



SDI



SDI

SDI Rescue Diving Manual

A Guide to Rescue Techniques, Stress, Injury and Accident Management



SCUBA DIVING INTERNATIONAL

SDI Rescue Diving Instructor Guide

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Introduction

Welcome to the SDI Rescue Diver Course!

This Instructor Guide, in outline format, is intended to assist the instructor in presenting the academic portion of this course. It identifies all key points that should be addressed, and elaborated upon, by the instructor. It closely follows the material in both the student's SDI Rescue Diving Manual and the instructor's Powerpoint presentations. It also includes the answer keys for the Scuba IQ Reviews for each of the eight chapters.

Instructors are encouraged to supplement this material with various hands-on classroom activities. As a prerequisite for this course, all participants will have current First Aid and CPR certification; naturally the related classroom activities may include a review and evaluation of these essential skills. Additional classroom time may be similarly devoted to demonstrating and practicing the procedures in the Five-Minute Field Neurological Exam, and the mechanics of On-Site Oxygen Therapy. The instructor also may find it beneficial to have appropriate teaching aids available, such as various types of floatation and rescue devices that will be used later in the open water exercises.

The open water exercises are outlined on the separate Instructor Slates, and copies of these slates are also included in the appendix of this guide. These exercises may be presented in any appropriate order, and in any combination. Each open water exercise should begin with an introductory demonstration by the instructor, followed by step-by-step practice, and conclude with a real-time demonstration by each student which is evaluated by the instructor. Similar to the circumstances in an actual emergency, during open water training the emphasis should be placed upon the overall effectiveness of an individual rescuer's actions, rather than any specific technique.

Following mastery of all open water rescue skills, the instructor will create a simulated dive emergency, to which the students are expected to appropriately respond (without direct intervention by the instructor). At the instructor's discretion, additional personnel (non-students) also may be utilized in this activity. Upon the conclusion of this simulated emergency, the students' performance should be reviewed and critiqued by the instructor and all participants. This final exercise is best used as an additional learning experience, rather than a pass-fail evaluation.

The Paperwork

- **Student Folder**

- Liability Release
- Medical Statement

Note to Instructor: When two or all three of these specialty diver courses are being conducted at the same time, a separate liability release must be completed by each student for each course he/she will be completing; a single medical statement may suffice, however, for multiple courses being undertaken at the same time.

Introductions

- **Professional Staff**

- **Participants**

- Your name?
- What type of diving experience do you have?
- Which diving activities interest you the most?
- What brings you here today?

About This Program

- **Specialty Certification**

- SDI Rescue Diver

- **A Few Things to Discuss**

- SDI Manual
- Scuba IQ Reviews
- Class Sessions
- Open Water Dives

Note to Instructor:

As three specialties are addressed in the student manual, it is important that the students clearly understand the actual course(s) being offered. In addition, it is important for the students to understand that, it is important for students to understand that even when they are not completing all three courses they are required to read the entire student manual, and they are required to complete and submit all of the Scuba IQ Reviews. The instructor also should take this opportunity to review the course schedule and related details.

Marketing Rescue Diver Training

Students frequently note that SDI Rescue Diver is one of the most challenging courses they have ever taken, yet at the same time it is also one of the most enjoyable. Not surprisingly, many instructors feel the same way about teaching this program.

Yes, the subject matter is serious, but when it is properly organized and enthusiastically presented, it also can be a lot of fun. As a student first encounters the various problems that are presented, and then learns to effectively deal with each situation, he or she will quickly become a far more confident and capable diver.

In discussing this Rescue Diver program with any potential participant, an instructor will do well to focus upon these key points:

- The student will become a more self-reliant diver;
- The student will become a better dive buddy;
- No exceptional strength or fitness is required;
- In completing this program, the student will be moving towards the prestigious rating of SDI Master Scuba Diver;
- The student also will be fulfilling an important prerequisite for professional-level certification.

This course naturally deals with assisting a person in distress. First and foremost, it teaches divers how to recognize and prevent their own potential problems, and how to address and resolve any such problem that may occur. Rather than being forced to rely solely upon someone else, a participant learns valuable self-reliance skills.

For most students, this may well be the first time in their dive training that their attention is directed outwards beyond themselves, focusing equally upon their fellow divers. Again the student learns how to recognize and prevent the potential problems of others, and how to address and resolve the problems that may occur. This training helps overcome any natural hesitancy as it builds self-confidence in the diver's ability to effectively render assistance in an emergency situation. With this training, the participant will become a more alert and capable dive buddy. These skills may be especially reassuring when the diver's customary buddy is a loved one.

On occasion the very notion of dive rescue conjures an image of the practitioner as a muscular lifeguard-type. This misperception may, at times, cause some degree of reluctance for a student to enroll in this training. In fact the skills, as taught in this program, may be readily employed by the average recreational diver. No inordinate level of physical conditioning is required. Building confidence, in a diver's own ability to deal with emergencies, is a primary goal of this course.

SDI Master Scuba Diver is the highest non-professional rating in recreational diving. It requires four SDI Specialty Diver certifications, a minimum of fifty logged dives, and this SDI Rescue Diver Course. In addition to First Aid and CPR training (which is equally valuable to both divers and non-divers alike), the prerequisites for Rescue Diver include:

- SDI Advanced Open Water Diver (which itself requires four Specialty Diver certifications and 25 logged dives); or
- SDI Open Water Diver plus 40 logged dives

In either case, by the time they are eligible to enroll in this course, divers already will be well on their way towards the SDI Master Scuba Diver certification, and thus this prestigious rating can be viewed as a realistic and achievable personal goal.

As would be expected of anyone involved in the supervision of diving activities, SDI Rescue Diver is a prerequisite for all SDI professional ratings. True, a potential student may yet have given little thought to the idea of becoming a Divemaster or even an Instructor. Nevertheless many find it satisfying indeed to realize that this prerequisite has been fulfilled, in the event that they decide to pursue a part-time or full-time career in diving.

From a purely business perspective, it is far easier to maintain a relationship with an existing customer, than it is to recruit a new customer. The same applies to dive training, where students are our customers. Successful instructors and facilities already understand the benefits of continuing education, and they strive to impart its value to their students. As a matter of routine, all students should be encouraged, even at the Open Water Diver level, to make a personal commitment to continue their training through SDI Rescue Diver, again because it will make them better divers and better dive buddies.

Chapter 1:

Notes to the Instructor

This chapter reinforces some basic skills from prior Open Water Diver training, and focuses upon helping the participant become a more self-reliant diver through personal awareness, preparation and planning.

Chapter 1: Safe Diving and the Diver

Topics in this Chapter:

- The Self-Reliant Diver
 - Awareness
 - Preparing for the Dive
 - Dive Planning
 - Buddy Check
 - Out-of-Air Emergencies
 - Limited Visibility
-

The Self-Reliant Dive

What is meant by the term “self-reliant”?

- The ability to look after all your problems underwater without assistance from your buddy

Critical elements in developing self-reliance

- Understand your equipment
- Take personal responsibility
- Develop self-awareness skills
- Become more aware of your surroundings
- Plan for contingencies
- Learn to handle your own emergencies

Through training and experience, all divers should strive for self-reliance

- First, you should be able to take care of yourself in most situations
- Then, you will be better prepared to assist another diver with any problems that arise

Awareness

Self awareness

- How cold or tired are you?
- How are you and your equipment working together, as a system?
- What is your remaining air supply?
- What is your current depth?
- What is your remaining NDL?

Global awareness

- Orientation and sense of direction
- Recognize and evade entanglement hazards
- Judge distance from bottom, and avoid stirring up silt
- Stay in sync with buddy, without getting in the way
- Instinctively pick the best navigational clues

Preparing for the Dive**Physical preparation**

- Appropriate level of physical fitness for typical diving activities
- Rescue scenarios often will require an increased physical effort

Mental preparation

- Evaluate conditions in terms of personal experience and training
- Mentally “walk” through the planned dive, with your buddy
- Anticipate possible problems, and identify appropriate responses

Equipment preparation

- Appropriate annual servicing of scuba gear
- Personal pre-dive inspection of all items
- Regulator system
- Buoyancy compensator
- Personal dive computer and gauges
- Exposure protection
- Accessory items, required for a particular dive
- Lights
- Reels
- Lift bags
- Surface floats and flags
- Signaling devices
- Cutting tools

Dive Planning

Detailed dive plan, agreed-upon by all dive buddies

- Objective: intent and nature of this dive
- Maximum depth and time limits
- Safety stop
- Adequate air supplies
- Route to follow, including entry and exit points
- Hand signals



Buddy Check

Should be performed before every dive by every member of the whole dive team

- Are BC / harness straps and buckles fastened?
- Is air on, and is tank full?
- Are all hoses properly routed?
- Alternate air source: type, location, and use?
- Is mask sealed, and are straps secure?
- Is weight system release accessible?
- Is dive knife or tool in place?
- Have hand signals been reviewed?
- Has dive plan been reviewed?
- Have contingency plans been reviewed?

Out-of-Air Emergencies: Buddy Dependent Options

Alternate air source / octopus regulator

- Out-of-air diver signals “out of air” and “share air”
 - Donor passes octopus and/or receiver reaches for octopus
 - Each grasps other’s BC strap with right hand
 - Maintaining eye contact, divers ascend together
 - Each uses left hand to vent air from BC during ascent
 - Both divers establish positive buoyancy at surface
- Special note: inflator-integrated alternate regulators*
- Donor must pass primary regulator, while switching to alternate
 - Otherwise, follow same procedure as with octopus regulator

Buddy breathing

- Diver signals “out of air” and “share air”
- Donor takes a breath, before passing second stage
- Each diver takes two breaths, on alternating basis
- Each diver exhales slightly, while without regulator
- One hand used to grasp buddy’s BC strap, and other hand to pass regulator (do not cover purge)
- Maintain eye contact, ascend together
- Vent air from BC during ascent
- Establish positive buoyancy at surface

Out-of-Air Emergencies: Buddy Independent Options

Redundant air supplies

- Pony bottle, with separate regulator system
- Self-contained units, such as Spare Air®

Direct emergency ascent

- At 9 m / 30 ft, the surface is only seconds away
- Considering the time required for some of the other options, a direct ascent might make more sense with less risk to either diver
- Procedures
- Basically it is a normal ascent, while exhaling slightly
- Be ready to discard weights, if necessary, during ascent
- Decreasing ambient pressure may allow an additional breath

Limited Visibility

Avoid buddy separation

- Stay within arm's reach of each other
- When appropriate, use a buddy line

Lost buddy search

- Stop, immediately look around, including up and down and side to side
- It may help to ascend a little, and look for buddy's bubbles
- It also may help to back-track a little, to see if your buddy stopped
- Search only for about one minute
- If you can't locate your buddy underwater, ascend to surface to reunite
- If buddy does not appear after several minutes, summon assistance

Navigation skills

- Important on every dive, especially important in poor visibility
- May be required in rescue searches
- Procedures
- Visualize your dive plan
- Visualize your environment
- Superimpose both images
- Calculate your progress
- Plot your position on the dive plan
- Use all available natural and instrument aids to complete route

Summary

Elements of safe diving

- Self-Reliance, through training and experience
- Awareness: personal and global
- Proper preparation
- Proper dive planning
- Pre-dive buddy check

Chapter 2:

Notes to the Instructor

This chapter explains how escalating stress can lead to dive accidents. It focuses upon the recognition of stress, in oneself and in another diver, both before a dive and during a dive, and offers techniques for successfully managing stress.

Specific rescue procedures, for dealing with a panicked diver, are addressed later in Chapter 4.

Chapter 2:

How Stress Leads to Diving Emergencies

Topics in this Chapter:

- Stress in Diving
 - Pre-Dive Stress
 - Recognizing Pre-Dive Stress in Others
 - Recognizing Pre-Dive Stress in Yourself
 - Dealing with Pre-Dive Stress
 - Stress and Panic in the Water
 - Panicky Diver at the Surface
 - Panicky Diver Underwater
 - Effects of Stress on Breathing
-

Stress in Diving

Anxiety and apprehension may arise ...

- Before the dive
- During the dive

Unrelieved stress

- May continue to escalate
- May be compounded by minor problems
- May lead to panic

Pre-Dive Stress

Common sources of pre-dive stress

- Diving in new or unfamiliar sites
- Adverse conditions
- New diving activities
- Peer pressure
- Diving with a new buddy
- Using new or unfamiliar equipment

Recognizing Pre-Dive Stress in Others

Withdrawal

- Staying away from the crowd, seeking a private place
- Having no opinion, or an “I don’t care” attitude
- Unusually quiet
- Moodiness

Gear problems

- Finding excuses to delay or abort the dive
- Fumbling with gear

Hyperactivity or excessive talking

- False enthusiasm, to mask apprehension
- Meaningless activity, to divert thoughts
- Talking about nothing in particular, or constantly repeating
- Using “dark” humor

Recognizing Pre-Dive Stress in Yourself

Pre-dive concerns may be more psychological than real

- Fear of the unknown
- Fear of failure, especially in front of others

Conduct an honest self-examination

- Is this an “experience expanding” activity, or am I exceeding my training and experience?
- Do I have the skills to perform this dive safely?
- If things start going wrong underwater, am I really briefed and prepared for the contingencies?
- Am I capable of looking after myself and my buddy in an emergency under these conditions?

Dealing with Pre-Dive Stress

Separate fact from fiction

- Start with a good dive plan
- Address all intentions and contingencies
- Ensure that everyone understands what is about to take place

Conduct a good dive briefing

- Cover the dive plan, as well as an organized response to emergencies

Conduct a good buddy check

- Catch accidents before they happen
- Familiarize each diver with the other's gear
- Review hand signals, dive plan, and out-of-air emergencies

Talk about any apprehension

- Discuss concerns with experienced divers and dive leaders
- Define realistic dive-related expectations
- Seek advice, to help overcome apprehension

Visualize the dive

- Mentally create a possible progression of events
- Superimpose the dive plan over the observed dive site
- Carry a slate with the dive parameters on it
- Anticipate problems, and mentally rehearse your response to each

Stress and Panic in the Water

Sources of stress during a dive

- Poor visibility
- Cold temperatures
- Over exertion and/or breathing difficulty
- Buddy separation
- Leaking mask
- Inability to keep buoyancy under control

Dealing with stress in the water – Act, don't just react !

- Stop where you are
- Signal your buddy that you have a problem
- Take 2 to 3 full breaths, to get your breathing under control
- Calm down and find the problem
- Look at your options and make a rational choice

Stress can quickly lead to panic

- Minor issues can escalate, if not resolved
- Panic may cause a diver to bolt for the surface

Panicky Diver at the Surface

Contributing factors

- Frequently involves difficulty in staying comfortably afloat
- Over-weighted
- BC not inflated
- Also may involve difficulty in breathing comfortably
- Overexerted
- Choppy sea state
- Poorly maintained regulator
- Constricting wet suit, dry suit, or BC
- Altered breathing pattern from general anxiety

Classic signs of water-induced panic

- Rapidly flailing arms
- Body as high as possible above the water
- Mask and regulator removed to ease breathing
- Gasping for air
- Eyes wide open in fright
- Not rational

Alternately, may exhibit passive panic

- In passive panic, the diver is “frozen” and immobile
- Passive panic may quickly and unexpectedly turn to active panic

Panicky diver may climb on top of any other diver within reach

- Stay out of reach until the situation is assessed
- You want to be part of the solution, not part of the problem
- You’ll be exposed to possible loss of regulator and mask, dropped weight belt, exhausting struggle
- Approach needs to be reasoned and practiced

Panicky Diver Underwater

Most often stems from some type of breathing difficulty

- Over exertion, caused by diver’s activity level or over-weighting
- Poor regulator performance
- Out-of-air emergency

Diver's panic reaction

- May be passive: frozen and immobile
- May be active: bolting for the surface, or grabbing for other diver's regulator (and possibly dislodging diver's mask)
- May quickly turn from passive to active
- Exercise caution in approaching a breathing, immobile diver

Effects of Stress on Breathing

Breathing "trigger" is the build-up of carbon dioxide
(not a lack of oxygen)

- CO₂ is a by-product of metabolism
- Increased workload will increase levels of CO₂

Anxiety causes an altered breathing pattern

- Typically rapid and shallow breathing, or panting
- Inefficient gas exchange
- Quickly leads to exhaustion, due to hypoxia
- Also creates a sense of suffocation, due to elevated CO₂ level

Distress often can be relieved with normal breathing

- First you may need to deal with other issues, such as buoyancy at the surface
- Then encourage the diver to take 2 to 3 full breaths
- Encourage the diver to calm down
- And then you may have a merely tired diver to deal with

Summary

Panic is the greatest single cause of diving accidents

- Unrelieved stress and accumulating problems produce panic
- Be alert to the signs of stress and panic
- Deal with apprehension and anxiety before they become worse

Chapter 3:

Notes to the Instructor

Up to this point the discussion has focused upon stress in somewhat general terms. This chapter now focuses upon specific factors and circumstances that may directly cause or contribute to a diving emergency.

Chapter 3: The Causes of Diving Accidents

Topics in this Chapter:

- How Diving Accidents Happen
 - Exceeding Prior Experience and Training
 - Cold or Tired Diver
 - Muscle Cramps
 - Over-Weighted Diver
 - Ocean Currents
 - Freshwater Rivers and Streams
 - Gear Problems
 - Injuries
 - Hyperthermia
 - Hypothermia
-

How Diving Accidents Happen

Although an occasional accident is inevitable

- Compared to some other sports, diving is relatively safe
- Safety stems from well-defined standards and instructional procedures
- Participants are trained to operate safely in an unforgiving environment
- Accidents frequently involve some type of diver error or inattention, and most are preventable

Exceeding Prior Experience and Training

Novice divers may encounter difficulty in dives that surpass their abilities

- First deep water dive
- First boat dive
- First night dive

Certain types of dives require specialized training

- Dives deeper than 30 m / 100 ft
- Penetration wreck diving
- Cave diving
- Ice diving

Possible hazards of overhead environments

- No direct access to the surface
- Disorientation
- Silt-out
- Falling objects
- Entanglement

Cold or Tired Diver

A person loses heat faster in water than in air at the same temperature

- Exposure protection typically is required
- Wet suits are selected by thickness, for warm to cold water
- Dry suits often are used for temperatures below 13OC / 55OF
- Cold divers will experience a loss of energy and stamina

Diving requires an output of energy – Appropriate physical fitness is required!

- Leg muscles used to propel diver through a dense medium
- Carrying and wearing heavy equipment
- Swimming against currents
- Entries through surf or over rocks
- Climbing vertical boat ladders
- Hauling a camera or loaded game bag

Recognizing a cold or tired diver

- Moving slowly, without following a consistent course
- Wandering on surface, too tired to look where he's going
- Uncoordinated movements, lacking fine motor skills
- Frequent stops or rest breaks
- Motionless on surface or underwater for long periods

Muscle Cramps

What is a cramp?

- Forceful, continuous, and involuntary muscle contraction
- Most often occurs in the lower leg (calf) or in the foot
- Also may occur in the upper leg (hamstring)

Cramps may be prompted by ...

- Sustained effort
- Poorly fitted fins or fin straps

- Cold water
- Dehydration
- Inadequate nutrition
- Lack of physical conditioning

Dealing with cramps

- Grab your fin tip and pull upwards
- Also may assist buddy, by pushing upwards on bottom of his fin tip

Prevention is the best cure

- Regular exercise
- Plenty of clear fluids during dive days
- Boots and fins that fit properly
- Adequate exposure protection
- Foods high in potassium

Over-Weighted Diver

Proper weighting

- Should float at eye level with an empty BC, while holding a normal breath

Excessive weight requires additional inflation of BC

- For positive buoyancy at the surface
- For neutral buoyancy underwater

Additional inflation of BC

- Causes unnecessary drag and exertion while swimming
- May constrict torso and affect breathing
- May limit ability to reach and handle other gear

Ocean Currents

Currents can be overpowering and exhausting

- Survey the dive site for surface currents, tides, rips, and longshore currents
- Plan your dive accordingly
- Start your dive against the current
- Use the current to help get back to your exit point
- Use appropriate lines when boat diving

If caught in a current at the surface

- Establish positive buoyancy
- Swim perpendicular to the current

Freshwater Rivers and Streams

Diving in fast moving water is hazardous

- Flowing water is powerful and can sweep away a diver
- Underwater entanglements pose a greater risk in moving water
- Be wary of eddies and other hydraulics
- Anything that interrupts the main direction of flow will result in current reversals that can trap a diver underwater
- Learn to read the river

If pinned underwater by a reversal

- Swim on the bottom, as deep as possible, to emerge downstream
- Surfacing too soon may result in being carried back upstream by the reversing current, and then pulled underwater again

Gear Problems

Properly maintained equipment rarely fails during a dive

- Annual servicing for regulators and BC's

Regulator malfunctions

- Free-flow, caused by elevated intermediate pressure
- Free-flow, caused by ice in the first or second stage valve
- Stoppage, caused by ice blocking the flow of gas(Ice may form inside a regulator in water temperatures below 10OC / 50OF)

Hose failure

- High pressure hose: louder noise
- Low pressure hose: more rapid loss of gas

BC malfunctions

- Inflator mechanism: over-inflating or not inflating
- Air loss from BC bladder or dump valve

Other gear problems

- Broken mask strap
- Broken fin strap

Injuries

Dive site injuries

- May have little to do with actual diving
- Most often they will be minor in nature

Hazard of passing boats

- Appropriate use of dive flags
- Special permission from authorities for diving in designated ship channels
- Observe areas that are “off limits” to divers

Other hazards

- Rocky shorelines
- Slippery boat decks
- Carrying heavy gear

Be prepared to deal with injuries

- Obtain first aid and oxygen training
- Have a first aid kit and oxygen available

Hyperthermia

Elevated body core temperature

- Exposure protection may contribute, while out of water
- Body's coping mechanism is perspiration
- Heat exhaustion: weakness, nausea, loss of alertness
- Heat stroke: life-threatening, body is no longer able to regulate core temperature

Considerations

- Buddy team should coordinate their gearing-up process
- Avoid donning exposure suit too early
- Don't hesitate to cool off

Hypothermia

Drop in body core temperature

- Diminished sense of awareness and survival skills
- Impacts ability to think rationally and function normally
- Decreased motor coordination

Shivering

- Effective method of producing heat
- Indicates that the body is fighting heat loss

In addition ...

- The brain constricts the blood vessels under the skin, and directs the blood primarily towards the lungs and major organs

Buddy considerations

- Ensure that all divers are comfortable during the dive
- Terminate the dive whenever a diver becomes cold

Summary

Almost all dive accidents are preventable

- Stay within the limits of your training and experience
- Keep in good physical condition
- Maintain equipment in good working order
- Practice proper buoyancy control
- Get sufficient rest before diving
- Pay attention to conditions and stay alert

Chapter 4:

Notes to the Instructor

This chapter enumerates methods of assisting a diver at the surface when an actual emergency occurs, while ensuring the safety of the rescuer.

Chapter 4: Responding to Emergencies on the Surface

Topics in this Chapter:

- Emergencies at the Surface
 - Staying Alert to Trouble
 - Reach or Throw
 - Swimming Rescues
 - Tired Diver Assist
 - Conscious Diver on the Surface
 - Unconscious Diver on the Surface
 - Rescue Breathing
 - Rescue Breathing Techniques
 - Equipment Removal
 - Removing a Diver from the Water
 - Recovering a Person to a Boat
-

Emergencies at the Surface

Ultimately all diving rescues and assists become surface rescues

- Most accidents happen at or near the surface (even if the situation began to develop underwater)
- In any underwater emergency, most often the principal goal is to get the victim to the surface as quickly as possible

Staying Alert to Trouble

Keep eyes and ears open, for possible signs of a diver in distress

- Listen for a whistle or shouting in the distance
- Watch for a diver alone on the surface – could suggest that buddies are separated, or that one surfaced in haste
- Watch for a diver in an unlikely area, such as a surf zone or ship channel
- Watch a diver's bubbles – a diver who appears to be alternately swimming and surfacing may be experiencing buoyancy or equalization problems
- Watch for a diver at the surface who is very high in the water, or very low in the water

Reach or Throw

Remember that your own safety comes first

- Reach out with an arm, keeping low and well balanced
- Use another object to extend reach – oar, boat hook
- Throw something to the victim – life ring, throw bag, floatation device
- Then simply pull the victim back to shore or the boat

Reaching or throwing is preferred

- Eliminates the need for a rescuer to enter the water
- Provides the quickest response

Swimming Rescues

Don't allow yourself to become another victim

- Be certain of your ability to swim the distance and then tow the person back
- If possible, take a floatation device – it provides additional support, and keeps the victim at arm's length
- Approach with a heads-up front crawl keeping victim in view
- Stop out-of-reach and observe behavior of victim

If the victim seems under control . . .

- Extend the floatation device
- Have the victim roll onto his back
- Have the victim breathe deeply
- Continue to talk to the victim, during tow

Panicky diver at surface

- A panicked diver loses control, and is unable to care for himself
- Victim requires immediate assistance – risk of exhaustion, drowning
- Stop out-of-reach and try to communicate
- Instruct victim to inflate his own BC
- If you must assist . . .
- Add air to your own BC
- Carefully circle around behind the victim
- Grasp victim's tank valve
- Reach over victim's shoulder to inflate his BC

If the panicky diver attempts to climb on top of you ...

- Evade: swim away backwards, and use your foot to push him away
- Control: reach across to his opposite hand, quickly pull / turn victim
- Escape: submerge while pushing victim up and away

Tired Diver Assist**The most likely rescue you'll ever perform is a tired diver assist**

- Plan your dive so that you have enough reserve energy in case of a difficult swim back to shore
- Watch for a buddy lagging behind during a surface swim
- Calmly communicate with diver, during assessment and assist
- Check for associated problems – cramps, overweighting, buoyancy issues, or cold
- Get diver onto his back, breathing deeply
- Tow, grasping the diver's tank valve
- After a few minutes of rest, victim may be able to assist with finning

Conscious Diver on the Surface**Assess circumstances while approaching the distressed diver**

- Does he respond to questions?
- Can he tell you what's wrong?
- Does his equipment appear to be intact?
- Has his mask been discarded?
- Is he in danger of inhaling water?
- Is his breathing pattern abnormal?
- Is he coughing or choking?
- Is there any bleeding from his mouth or nose?

Start signaling for help ...

- When there are indications of more than just a tired or cold diver
- When assistance will be needed for a long or difficult tow
- When assistance will be needed to remove victim from the water

Unconscious Diver on the Surface**An unconscious, breathing diver is in extreme danger**

- Inhalation of water
- Drowning

Unconsciousness can stem from ...

- Drowning
- Barotrauma
- Hypothermia
- Contaminated air
- Exhaustion
- Panic-related breathing irregularities
- Marine life injury
- Traumatic injury

Attempt to get a response from victim

- Shouting to victim
- Splashing water at victim
- Touching / tapping victim

For a face-down victim, approached from the side

- Grab BC and attempt to roll the victim
- May need to push / pull him with several fin strokes, to get the victim's submerged legs elevated enough to allow him to be rolled

For a face-down victim, approached from the head

- Reach out, crossing your arms
- Use your right hand to grasp victim's right hand, and your left to grasp victim's left
- Pulling victim's hands will cause him to roll

Rescue Breathing

Immediately assess the unconscious diver for breathing

- Get the victim buoyant, and positioned on his back in the water
- Look, listen, and feel for breathing
- Victim's skin color also may be a good indication of respiration
- Presumably an unconscious diver, face-down on the surface without a snorkel or regulator in his mouth, is not breathing

Goal: to ventilate the victim's lungs

- Rescuer's exhaled breath contains sufficient oxygen
- Distribution of oxygen, throughout victim's body, requires a heart beat
- Problematic to determine whether victim has a pulse, while in the water, so simply assume that victim's heart is beating

The earlier the rescue breathing is started, the more likely a victim will be resuscitated

- Pinch the victim's nose, to prevent escape of air
- Seal your mouth around the victim's mouth
- Administer two full breaths
- Begin towing, and continue rescue breathing
- Appropriate rhythm, while in the water, is two breaths every ten to twelve seconds

Use of barriers

- Prevention of disease transmission
- Personal preference, to avoid direct contact
- Pocket mask works best if rescuer is positioned at top of victim's head

Rescue Breathing Techniques

Rescue breathing can be performed from either side of the victim

- Right-handed rescuers often prefer to position themselves on the victim's left side, in order to tow the victim with their left hand and pinch the victim's nose with their right hand
- In doing so, the rescuer also will be able to use his right hand to remove the victim's gear

"Do-si-do" technique

- Rescuer takes position at victim's side, near head
- With the hand closer to victim's feet, the rescuer reaches under the victim's arm and grasps the tank valve or collar of exposure suit
- Rescuer's other hand is used to pinch victim's nose
- During rescue breaths, rescuer should kick up and also roll patient towards him
- Rescuer may use hand to cover victim's nose and mouth between rescue breaths, to exclude water

Chin-carry technique

- Rescuer takes position at top of victim's head and uses dominant hand to grasp victim's chin, while cradling victim's head on rescuer's shoulder
- Rescuer's other hand is placed in center of victim's back, to provide lift
- During rescue breaths rescuer slides hand up from chin, to pinch nose
- Rescuer may use hand to cover victim's nose and mouth between rescue breaths, to exclude water

Equipment Removal

Will make it easier to tow the victim, and to perform rescue breathing

- Drop victim's weights, to aid buoyancy
- Remove victim's mask, to assess respiration and to administer rescue breaths
- Remove victim's BC, to minimize drag while towing and to facilitate victim's removal from water
- At the appropriate time, for similar reasons, the rescuer also should discard his own gear

Removing a Diver from the Water

Backpack carry

- Rescuer stops tow in water mid-torso deep, takes off fins, and stands next to victim facing exit
- Rescuer reaches across victim, using right hand to grasp victim's right wrist and left hand to grasp victim's left wrist
- Rescuer pulls and rotates victim, while rescuer sinks below surface
- Rescuer pulls victim onto rescuer's back, with victim's arms across rescuer's shoulders
- Rescuer stands and carries victim out of the water

Two-person carry

- Turn victim, on his back, so that his feet are pointed towards exit
- Rescuers stand on either side of victim, facing exit
- Each rescuer places victim's arm over rescuer's shoulder, and then wraps own arm around victim's back or waist
- Each rescuer reaches under victim's legs with other hand, and grasps the other rescuer's wrist
- Victim is lifted (in a seated position) and carried out of water

Recovering a Person to a Boat

Unconscious person lift

- Position victim with back towards boat
- Rescuer (on boat) reaches down, placing hands under victim's arms
- Rescuer should use his legs to lift the diver into the boat

Roll-up net

- Attach inboard edge of net to rail or deck, and drape the rest of the net in the water
- Position victim on his back, across the net in the water

- Rescuers grasp outboard edge of net, and haul net and victim onto the boat
- Alternately may use a net, tarp, blanket, or lengths of rope in place of a net

Boarding ladder

- Position victim face-to-face with rescuer
- Victim's arms are placed around rescuer's neck, and rescuer reaches under victim's arms to hold and climb ladder
- Victim's legs also are placed around rescuer's waist, supported on rescuer's knees as rescuer climbs ladder

Spine boards and floatation litters

- Secure the victim to the board or litter, prior to lifting
- Valuable when head, neck, or back injuries are suspected

Summary

Ultimately all diving rescues and assists become surface rescues

- Stay alert to signs of a diver in distress
- Reaching or throwing is preferred
- In swimming rescues, stop and access the diver's behavior
- The most likely rescue is a tired diver assist
- Exercise caution in approaching a panicky diver
- With an unconscious diver, get him buoyant and on his back
- Look, listen and feel for respiration
- Initiate rescue breathing as quickly as possible

Chapter 5:

Notes to the Instructor

This chapter again focuses upon factors and circumstances that may directly cause or contribute to a diving emergency, particularly barotrauma and related issues.

Chapter 5: Responding to Emergencies Underwater

Topics in this Chapter:

- Emergencies Underwater
 - Accident Prevention
 - Signs of Trouble Underwater
 - Underwater Emergencies
 - Major Barotrauma
 - Marine Life Injuries
-

Emergencies Underwater

Naturally a diver is exposed to certain risks

- Hyperbaric (high pressure) environment
- Temperature considerations
- Physical hazards including currents, entanglement, and hostile marine life
- Poor judgment: most common factor in accidents

Unconsciousness is the most serious underwater emergency

- The priority is to get an unconscious diver to the surface as quickly as possible

Accident Prevention

Avoid being overtaken by the unexpected

- Pre-dive preparation
- Dive plan

Fine tune the dive plan, during the dive, to accommodate ...

- Changing currents
- Thermoclines
- Surge
- Lingering at areas of interest

Most accidents stem from ...

- Actions by a diver
- Inactions by a diver
- Reactions by a diver

Signs of Trouble Underwater

Watch buddy for indications of a problem

- Slower or faster than normal descent or ascent
- Poor buoyancy control
- Irregular breathing patterns
- Erratic movements
- Lack of attention

Underwater Emergencies

Entangled Diver

- May be avoided by staying aware
- Typically involves tank valve, dangling hoses or gauges
- If entangled: stop activity, maintain self-control, consider options
- Often a diver will be able to back-out of the entanglement
- Sometimes a dive knife or other cutting device will be needed

Carotid sinus reflex

- Sensors, located in neck, control blood pressure to brain
- Tight hood, collar or neck seal can cause reduction in blood pressure
- May result in dizziness, vertigo, or sudden blackout

Carbon monoxide poisoning

- Stems from contaminated compressor intake, or poor compressor maintenance
- CO bonds to hemoglobin, and prevents blood from carrying oxygen
- May result in headache, tightness across forehead, or sudden collapse

Nitrogen narcosis

- Caused by elevated pressure of nitrogen at depth
- May adversely impact thinking and coordination
- Other contributing factors include rapid descent, cold, exertion, fatigue, apprehension, and certain drugs
- Effects subside upon ascent

Squeezes

- Caused by an unequalized air space
- Natural air spaces: middle ears, sinuses, lungs
- Artificial air spaces: mask, dry suit, hood

Major Barotrauma

- Any pressure-related injury

Decompression illness (DCI)

- Broad category of major barotraumas
- Includes DCS, AGE, other over-expansion injury

Decompression sickness (DCS, "bends")

- Dissolved nitrogen comes out of solution upon ascent, forming bubbles
- DCS is avoided by adhering to depth and time limits defined by a personal dive computer or dive tables
- Other contributing factors include rapid ascent, over-exertion, fatigue, dehydration, hypothermia, hyperthermia, older age, poor physical condition, and certain drugs
- Type I: pain, and/or skin rash
- Type II: impairment of sensation, motor skills, thought processes, behavior, and/or vital function
- May occur shortly after the dive, or up to 24 to 48 hours later
- Symptoms often develop gradually, or may quickly cascade

Arterial Gas Embolism (AGE)

- Gas bubble passes across alveoli, enters arterial blood flow
- If bubble lodges in brain, may produce symptoms similar to stroke
- If bubble lodges in coronary artery, may produce cardiac arrest
- Onset of symptoms is often immediate and dramatic

Other lung expansion injury (lung rupture)

- Mediastinal emphysema: escaping gas gathers around heart and lungs, applying pressure on vital organs
- Subcutaneous emphysema: escaping gas gathers under the skin, often near the neck, applying pressure on the trachea
- Pneumothorax: escaping gas gathers in the pleural sac surrounding the lungs, applying pressure and causing a lung collapse

First Aid is the same for all DCI

- Activate EMS / seek medical attention
- Have patient lie down (left side preferred)
- Administer oxygen
- Provide fluids (if conscious)
- Monitor patient

