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As SCUBA divers age, increased scrutiny must be given to providing medical clearance for this population

There are few criteria (except perhaps for cardiac conditioning) that provide medical guidelines for older divers to continue recreational SCUBA diving.

This presentation provides information to help make medical decisions to clear older individuals for recreational SCUBA diving activities

Three domains should be considered for making these decisions. The domains are based on the following sources of information:

- Literature reviews
- Personal interviews
- Personal experiences of [several of] the authors
- Direct observations of older divers

Each domain has absolute, relative and no contraindications for recreational SCUBA diving

Musculoskeletal System	Cardiovascular Pulmonary	Nervous System Sensory Organs	Endocrine Metabolic/Skin	Miscellaneous (GI, GU, etc.)
<ul style="list-style-type: none"> • Decreased speed of activity • Decreased endurance • Decreased bone & muscle mass • Decreased flexibility and joint ROM's • Decreased height/ disc collapse • Decreased ability & increased time for injury recovery • Increased muscle stiffness after activity 	<ul style="list-style-type: none"> • Decreased cardiac output/increased BP • Atherosclerotic vessel changes • Heart valve incompetence • Heart conduction abnormalities • Decreased ventilatory capacity & reserve • Increased ant-post diameter of chest • Impaired gas exchange 	<ul style="list-style-type: none"> • Improved judgment & reasoning ability • Decreased low light & color perception • Farsightedness • Decreased auditory acuity • Balance & proprioception decrements • Decreased eye-hand coordination • