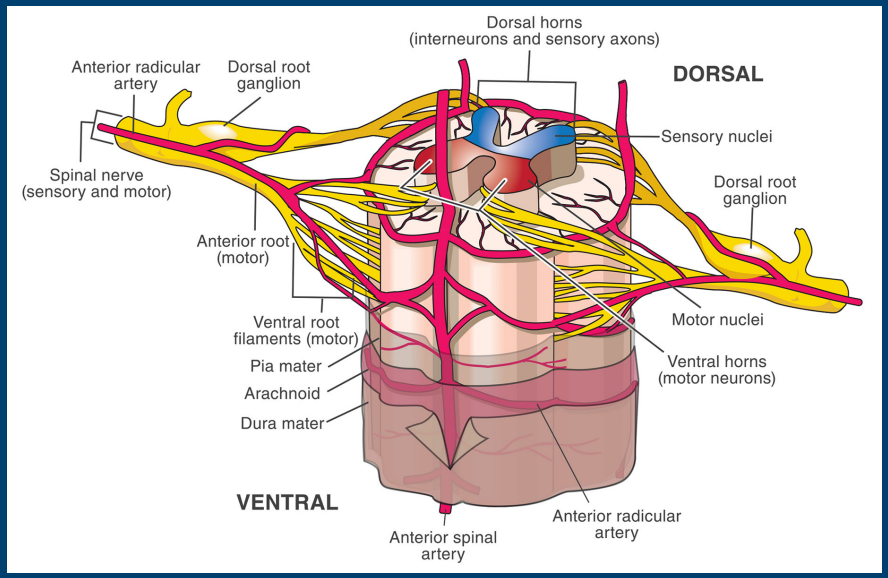

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Nervous System

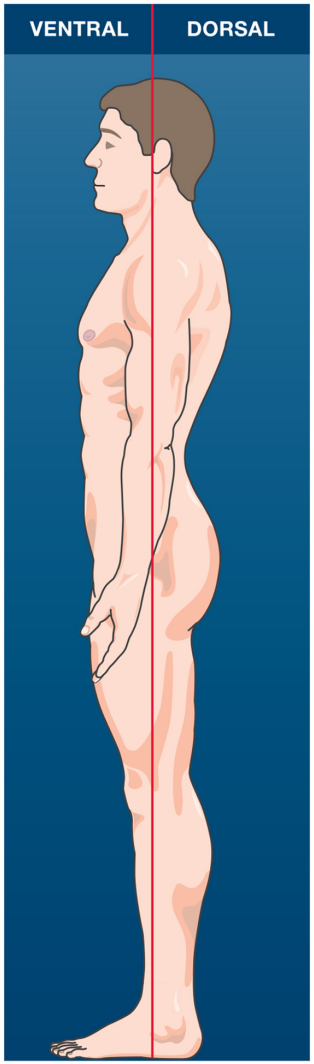
Nervous System

Central nervous system

- Brain
- Spinal cord

Peripheral nervous system

- Nerves



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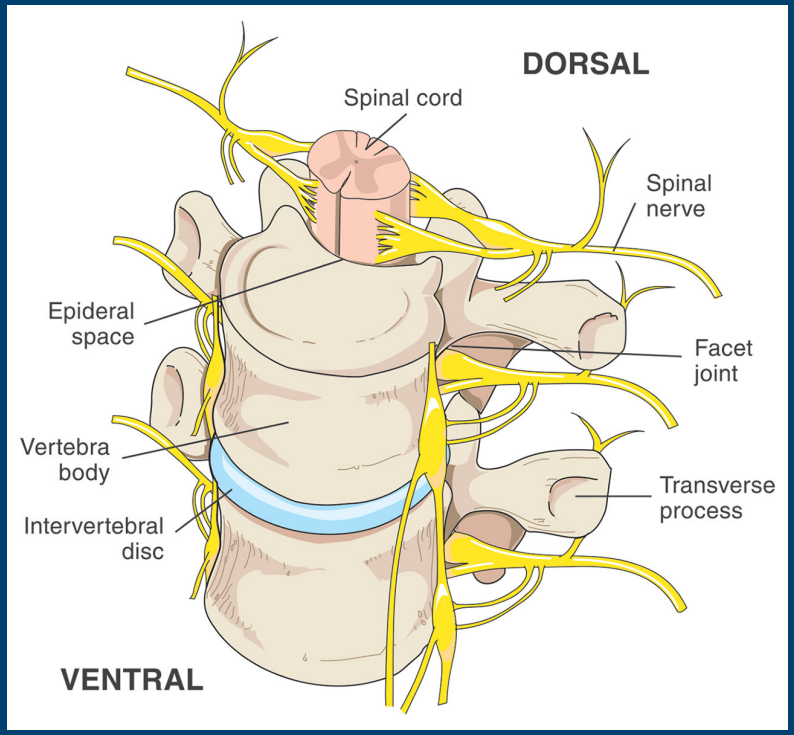

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Nervous System

Spinal cord

- Provides interface between central nervous system and peripheral nervous system
- Contains nerve tracts or columns that conduct impulses either to or from the brain
  - Sensory tracts travel up the dorsal (posterior) columns
  - Motor tracts travel along the ventral (anterior) columns