- Treat for shock
- Administer CPR when appropriate

Marine Life Injuries

Punctures – bites and spine wounds

- Control bleeding
- Clean with fresh water and soap
- If spines are embedded in skin, remove if possible
- Apply antiseptic / antibiotic
- Bandage wound
- Seek medical attention when appropriate

Envenomation

- Soak in hot water
- Apply constriction bandage
- Splint the limb, to limit movement
- May be life-threatening; seek medical attention, and be prepared to administer CPR

Stings – jellyfish and corals

- Remove any clinging tentacles (wear gloves)
- Neutralize with baking soda paste or ammonia
- Clean with fresh water and soap
- Sometimes may be life-threatening; seek medical attention when appropriate, and be prepared to administer CPR

Cuts and scrapes – coral and barnacles

- Control bleeding
- Clean with fresh water and soap
- Apply antiseptic / antibiotic
- Bandage wound
- Seek medical attention when appropriate

Summary

Underwater emergencies

- Most underwater accidents stem from a diver's actions, inactions, or reactions
- Unconsciousness is the most serious underwater emergency
- The priority is to get an unconscious diver to the surface as quickly as possible

**Note to instructor: the actual techniques for surfacing an unconscious diver are addressed in Chapter 7*

Chapter 6:

Notes to the Instructor

This chapter details the proper response to a dive emergency, including the in-water rescue itself, attendant administrative duties, and appropriate continuing care once a victim has been removed from the water.

Chapter 6: Dive Accident Management

Topics in this Chapter:

- Dive Site Organization
 - Assessing the Diver's Injuries
 - Basic Life Support
 - Secondary Assessment
 - Five-Minute Field Neurological Exam
 - Shock
 - On-Scene Oxygen Therapy
 - Hypothermia
 - Hyperthermia
-

Dive Site Organization

The Advantage of Organization

- Security of knowing that all support persons are practiced and rehearsed in their roles

Personnel

- On-site: may include instructors, divemasters, divers
- Off-site: public safety / emergency response dive team

Role of rescue team leader

- Initiate the recall signal, to bring all divers back
- Assemble rescue and emergency gear
- Assign rescue divers to assist victim in water
- Assign someone to begin recording events, times, and related information
- Assign someone to summon additional assistance

Appropriate behavior of rescuers

- Respect the dignity of the victim
- Avoid making a fuss about minor incidents
- Do not talk about victim in third person in front of others; use his name
- Stay calm and reassure the victim; remember that even an unconscious person may hear every word that is said, and the victim's mental state may be important to his survival
- Be gentle with other people at the scene

The four R's of accident management

- Recognize
- Respond
- Rescue
- Record

Assessing the Diver's Injuries

Scene survey

- Is there any danger to the rescuer or victim ?
- Should the victim be moved ?

Primary survey – the ABC's

- Airway: open and unobstructed
- Breathing: look, listen and feel for signs of respiration
- Circulation: carotid pulse, or other signs of life

Basic Life Support

Rescue breathing – out of the water

- Head tilt / chin lift
- Administer two full initiating breaths
- If circulation exists, continue with one breath every five seconds

Blocked airway

- First, reposition head and again try rescue breathing
- Then, if blockage continues . . .
- Visually check for obstructions
- Use finger sweep
- Administer abdominal thrusts

One rescuer CPR – Rule of 2's

- Give two full breaths
- Blow for two seconds
- Stack two hands, up two fingers on sternum
- Compress two inches (5 cm)
- Compress almost two times per second
- Compress 15 times, and repeat
- After four cycles (about one minute) check for respiration and pulse

Alternate CPR recommendations

- Some authorities now suggest a rhythm of 30 compressions followed by two breaths
- Some authorities also suggest that compressions should be started immediately, if respiration is absent (without checking for pulse)

Secondary Assessment

When respiration and circulation are present...

- Rescuer may then proceed with further injury assessment, and render appropriate care

Vital signs – periodically check and record

- Respiration: normal is 10 to 20 breaths per minute, and effortless
- Pulse: normal is 50 to 90 beats per minute, and steady
- Skin color, temperature and moisture: skin, nail beds, and inside of eyelids should be pink; skin should be warm and dry

Level of consciousness

- “Alert and oriented” – patient is fully conscious and aware of surroundings
- “Responds to verbal stimuli” – patient answers questions, though may be confused
- “Responds to painful stimuli” – patient cannot speak, but responds to pinching
- “Unresponsive” – patient will not respond to any stimuli, and is fully unconscious

Patient evaluation

- Start at head, then neck, torso, arms, abdomen, and legs
- Check for bleeding, fractures, tenderness, and other apparent abnormalities

Five-Minute Field Neurological Exam

Perform if DCI is suspected, then repeat periodically if medical attention is delayed

- Look for deviations from the expected norm
- Look for differences, one side versus the other
- Look for changes over time

Orientation

- Ask patient his/her name, age, the location, date, and/or approximate time of day
- Evaluate overall alertness

Eyes

- Ask patient to track your moving finger (with both eyes open), and evaluate uniform and fluid movement of eyes
- Check pupil size and reaction to light
- Inquire about blurred vision or other visual disturbances

Forehead

- Check sensation, in response to touch
- Ask patient to raise and lower eyebrows, and evaluate uniform movement

Face

- Ask patient to whistle, smile and/or clench teeth
- Evaluate uniform movement of facial muscles
- Check for equal tension in jaw muscles

Ears

- With patient's eyes closed, rub your fingers together and determine distance from each ear that patient hears this sound
- Inquire about ringing in ears or other hearing disturbances

Gag reflex

- Ask patient to swallow
- Observe movement of Adam's apple and/or neck muscles
- Watch for any difficulty

Tongue

- Ask patient to stick out tongue
- Watch for any drooping or one-sided tendency

Shoulders

- Check sensation, in response to touch
- Ask patient to raise shoulders against resistance, and compare muscle strength

Arms & Hands

- Check sensation, in response to touch
- Ask patient to move arms against resistance, and also ask patient to squeeze your hands, compare muscle strength

Chest

- Check sensation, in response to touch
- Observe general breathing pattern
- Inquire about any difficulty or discomfort

Legs

- Check sensation, in response to touch
- Ask patient to move legs against resistance, and compare muscle strength

Heel-to-toe walk

- Observe patient's balance and coordination (use caution, or omit this exercise completely, on a moving boat)

First aid for suspected DCI

- Activate EMS / seek medical attention
- Have patient lie down (left side preferred)
- Administer oxygen
- Provide fluids, if conscious
- Monitor patient
- Treat for shock
- CPR when appropriate

Shock

What is it ?

- Radical drop in body's fluid levels
- May be caused by considerable loss of blood (internally or externally), or by loss of other fluids through profuse sweating and vomiting
- Also may be caused by any injury or trauma, which triggers dilation of blood vessels and thus significantly reduces blood pressure
- The body is unable to transport sufficient blood, and oxygen, to all tissues
- The brain switches circulation away from other tissues and directs it to itself, the heart and lungs

First aid

- Calm and reassure the patient
- Determine and treat the cause of the shock reaction
- Victim should be placed on his back with his feet slightly elevated (if no head or spine injury)
- Remove wetsuit hood and loosen suit

- Closely monitor vitals signs, and watch for vomiting
- Maintain an open airway
- Administer oxygen
- Activate EMS / seek medical attention

On-Scene Oxygen Therapy

Benefits of oxygen

- May diminish the size of nitrogen bubbles in DCS, easing pains and diminishing long term tissue damage
- May reduce the size of air bubbles in AGE, and help preserve tissues cut off from direct blood flow

Nasal cannula

- Tube-like device, used to deliver oxygen to nostrils
- Constant flow
- Flow should be set at 15 litres per minute
- Delivers only about 30% to 40% oxygen to patient

Non-rebreather mask

- Mask covers patient's mouth and nose
- Has an attached reservoir bag
- Constant flow
- Flow should be set at 15 litres per minute (increase flow to 25 litres per minute, if bag completely deflates upon patient's inhalation)
- Delivers about 70% to 90% oxygen to patient

Demand-type system

- Close-fitting mask, with demand regulator
- Intermittent flow, only upon patients inhalation
- Mask covers patient's mouth and nose
- Delivers 100% oxygen to patient

Hypothermia

Possible signs and symptoms

- Shivering violently
- Somewhat cyanotic
- Slurred speech
- Difficulty walking
- Weakness

First aid

- Gradually warming of patient
- Administer fluids, including warm fluids
- Light physical activity
- Administer oxygen, if cyanotic or exhibiting respiratory distress

Hyperthermia

Signs and symptoms of heat exhaustion

- Muscle cramps
- Dizziness
- Overwhelming tiredness
- Weakness

First aid for heat exhaustion

- Cool the patient
- Remove exposure suit (or loosen clothing)
- Administer fluids
- Administer oxygen, if exhibiting respiratory distress

Signs and symptoms of heat stroke

- Listless and/or unresponsive
- Rapid and stronger than normal pulse (bounding)
- Rapid breathing
- Skin is hot, red, and dry

First aid for heat stroke

- Immediately cool the patient as quickly as possible
- Remove exposure suit (or loosen clothing)
- Administer fluids if conscious
- Administer oxygen
- Treat for shock

Summary

Dealing with dive emergencies

- Recognize, respond, rescue, and record
- Assess the victim's injuries
- Render appropriate first aid, including oxygen

Chapter 7:

Notes to the Instructor

This chapter focuses upon specific procedures relating to “lost and unconscious” divers. These include reasons why divers sometimes become separated from their buddy, organizing a search and procedures for an effective search, and addresses techniques for surfacing with both a conscious and an unconscious diver.

Chapter 7: Lost Diver Search and Recovery

Topics in this Chapter:

- The Missing Diver
 - Organizing the Search
 - Search Patterns
 - Abandoning the Search
 - Assisting a Diver up to the Surface
-

The Missing Diver

Sometimes divers get separated

- One diver may stop, or veer off, to look at something
- One diver may be taking photographs
- Divers may fail to maintain buddy contact
- One diver may encounter a serious problem

If a diver is missing for more than about 10 minutes . . .

- Assume that there is a problem
- Organize a search

Organizing the Search

General consideration

- A well thought-out and planned search will be most productive

Last known point

- Where did the buddy separation occur, or where was it first noticed?
- Where did the other buddy surface?
- Did an observer notice bubbles, or anything unusual?

Gather information – interview buddy

- Circumstances of the dive; anything unusual?
- How deep were they diving?
- How long had they been in the water?
- How much air did the lost buddy have?
- Might the buddy already have exited the water ?

Available personnel

- Don't attempt a solo search for your own buddy; note landmarks, and get help
- Recruit available divers
- Designate a team leader, who will coordinate from shore or boat
- Team leader determines areas to be searched, and by whom
- Do not allow persons to dive beyond their training and ability
- Ensure that divers have sufficient air and allowable bottom time for search

Search plan

- Define the search area
- If necessary, divide a bigger area into easily searched portions
- Designate a well-marked starting point
- Determine a stop point, in advance

Search Patterns

Circular search

- Using a tethered line, the diver swims a circle around a fixed point
- The distance is extended from the fixed point on each revolution
- The maximum distance, from the fixed point, is 30 metres / 100 feet
- Then move to another fixed point, allowing patterns to overlap

Sweep search

- Tender, on boat or shore, directs search pattern
- Using a tethered line, the diver swims back and forth in an arc
- The tender extends the distance on each arc
- The maximum distance, for the tethered line, is 30 metres / 100 feet

Random search

- Useful along shorelines with rocky outcrops and coves, where there are underwater crevices and overhangs, or where swaying kelp is an issue
- Competent free-swimming divers may be employed for these areas
- An observer should be assigned, to watch from shore or boat

Abandoning the Search

After about 90 minutes, survival is unlikely

- Do not endanger other divers by continuing a futile effort
- Public safety / emergency response dive teams are in a better position to make the recovery

Assisting a Diver up to the Surface

Upon making contact with a missing or distressed diver . . .

- First determine what the problem is
- Do not rush into a situation you don't understand
- The correct response will vary, depending on whether the diver is conscious or unconscious

Conscious diver

- Establish contact while out of arm's reach
- Signaling "OK" should provoke some response, and diver may identify the problem
- Before attempting to render assistance, signal your intentions

Ascending with the conscious diver

- Signal the diver to calm down and take a couple of deep breaths
- Move so that diver sees your approach
- Gently and firmly grasp diver under his arm
- Signal to ascend
- Monitor diver and communicate frequently
- If diver fails to vent air from BC, you may need to do it for him
- Ascend at as normal a rate as possible
- Establish positive buoyancy at surface

Unconscious diver

- If there is no response from diver, start immediate ascent
- Ensure that the victim's regulator stays in place
- If diver is not breathing, there is no risk of lung expansion injury
- Vent air from both BC's during ascent
- Ascend at as normal a rate as possible
- Establish positive buoyancy on surface

Summary

In the event of a lost diver

- After about 10 minutes assume there's a problem
- Organize a search
- Get the victim to the surface
- Assess victim and administer appropriate care

Chapter 8:

Notes to the Instructor

DCI mandates medical intervention, and this chapter introduces the participant to the procedures of recompression therapy.

Chapter 8: Recompression Chambers and Therapy

Topics in this Chapter:

- Why Recompression ?
 - Recompression and Decompression Chambers
 - Recompression Therapy
 - Divers, do you know where your chambers are ?
 - Emergency Contact Information
-

Why Recompression ?

Most bubble formation occurs upon ascent after a dive

- Shrinks the bubbles
- With sufficient pressure, gas bubbles can be forced back into solution, resolving the illness

Recompression and Decompression Chambers

Many hospitals use hyperbaric therapy for other illnesses and injuries

- There is no physical difference between a recompression chamber and a decompression chamber
- The only distinction is the application or use of the chamber

Recompression Therapy

Chambers are used to re-pressurize a diver

- Diving is simulated by pumping pressurized air into the chamber, increasing the ambient pressure
- The pressure is increased until the desired “depth” is achieved
- The diver is returned to an equivalent depth, without putting him back in the water
- After some time, the diver is slowly returned to surface pressure
- Multiple treatments may be required

Divers, do you know where your chambers are ?

The rescue does not end on the beach

- Rescue divers need to know where to transport the victim for definitive care
- Local protocol might require that a diver first be evaluated by a medical facility

Emergency Contact Information

For this area

- Emergency Medical Services
- Coast Guard or Marine Police
- Divers Alert Network
- Local hospital / local chamber

Appendix:

- Diver's First Aid Kit
- Student Slate
- Instructor Slates
- Emergency Contact Information (USA)
- Scuba IQ Review Answer Keys

Diver's First Aid Kit

- First aid manual
- TDI/SDI CPROX and CPR-1st slates *
- TDI/SDI Five-Minute Field Neuro Exam slate *
- Oxygen kit with selection of appropriate masks
- Disposable latex or vinyl surgical gloves
- Barrier mask for CPR
- 2 litres of fluid; 1 litre of a sport drink for electrolyte replacement, 1 litre of water
- Topical disinfectant such as Betadine for barnacle and coral scrapes
- Topical antibiotic cream for cuts and scrapes
- Topical anesthetic or anti-itch cream
- 50% hydrogen peroxide, an effective external ear wash
- Eye drops to wash out foreign objects
- Decongestant tablets such as Sudafed to drain blocked sinuses or ears after diving
- Antihistamine tablets such as Chlor-Trimeton to reduce swelling and irritation in ears and sinuses
- Eye dropper
- Gauze squares, 4" x 4", for use as pressure bandages to stop bleeding
- Absorbant pads for bleeding
- Assortment of 'bandaids'
- Self-adhesive surgical dressing to cover large wounds
- Tweezers, scissors, sharp knife or scalpel
- Air-activated heat pads
- Cold packs to reduce swelling of sprains
- Reflective "Space Blanket" for wrapping cold persons
- Plastic bag for the disposal of soiled or blood-contaminated items
- Notebook and pen to record information

Instructor Slates



SDI Rescue Diver Course Open Water Exercises

Out-of-Air Emergency

1. Buddy Dependent Options

Alternate Air Source / Octopus Regulator

Buddy Separation (optional)

2. Buddy-Independent Options

Redundant Air Supplies / Pony Bottle, SpareAir®

Direct Emergency Ascent

Cramp Release

1. Self

2. Buddy-Independent Options

Tired Diver Tow

1. Tank Valve Tow

2. Other Methods (optional)

Distressed Diver at Surface

1. Reaching Rescues

2. Throwing Rescues

3. Swimming Rescues with Flotation Devices

Panicked Diver at Surface

1. Approach: Circle Around and Inflate Victim's BC

2. Approach: Submerged approach at knee level, turn victim, Surface and inflate victim's BC

3. Evade: Swim Backwards, Use Foot to Push Away

4. Control: Grasp Wrist, Pull and Turn Victim

5. Escape: Submerge, Push Up and Away



SDI Rescue Diver Course Open Water Exercises

Unconscious Diver at Surface

1. Rolling a Face-Down Victim

Approached from the Side

Approached from the Head

2. Rescue Breathing

Establish Victim's Buoyancy

Do-Si-Do Technique

Chin-Carry Technique

Use of Pocket Mask

3. Removal of Victim's Gear

4. Removal of Rescuer's Gear

Distressed Diver Underwater

1. Approach

2. Communicate and Calm the Diver

3. Identify and Address the Problem

4. Assist the Diver to the Surface

Unconscious Diver Underwater

1. Approach

2. Protect Regulator in Victim's Mouth

3. Surface the Victim

Removing a Diver from the Water

1. At Shore (dependent upon training site)

Backpack Carry

Two-Person Carry

2. Onto a Boat (dependent upon training site)

Unconscious Person Lift

Roll-Up Net

Boarding Ladder

Spine Board and/or Flotation Litter



SDI Rescue Diver Course Open Water Exercises

Dive Accident Management	
1. Primary Survey	CPR for a non-breathing victim
	Use of barriers
2. Secondary Survey	Injury assessment for a breathing victim
3. Five-Minute Field Neurological Exam	DCI evaluation for a responsive victim
4. On-Site Oxygen Therapy	Oxygen administration for a breathing diver
	Supplemental oxygen with rescue breathing