Possible causes of nerve pathway interruptions

- Decompression Illness (DCI)
- Trauma
- Stroke

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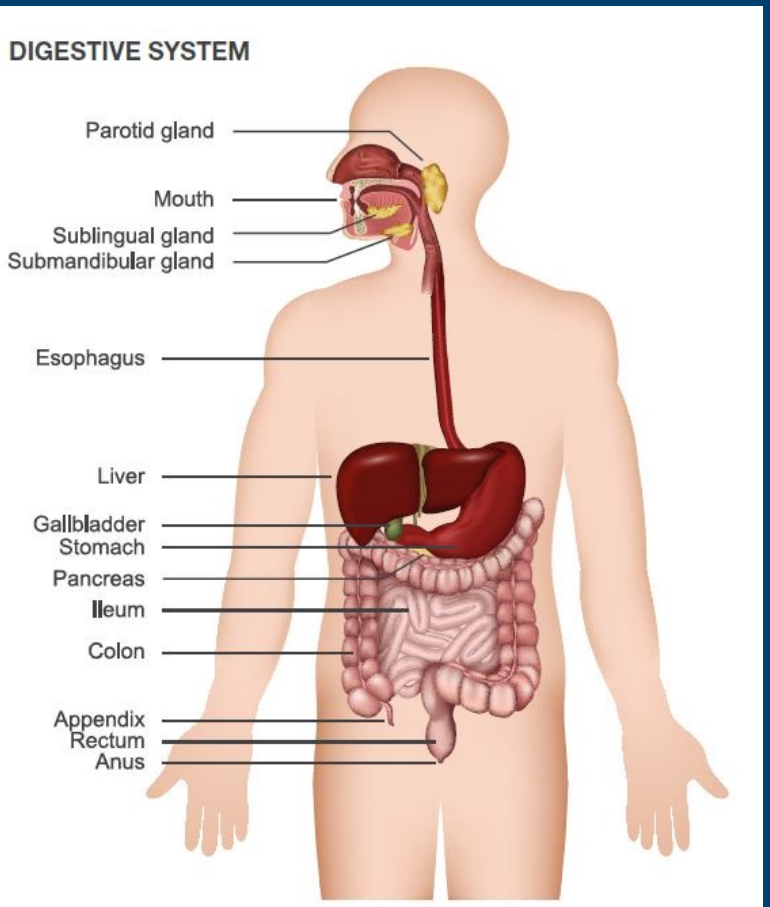

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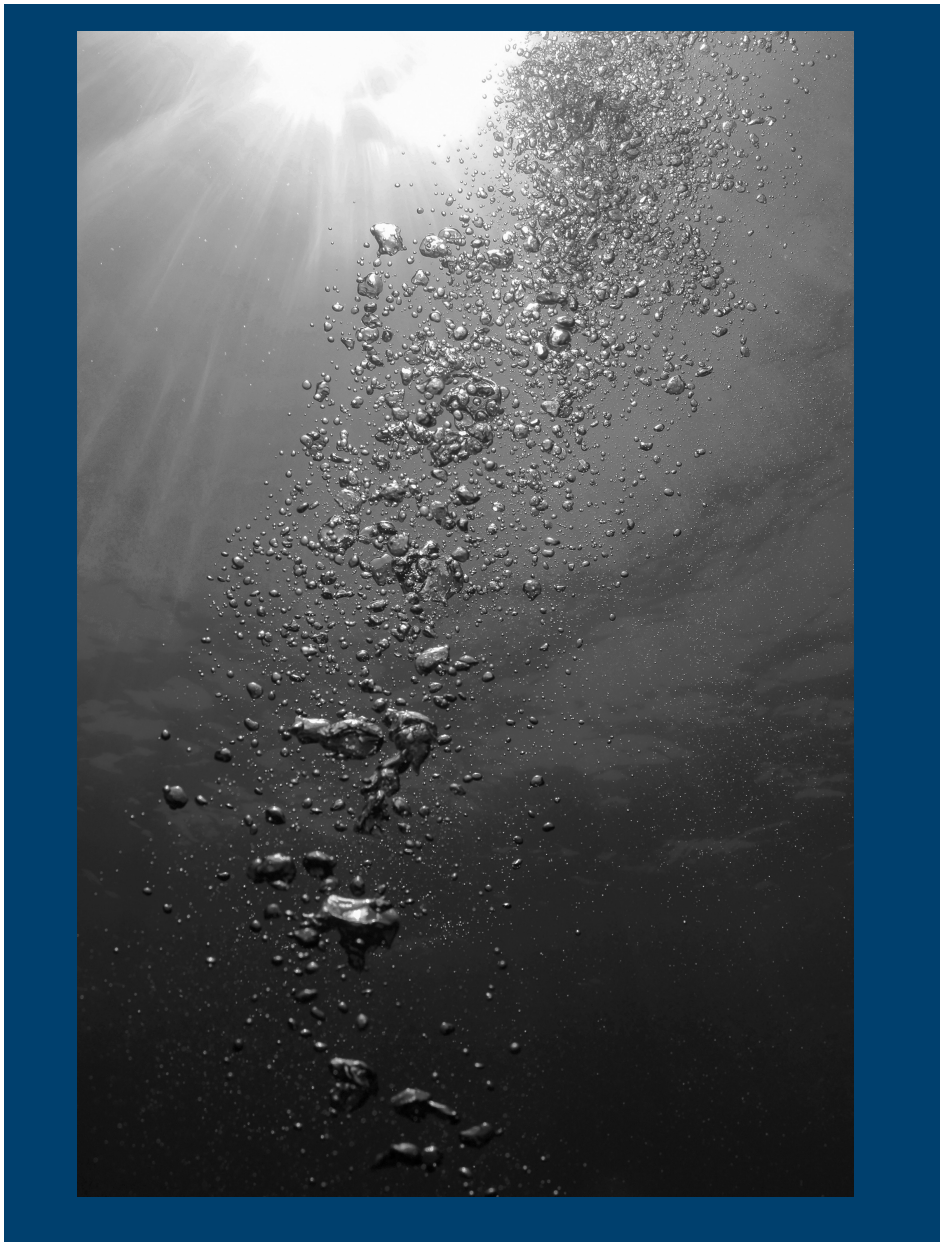
Digestive System

- Includes
  - Mouth
  - Esophagus
  - Stomach
  - Small intestine
  - Large intestine
- Organs that aid in digestion
  - Pancreas
  - Liver
  - gallbladder



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Overview of Atmospheric Gasses

Oxygen (O_2)

- Colorless, odorless, tasteless gas
- Approximately 21% of the Earth's atmosphere
- Essential for life
- Transported throughout the body by red blood cells
- Exhaled air is approximately 16% oxygen

Carbon Dioxide (CO_2)

- Normal air contains 0.033% CO_2
- A waste product of cellular metabolism
- Eliminated from the body via respiration (exhalation)
- Exhaled air has approximately 4-5% CO_2
  - but no impact on rescue breathing
- Elevated levels can cause drowsiness, dizziness and unconsciousness

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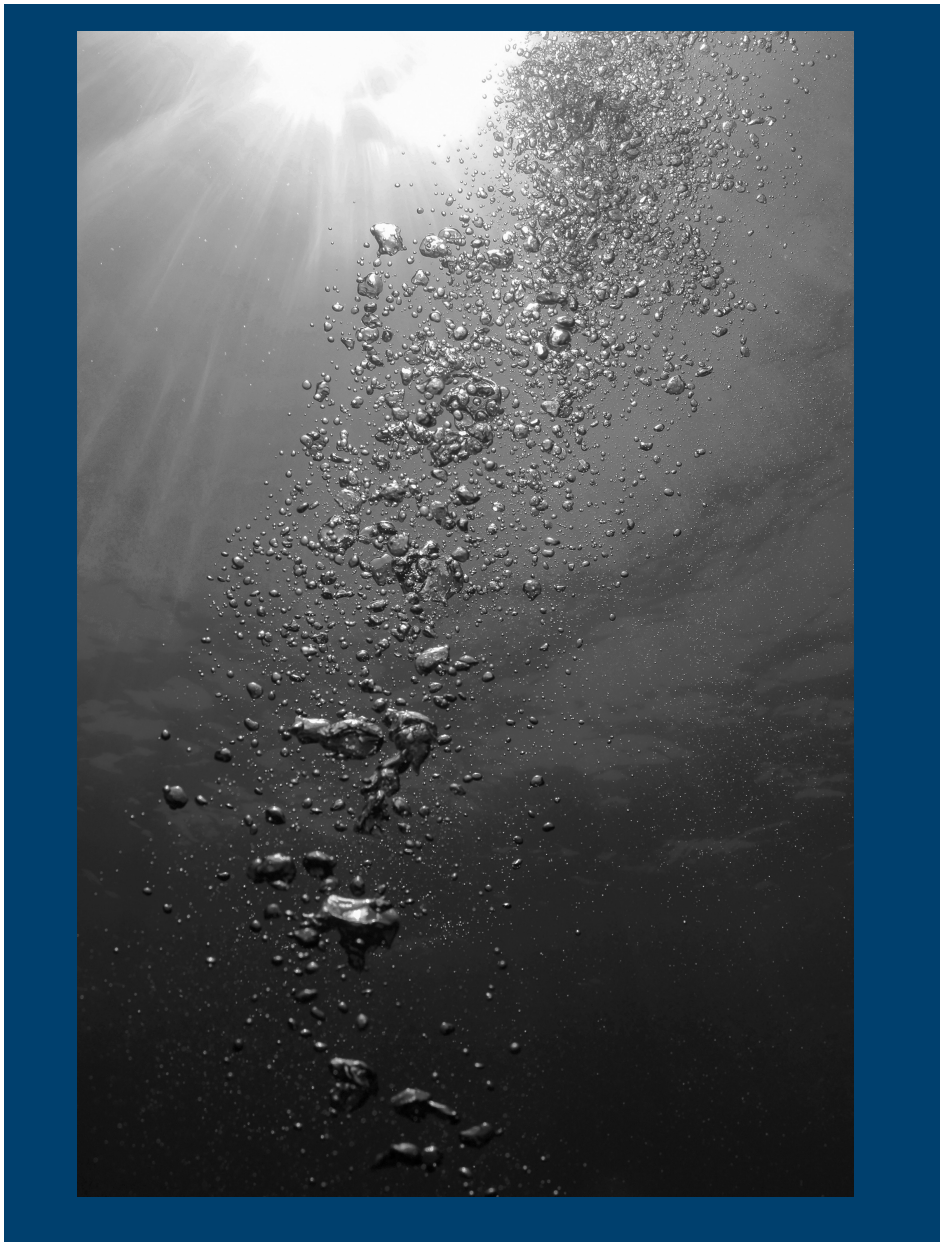

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Overview of Atmospheric Gasses

Nitrogen (N_2)

- Approximately 78% of the Earth's atmosphere
- An inert gas (is not involved in cellular metabolism)
- Does not interfere with resuscitation efforts

Carbon Monoxide (CO)

- Interferes with oxygen delivery to body tissues
- Binds to hemoglobin inhibiting the uptake of O_2 and its delivery to tissues
- Small amounts can become toxic underwater due to increased partial pressures at depth

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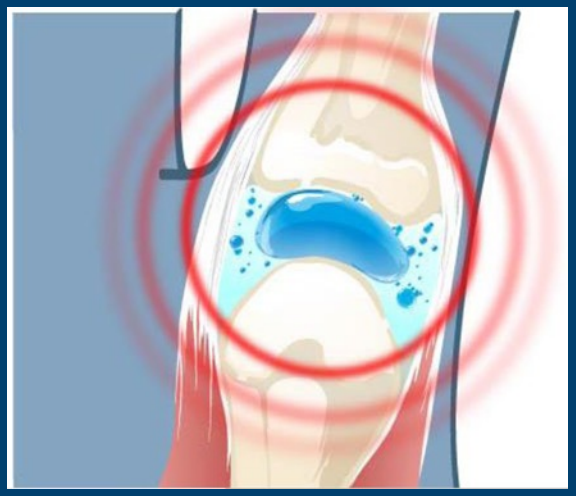
Decompression Illness

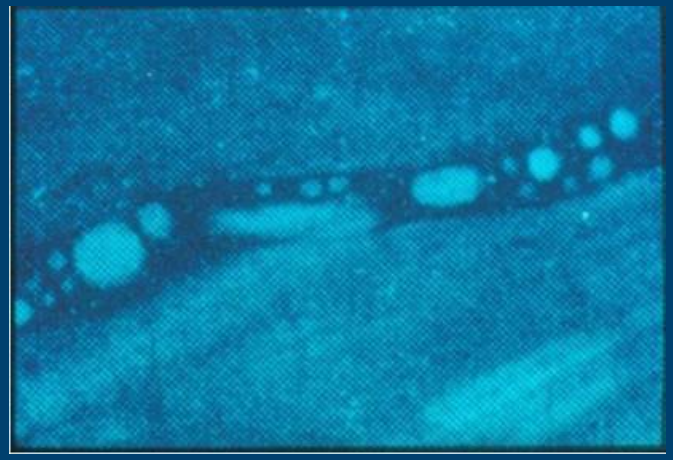
Decompression Illness (DCI) encompasses two different processes related to decompression