Missing Diver	
1. Gather Information	Determine Last Point
	Additional Details from Buddy
2. Team Assignments	Team Leader / On-Shore Coordinator
	Call for Assistance
	Record Keeping
	In-Water Search Team
3. Define the Search Area	Start Point
	Stop Point
4. Search Patterns	Circular Search
	Sweep Search
	Other Methods (dependent upon training site)



SDI Rescue Diver Course Open Water Exercises

Final Combined Exercise

Simulated Emergency, as defined by Instructor

Response by Students (without intervention by Instructor)

Review and Critique, by Instructor and all Participants

Notes

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Student Slates

DCS Field Evaluation



Diver (and/or Buddy) Interview

Details of all dive profiles

Check One: Air Nitrox Trimix _____ O₂%

Any unusual events ?	Entanglement
Out-of-Air Emergency	Significant Over-Exertion
Equipment Malfunction	Loss of Buoyancy Control
Buddy Separation	Rapid Ascent
Other:	

Any Prior History of DCS ? No Yes (If yes, enter Date _____)

Any Other Medical Issues ? No Yes (if yes, explain)

Signs and Symptoms of DCS

Skin Rash	Hearing Disturbances
Tingling or Numbness	Visual Disturbances
Joint or Limb Pain	Slurred Speech
Back or Abdominal Pain	Distressed Breathing
Chest Pain or Discomfort	Severe Coughing
Extreme Fatigue	Blood or Froth in Mouth
Loss of Muscle Strength	Paralysis
Loss of Coordination	Convulsions
Dizziness	Unconsciousness
Disorientation	Cardiac Arrest
Neck Swelling	Rapid or Erratic Pulse
Abnormal Sounding Voice	Signs of Shock

First Aid for Suspected DCS

EMS / Medical Attention	Monitor Patient
Patient Laying Down (left side)	Treat for Shock
Provide Fluids (if conscious)	CPR when appropriate

5 Minute Field Neurological Evaluation Exam



This field neurological exam should be conducted immediately whenever DCS is suspected, and then repeated periodically if medical attention is delayed; record all observations, and note the time.

- Look for deviations from the expected norm
- Look for differences, one side versus the other
- Look for any changes over time

Orientation	Ask patient his/her name, age, the location, date, and/or approximate time of day; evaluate overall alertness.
Eyes	Ask patient to track your moving finger, evaluate uniform and fluid movement of eyes; also check pupil size and reaction to light; inquire about blurred vision or other visual disturbances.
Forehead	Check sensation, in response to touch; ask patient to raise and lower eyebrows, evaluate uniform movement.
Face	Ask patient to whistle, smile and/or clench teeth, evaluate uniform movement, and check for equal tension in jaw muscles.
Ears	With patient's eyes closed, rub your fingers together and determine distance from each ear that patient hears this sound; inquire about ringing in ears or other hearing disturbances.
Gag Reflex	Ask patient to swallow, observe movement of Adam's apple and/or neck muscles, watch for any difficulty.
Tongue	Ask patient to stick out tongue, watch for any drooping or one-sided tendency.
Shoulders	Check sensation, in response to touch; ask patient to raise shoulders against resistance, compare muscle strength.
Arms & Hands	Check sensation, in response to touch; ask patient to move arms against resistance and also ask patient to squeeze your hands, compare muscle strength.
Chest	Check sensation, in response to touch; observe general breathing pattern, and inquire about any difficulty or discomfort.
Legs	Check sensation, in response to touch; ask patient to move legs against resistance, compare muscle strength.
Heel-to-Toe Walk	Observe patient's balance and coordination (use caution, or omit this exercise completely, on a moving boat).

Field Neurological Observation Record



This field neurological exam should be conducted immediately whenever DCS is suspected, and then repeated periodically if medical attention is delayed; record all observations, and note the time.

- Look for deviations from the expected norm
- Look for differences, one side versus the other
- Look for any changes over time

Name of individual(s) being examined:

Time (hr : min)	:	<input type="checkbox"/> +15 minute	<input type="checkbox"/> +15 minute	<input checked="" type="checkbox"/> +15 minute
Orientation				
Eyes				
Forehead				
Face				
Ears				
Gag Reflex				
Tongue				
Shoulders				
Arms & Hands				
Chest				
Legs				
Heel-to-Toe Walk				

Field Neurological Notes:



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Emergency Contact Information (USA)

- **DAN / Divers Alert Network**
 - Diving Emergencies: 919-684-8111 (24 hours, collect, worldwide)
 - Diving Emergencies: 919-684-4DAN (24 hours, collect, worldwide)
 - Non-Emergency Information: 919-684-2948
- **US Coast Guard:** Marine Radio VHF Channel 16 (monitored continuously)
- **EMS / Emergency Medical Services :** Dial 911 (countrywide)

Scuba IQ Review Answer Keys

Chapter 1:

Scuba I.Q. Review

1. What does the term “self-reliant” diver mean?

The ability to look after all your problems underwater without assistance from your buddy

2. A diver's sense of awareness underwater is made up of what two components?

Self awareness

Global awareness

3. List three essential parts of a good dive plan.

Physical preparation

Mental preparation

Equipment preparation

4. What two broad categories of options describe responses to out-of-air emergencies?

Buddy Dependent

Buddy Independent

5. When might a diver favor a buddy-independent response to a buddy-dependent response in an out-of-air emergency?

In depths of less than 30ft (9m), the surface is only seconds away; considering the time it might take to employ another option, a direct ascent might make more sense with less risk to either diver

6. Describe two self-rescue options for an out-of-air diver at a depth of 20' (6 m).

Redundant Supply Ascent

Direct Ascent

Important: Do not sign the following until told to do so by your instructor.

“I have reviewed this information with my instructor and understand the correct response to each item.”

Chapter 2:

Scuba I.Q. Review

1. What are some common sources of pre-dive stress?

Diving in new and unfamiliar sites

Adverse conditions

New diving activities (such as first night dive)

Peer pressure

Diving with a new buddy

Using new or unfamiliar equipment

2. How might you recognize stress in your dive buddy?

Withdrawal

Hyperactivity

Constant talking

Gear fumbling

Inappropriate or dark humor

Moodiness

3. Describe some ways you might help reduce pre-dive stress in yourself and a buddy.

Separate fact from fiction,

Conduct a good dive briefing

Conduct a good buddy check

Talk to the dive leaders

Visualize the dive

4. How can visualization be helpful to a scuba diver?

Can be used to forecast possible events, to prepare for the unexpected events of the dive, having an idea of what might go wrong at critical moments will help you consider an appropriate response before the problem arises.

5. What factors may cause stress and panic in a diver while underwater?

Poor visibility

Cold temperatures

An out of air emergency

Over exertion and/or breathing difficulty

Leaking mask

Buddy separation

Inability to keep buoyancy under control

The feeling of general discomfort in the water combined with a sense of inability to help themselves out of a crisis

6. What dangers does the rescuer face when attempting to help a panicky diver?

The possibility of loss of the regulator and mask, dropped weight belt and an exhausting struggle

7. Why do alterations in breathing patterns affect a struggling or panicky diver?

It increases the feeling of suffocation and panic. This condition will rapidly result in exhaustion due to hypoxia (lowered blood level of oxygen) and the increasing sensation of air starvation due to the elevated level of the “trigger gas”, carbon dioxide.

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Signature: _____ Date: _____

Chapter 3:

Scuba I.Q. Review

1. List four common problems that may lead to diving accidents.

Exceeding prior experience and training

Cold or tired diver

Muscle cramps

Overweighting

Currents

Equipment

2. Relative to the observer on the shore, in which direction do the tides run?

Parallel to the shoreline

3. What is one way of solving the problem of divers being unable to swim back to the dive boat against the current?

Trail a long, floating drift line aft of the boat.

Run a water level line from the entry point to the descent line.

4. What are rip currents? How are they formed?

Rips are relatively high-speed currents that move out to sea from the shore. They may be produced by high tide waters accumulating behind barrier reefs and then flowing to the sea with great force as the tide changes. Rips may also be produced by currents that move parallel to the shoreline.

5. Describe the danger of strainers to river divers.

The diver can become entangled or caught in debris and unable to free themselves due to the current holding the diver in place.

6. Why are low-head dams and other hydraulics so dangerous to divers?

A diver may be carried to and pinned on the bottom by the relentless current.

7. The water need not be freezing cold for a free-flow or freeze up to occur.

Why is this so?

A deep dive with its associated high air demands and thus cooling effect of air passing through valve stems, may be sufficient to cause ice to form.

8. What kinds of injuries might you expect to find on a diver struck by a boat?

Head injuries are a typical result though broken arms, collarbones and neck injuries are frequent as well.