- Arterial gas embolism (AGE)
- Decompression sickness (DCS)

First-aid treatment for both AGE and DCS is the same

Most important initial action is early recognition and use of supplemental oxygen





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Decompression Sickness (DCS)

Results from bubbles formed within tissues or blood from inert gas (nitrogen or helium)

Bubble Formation can cause:

- Tissue distortion and interruption of blood flow
- Blood clotting, inflammation, circulatory system fluid leakage, and vasoconstriction

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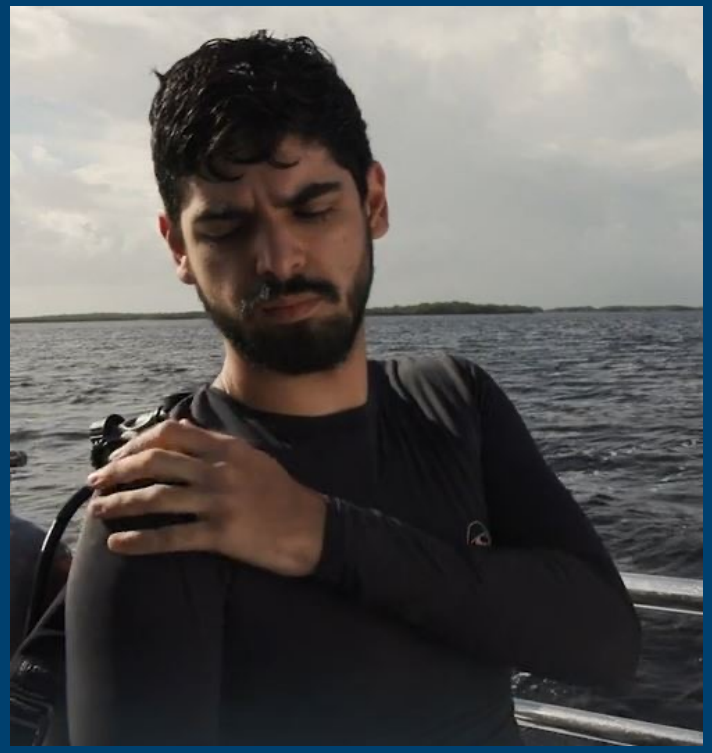

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Decompression Sickness (DCS)

Symptoms may include:

- Pain, Numbness
- Constitutional (fatigue, nausea)
- Vertigo, Dizziness
- Motor weakness
- Skin rash

First Aid:

Early treatment with high concentrations of O_2 (as close to 100% as possible)

Definitive treatment should be sought even if symptoms disappear

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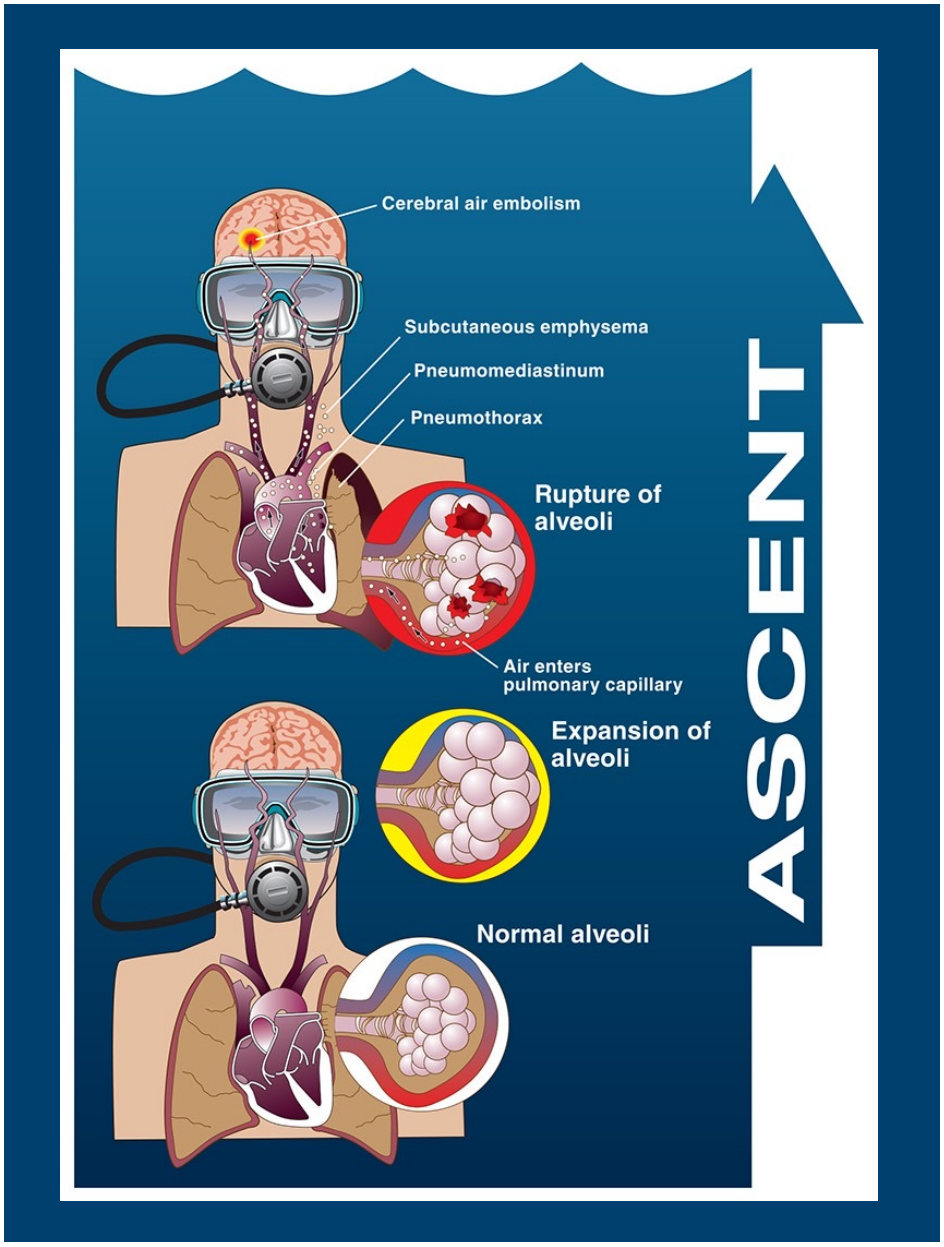

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Arterial Gas Embolism (AGE)

AGE typically results from a lung overexpansion injury

AGE allows gas from the lungs to enter the blood stream

- If transported to the brain can cause rapid and dramatic effects

Primary risk factor

- Breath hold during ascent
- Can occur in as little as 4 feet (1.2m)

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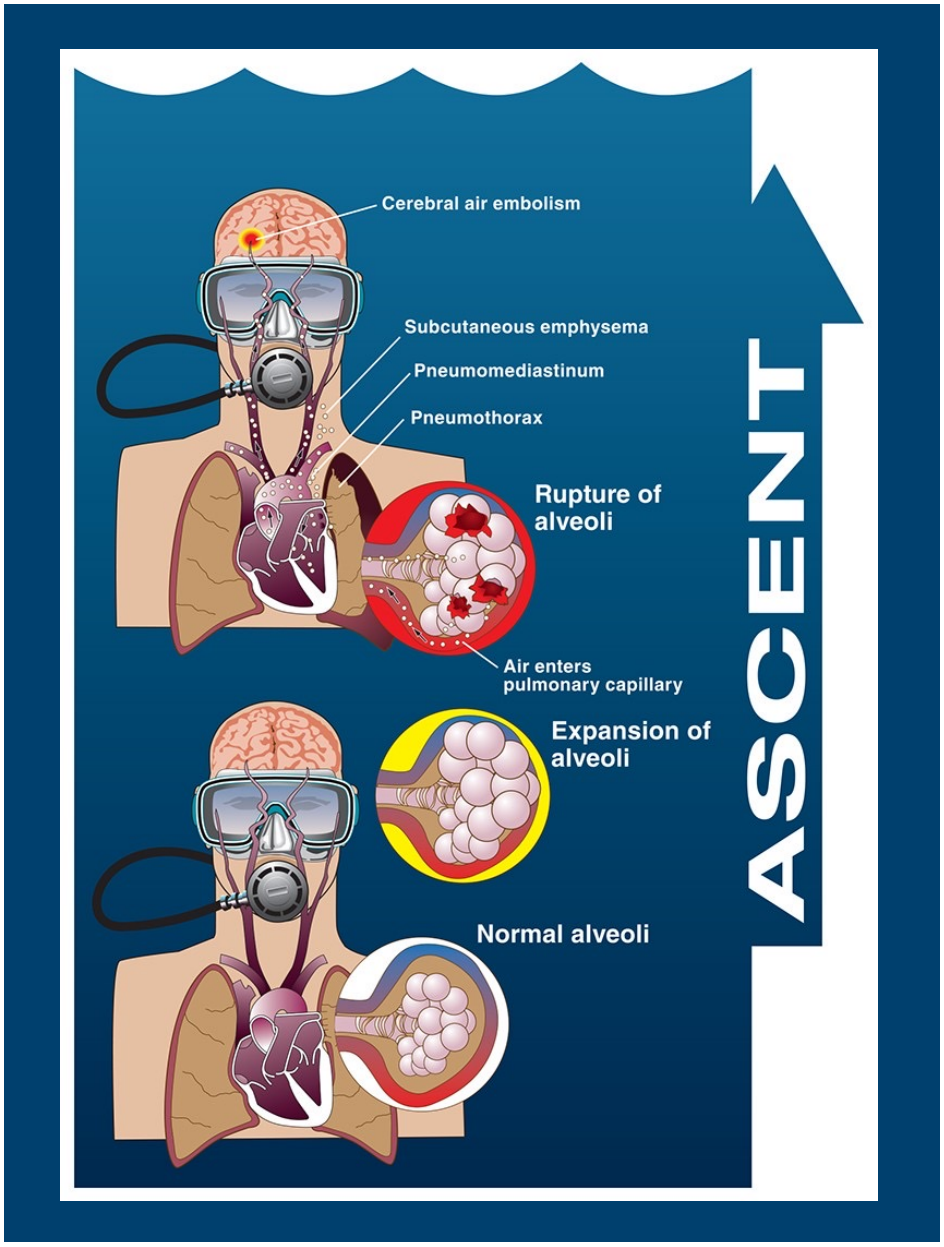

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Arterial Gas Embolism (AGE)

- Other potential risk factors:
  - Lung infections
  - Asthma
  - Other pre-existing condition

Other forms of pulmonary barotrauma

- Pneumothorax
- Subcutaneous emphysema
- Mediastinal emphysema
- Pneumopericardium