9. List the four ways in which our bodies lose heat to the environment.

Perspiring and losing heat through evaporation

Warming the air in contact with the skin (conduction)

Removing warm air from around skin (convection)

Emitting infrared radiation

10. Describe the two main methods the body uses to manage heat loss in cold water.

Shivering

The brain constricts the blood vessels under the skin, and directs the blood primarily towards the lungs and major organs

11. Discuss the dangers of diving in overhead environments without specialized training.

No direct access to the surface

Disorientation

Silt-out

Falling objects

Entanglement hazards

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Signature: _____ Date: _____

.....

Chapter 4:

Scuba I.Q. Review

1. What signs might signal to an observer that a diver on the surface may be in distress?

Encountering or observing a diver alone, divers observed in unlikely areas, unusual bubble patterns, a diver at the surface who is either very high or very low in the water

2. Why is a reaching or throwing response the preferred way of assisting a diver to shore or to the boat?

This keeps us from having to enter the water and is actually a speedier response

3. Why is it prudent to stop at least 15 ft. (5 m) away from a diver whom you think might be having problems?

To observe the behavior of the victim and insure they are in control

4. Why is panic the leading cause of diver accidents?

A panicked diver loses self-control and as such is unable to take care of himself

5. What are the best steps to follow in assisting a panicked or struggling diver?

Approach the diver cautiously, talking to the diver; watch your own safety; establish the diver's buoyancy; assist to safety

6. The most likely rescue scenario in aiding a fellow diver is...?

A tired diver assist

7. An unconscious, breathing diver on the surface is in extreme danger of ?

Inhalation of water, and drowning

8. How do we determine if a person is breathing?

Look, listen, and feel; the victim's skin color also may be a good indication of respiration

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Signature: _____ **Date:** _____

Chapter 5:

Scuba I.Q. Review

1. What indicators might warn you that your buddy may be experiencing problems?

Poor buoyancy control, irregular breathing pattern, erratic or jerky movements, not maintaining buddy contact, disorientation

2. What are the watchwords to keep in mind in any underwater problem?

Stop your activity, keep your self-control and consider your options

3. Describe the carotid sinus reflex.

When external pressure is applied to the carotid arteries or to the sinuses themselves, the sinuses will react with a reduction in blood pressure and thus a reduction in oxygen to the brain

4. What is the danger of carbon monoxide contamination in a diver's air supply?

CO binds readily to hemoglobin, more so than oxygen, leading to insufficient oxygen to vital organs

5. What is the best way to deal with nitrogen narcosis problems?

Narcosis passes quickly as the diver rises to shallower depths and disappears completely on ascent

6. Describe the physics of an ear squeeze.

An imbalance of pressure outside pressing on the eardrum and causing it to flex inward

7. Why is the BC a factor in dry suit squeezes?

Divers who use their BC to control their buoyancy may suffer a suit squeeze if air is not added to the suit

8. What is a barotrauma?

Any pressure related injury

9. Why is recommended ascent rate only 30 ft (9 m) per minute?

Most dive computers have an ascent rate of 30 ft per minute, allowing the diver's physiology to catch up with the physics

10. List some contributing factors to the occurrence of decompression sickness.

Dehydration

Hypothermia and heat related injuries

Working hard

Poor physical condition

Heavy smoking

Alcohol abuse or abuse of other drugs

Fatigue before the dive

Obesity

Dive conditions

11. What is the difference between Type I and Type II bends?

Type I: May produce a rash like reddening of the skin, usually on the upper body and arms and may be accompanied by mild, transient joint pain; joint pain is more common and often exists in the absence of skin involvement

Type II: Any sign that demonstrates impairment of motor skills, thought process, or behavior

12. What is the on-scene treatment of choice in the event of decompression sickness?

Keep the victim calm, cool and relaxed. Deliver high flow oxygen to the victim for as long as possible during transport to a dive physician

13. How does a lung over-expansion injury happen?

Temporary or permanent lung blockage, breath holding

14. List the most common signs and symptoms of a lung over-expansion injury.

Shortness of breath, pain in the center of the chest, rapid erratic pulse, signs and symptoms of shock, swelling around the neck, possible voice changes

15. Why is a lung over-expansion injury immediately life threatening?
Bubbles of air that escape from the lungs can travel to all parts of the body

16. Why is decompression sickness a venous gas embolism and bubbles in the blood from a lung over-expansion injury an arterial gas embolism?
Arterial gas embolism takes place on the arterial side of the circulation as air moves through the alveoli into the blood, as opposed to DCS nitrogen bubbles on the venous side of the circulation where bubbles form as the nitrogen is moving out of the tissues and back towards the lungs

17. Describe the signs and symptoms of a venomous puncture wound from a lionfish or stonefish.
Punctures from the spines produce an immediate intense pain that persists for many hours; the victim may show signs of weakness, nausea and vomiting; cardiac arrest is possible

18. Describe how you would handle the tentacles of a stinging jellyfish.
With gloves

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Chapter 6:**Scuba I.Q. Review**

1. Why is good, general dive site organization a benefit in the event of a diving accident?

The security of knowing that all support persons are practiced and rehearsed in their roles

2. List and explain the four R's of the emergency plan.

**Recognize
Respond
Rescue
Record**

3. Who is the most important person on the accident scene?

You are the most important person on the accident scene

4. What is meant by the A, B, C's of the Primary Survey?

**Airway
Breathing
Circulation**

5. What are the indications that CPR should be begun on a diving accident victim?

You have established that the victim is not breathing, and has no pulse or other signs of life (not specifically stated in text)

6. What will we measure and record on the Secondary Survey?

**Vital signs
Level of consciousness
Patient evaluation**

7. Describe the steps in a field neurological examination.

**Orientation
Muscle Strength
Eyes
Sensory
Swallowing reflex**

8. How often should the Secondary Survey and neuro exam be repeated?

Every 15 minutes

9. What is shock and how do we treat it?

Shock: because of loss of fluids, the body is unable to provide blood and oxygen to all tissues; the brain then switches circulation away from the other tissues and directs it only to itself, the heart and lungs

Treatment: calm and reassure the patient, determine and treat the cause of the shock reaction, victim should be placed on his back with his feet slightly elevated, remove wetsuit hood and loosen suit, monitor vitals closely, maintain an open airway and watch for vomiting, give oxygen and get help

10. Why is oxygen therapy so valuable in treating diving injuries?

Oxygen may diminish the size of nitrogen bubbles in DCS, easing pains and diminishing long term tissue damage; it can also reduce the size of air bubbles in AGE, as well as help preserve tissue cut off from direct blood flow

11. List and describe the main methods of delivering oxygen to the patient.

Nasal cannula

Non-rebreather mask with reservoir bag

Demand type regulator

12. How do we recognize hypothermia?

A diver suffering from moderate hypothermia will be shivering violently, be somewhat cyanotic, may slur his speech, have difficulty walking and will appear weak

13. What are the signs and symptoms of heat exhaustion and heat stroke?

Heat Exhaustion: the diver will be pale and sweating profusely in a desperate attempt to cool himself and will be beginning to suffer from fluid loss as well

Heat Stroke: the victim will be listless, possibly unresponsive, with a rapid, stronger than normal pulse (bounding) rapid breathing and the skin will be hot, red, and dry

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Signature: _____ Date: _____

Chapter 7:

Scuba I.Q. Review

1. What kinds of information do we need to gather to plan an underwater search?

The last known point and where the buddy surfaced; the circumstances of the dive; how deep they were diving; how long they had been in the water; and how much air the lost diver had left in his tank

2. List the three major components in any underwater search pattern.

Define a search area

Define a start point

Define a stop point

3. When might we use free-swimming divers to conduct random searches?

Along shorelines where there are many rocky outcrops and coves, or where underwater there are crevices and overhangs, or anywhere kelp is long and subject to swaying from the surge

4. How would you bring a conscious, but confused diver to the surface?

Signal the diver OK, slow down and take a couple of breaths to relax; approach the diver, then gently and firmly grasp him under the arm while signaling to ascent with your other hand; if he fails to vent his BC you'll have to do this for him as well as yourself; maintain control and continue to signal the diver to relax and breathe normally; monitor the diver constantly and communicate with him frequently; ascend at as normal a rate as possible by using good buoyancy control

5. If the diver is breathing, but unresponsive on the bottom, what would our main concern be as we bring him to the surface?

To make sure the victim's regulator stays in place during the ascent

6. Why is a lung over-expansion injury not a serious consideration when bringing an unconscious, non-breathing victim to the surface?

An unconscious person is not holding his breath, thus the expanding air will vent on ascent

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Signature: _____ Date: _____

Chapter 8:

Scuba I.Q. Review

1. What is the value of recompression in decompression sickness accidents?
Subjecting the diver to pressure shrinks the bubbles; with sufficient pressure, gas bubbles can be forced back into solution, resolving the illness
2. What is the difference between decompression chambers and recompression chambers?
The only distinction is the application or use of the chamber
3. How does a chamber simulate descending to depth?
Diving is simulated by pumping pressurized air into the chamber and, thereby increasing the ambient pressure, until the desired "depth" is reached
4. Do you know where the nearest chamber is to your frequent dive sites?
(class discussion)

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