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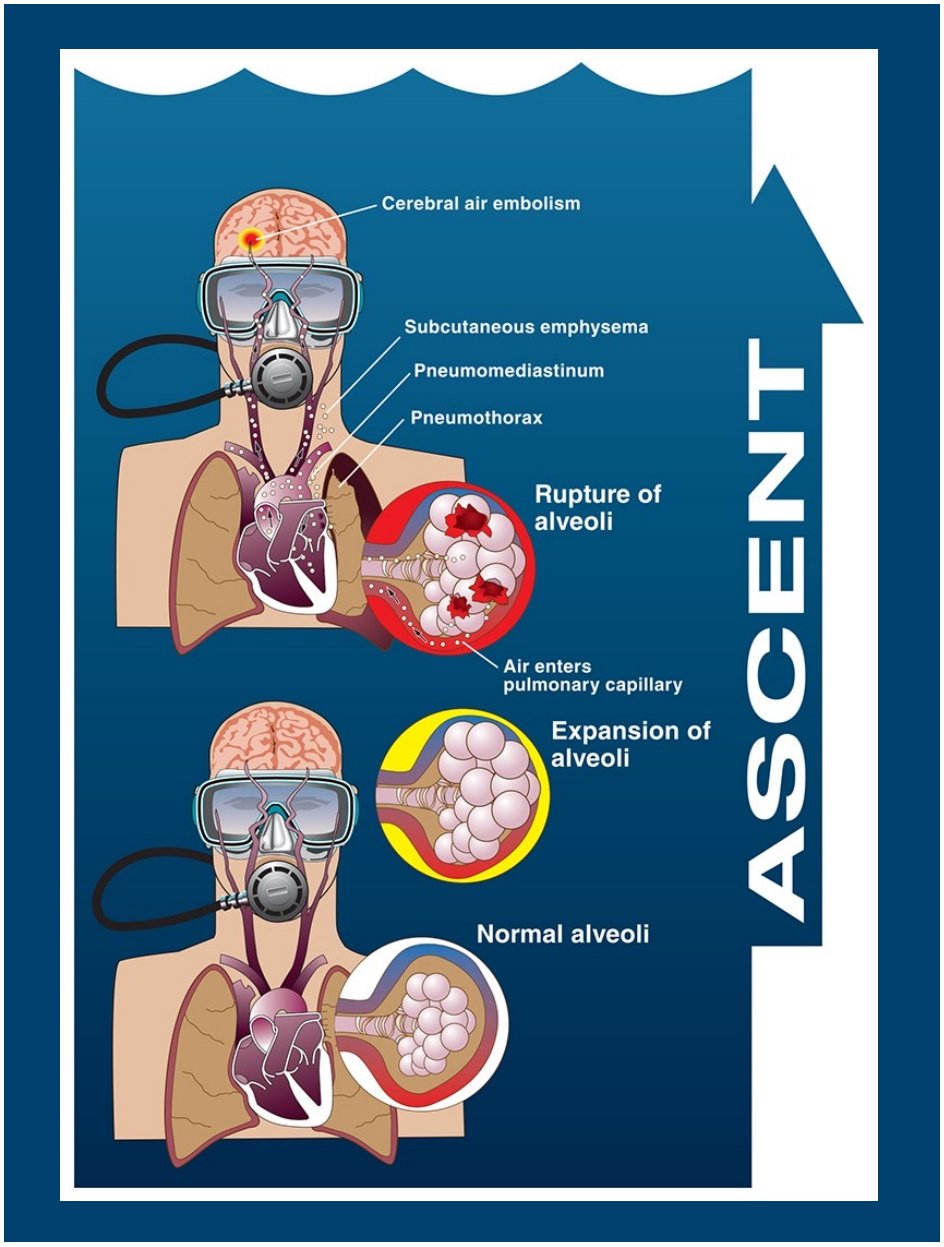

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Arterial Gas Embolism (AGE)

Signs and Symptoms:

- Chest pain
- Changes in voice pitch
- Difficulty breathing or swallowing
- Gas bubbles felt under the skin
- Cyanosis, bluish coloration of the skin

First Aid:

Early treatment with high concentrations of O_2 (as close to 100% as possible)

Access into EMS as soon as possible for advanced medical evaluation and treatment

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Decompression Illness (DCI)

- **Medical Evaluation** recommended for all suspected cases of DCI
  - Symptoms may recur
  - Risk of recurrence reduced with hyperbaric treatment
  - Prolonged delays may reduce effectiveness of treatment

- **Signs and Symptoms (most frequent):**
  - Pain, especially joint or muscle
  - Paresthesia/Numbness
  - Fatigue/Malaise, Nausea
  - Vertigo/Dizziness
  - Motor Weakness
  - Skin Rashes
  - Altered mental status

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Decompression Illness (DCI)

Symptom onset varies

- DCS complaints typically begin within 6 hours
  - May be delayed as much as 24 hours
- AGE symptoms present immediately upon surfacing or within 15 minutes
  - Presentation may be more dramatic array of symptoms

Residual symptoms

- Not uncommon, especially in severe cases or considerable delay to treatment

Return to diving

- Should be made in consultation with a physician knowledgeable in dive medicine

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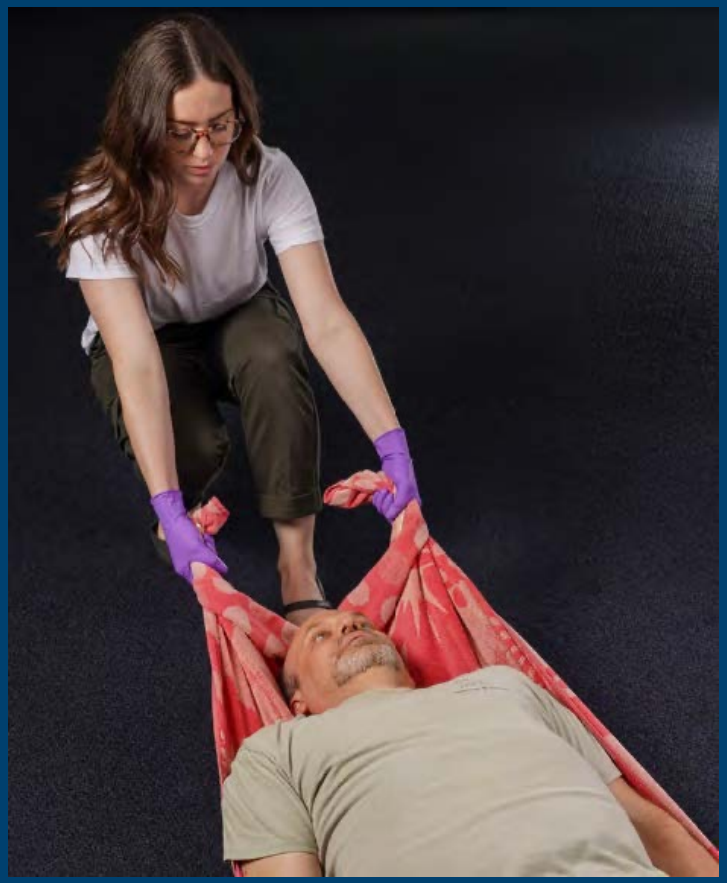

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Dive Emergency Preparation

- BLOOD BORNE PATHOGENS
- EMERGENCY ACTION PLANS
- LIFTING AND MOVING

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Blood Borne Pathogens

Occupational Safety and Health Administration (OSHA)

- Created 1970 to assure safe, healthful working environment
- Provides training, outreach, assistance

Blood Borne Pathogen Standard (BBP)

- Applies to employees who may come into contact with human blood, body fluids, body tissues or organs
- Requires training to assist in
  - understanding the need for protection
  - options to meet that need
  - what to do if exposed

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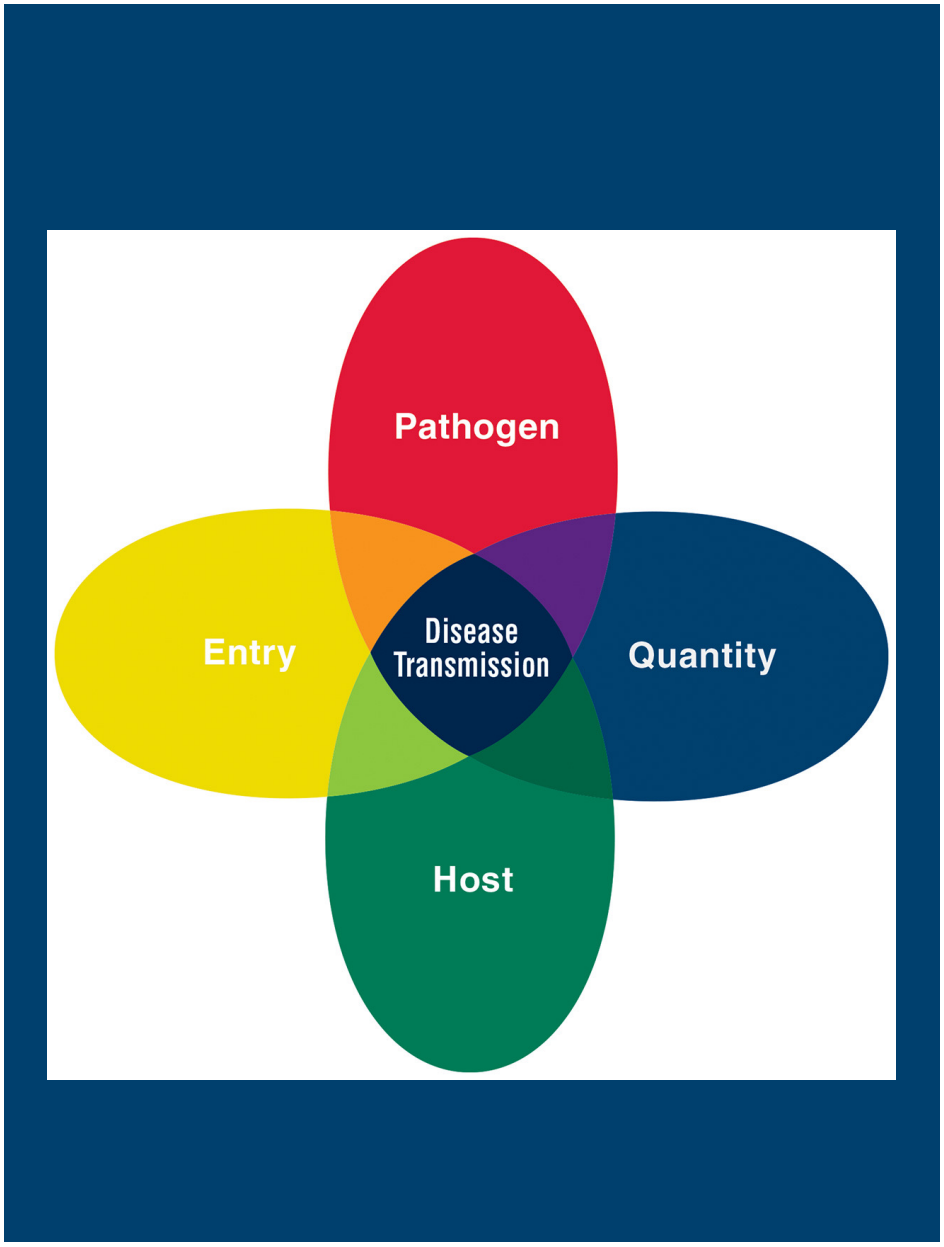

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Blood Borne Pathogens

Disease Transmission

Four things must meet:

- Infectious pathogen present
- Sufficient quantity of the pathogen must be present
- Exposure to a susceptible host
- Site of entry/Mechanism of transmission

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Blood Borne Pathogens

Mechanisms of Transmission

- Direct – person to person
  - touching, biting, kissing, open wound
- Indirect – transfer by an inanimate object
  - clothing, utensils, furniture, door knobs
- Airborne – aerosol droplets inhaled by another person
  - sneezing, coughing
- Vector – transfer by an insect bite
  - mosquitoes, ticks

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Blood Borne Pathogens

Prevention

- **Prevention** is the best protection
- **Personal protective equipment (PPE)** a focus of first-aid courses
  - Gloves, eye shields, masks, clothing (scrubs)
- **Hand washing**
- **Avoid** eating, drinking, handling contact lenses in potential exposure areas
- **Engineering controls**
  - Hand washing stations, eye flush stations, sharps disposal

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Blood Borne Pathogens

Exposure Control Plan

- Required where OSHA regulations apply
- Tailored to specific facility
- Designated safety officer to monitor
- Addresses
  - Use of PPE
  - Disposal of sharps
  - Vaccinations
- Annual review required

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Blood Borne Pathogens

Hepatitis B (HBV)

- **Affects the liver**
- 50-100 x **more infectious than HIV**
- Effective **vaccination is available**

- Symptoms.
- Most people do not experience symptoms when newly infected. Acute symptoms can last for several weeks. Symptoms may include:
  - Yellowing of the skin and eyes (jaundice)
  - Extreme fatigue
  - Dark urine
  - Nausea and vomiting
  - Abdominal pain
- For some people, symptoms may persist for several months or up to a year.

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Blood Borne Pathogens

Hepatitis C

- **Affects the liver**
- **About 40%** of infected people recover fully
- **Symptoms** may take many years to develop
- **Many infected people become chronic carriers** and may not realize they are infected.
- **Less contagious** than Hepatitis B
- **No immunization** available

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Blood Borne Pathogens

Human Immunodeficiency Virus (HIV)

Affects the immune system, causes AIDS

- ***HIV*** *is the* ***virus***
- ***AIDS*** *is the* ***disease*** *caused by the virus*

Symptoms may take years to develop

Least infectious of the 3 major pathogens

No immunization available

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Blood Borne Pathogens

If you believe you have been exposed:

- Milk the wound, encourage bleeding
- Wash with soap and water
  - Flush eyes, nose, mouth with running water
- Report injury per your company protocols
- Seek medical evaluation and counseling

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Blood Borne Pathogens

Zoonosis

General term describing transmission from vertebrate animals to humans

Not part of BBP but same prevention measures apply

Transmission typically occurs through open wounds, ingestion, inhalation, contact with mucous membranes

Symptoms vary with the specific disease

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Blood Borne Pathogens

Contaminated Water and Chemicals

Common risk for some professional divers

Requires specialized training beyond the scope of this course

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Emergency Action Plans

Elements to Include

- **Locations** for all emergency kits and supplies
- **Communication equipment** and how to use it
- **Local resources**
  - EMS
  - Nearest medical facility
  - Transport option to nearest medical facility
- **Direction for EMS** to get to your location if required
- **DAN Emergency Hotline** number (919-684-9111)
- **Method to document** nature of injury and care rendered

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Emergency Action Plans

Diver (or Injured/Ill Person) Information to Record

- Person's name, address, DAN member number
- Emergency contact information
- Person's medical history
  - S-A-M-P-L-E, discussed later
- Signs and symptoms
- Dive profile (if applicable)

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Emergency Action Plans

Medical Facility vs. Hyperbaric Unit

- Go to nearest medical facility ***FIRST***
- Medical evaluation required before hyperbaric treatment
  - Referral for treatment may be required
- Not all chambers treat divers
- Chambers that do treat divers may not be available at time of need

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Emergency Action Plans

Emergency Equipment

- Oxygen Units
  - **See Appendix for DAN options**
- First-aid Kits
  - Appropriate for environment and anticipated use
- Communication equipment as appropriate

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Lifting and Moving

General Considerations

Moving an injured person strongly discouraged

Exceptions:

- To move the person to their back for CPR
- Imminent danger (fire, explosive, traffic)

When moving is necessary –

Protect both first-aid provider and injured or ill person

Move in orderly, planned and unhurried fashion

Use the safest and easiest method

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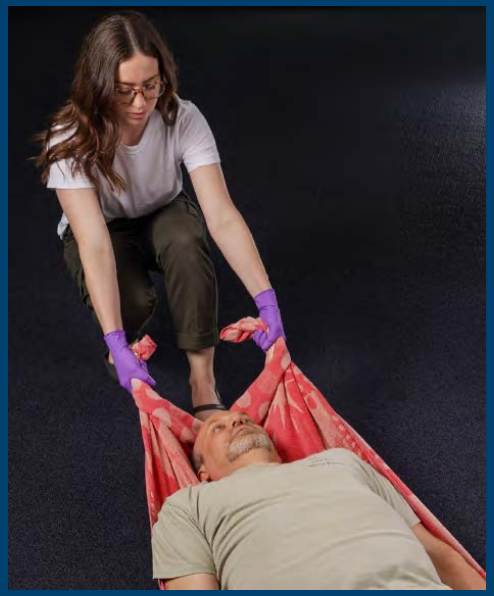

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Lifting and Moving

Techniques

Armpit-Forearm Drag

- Reach under armpits from behind grasping
- individual's opposite wrist
- Pull in direction of body's long axis

Shirt Drag (if individual is wearing collared shirt)

- Grasp shoulders and collar of shirt
- Use shirt to support head and pull along long axis

Coat or Blanket Drag

- Roll person onto side, tuck blanket underneath
- Return person to back, pull other edge of blanket out
- Gather blanket under head and neck for support
- Pull along long axis of person's body

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Lifting and Moving

Reminders

- **Maintain a straight rigid back**
- **Bend at hips not waist**
- **Keep your head in a neutral position**
- **Lift with legs**

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Response and Assessment

Scene Safety Assessment

Universal Precautions

Initial Assessment and Positioning for Care

Neurological Assessment

Conducting a Neurological Assessment

The Four Functional Areas of a Neurological Assessment

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Scene Safety

Avoid becoming injured yourself

Think S A F E

- Potential Hazards:
  - Fire
  - Chemicals
  - Electricity or Gas
  - Traffic
  - Animals
  - Others?

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Scene Safety

Standard Precautions

Personal Protective Equipment (PPE)

- Gloves, face masks, eye protection, clothing
- Aids in **avoiding contact** with blood and other body fluids
- Helps **minimize risk** of infection
- **Prevents** disease transmission

Avoid contaminated sharp objects

- Dispose of sharps in an approved container

Thoroughly wash hands after providing care

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Scene Safety

SKILLS

Scene Safety Assessment

Donning and Doffing Gloves

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Initial Assessment

Assessing Responsiveness

Tap and shout “Are you OK?”

State your name and desire to help

If the injured diver responds, place in the recovery position

If the injured diver does not respond, scan quickly to determine if he is breathing normally while checking for a pulse

Call or send someone to call EMS immediately

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Initial Assessment

Pulse Check

Adult and Child (carotid artery)

place two fingers on the Adams' Apple then slide towards you and slightly upward into groove on the side of the neck

Infant (brachial artery)

place two fingers in the groove along the inside of the upper arm towards the armpit

Allow at least 5 seconds but no more than 10 seconds to check for a pulse

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Initial Assessment

Recovery Position

Good positioning to **help protect the airway**

Continually check to ensure condition does not deteriorate

Do not use if spinal injury is suspected

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Initial Assessment

Log Roll

Protect neck and spine

Use to move the person onto his back

If the individual is:

- unresponsive
- not breathing normally
- does not have a definite pulse

call for EMS & initiate CPR

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Initial Assessment

SKILLS

Initial Assessment

Log Roll (optional)

Recovery Position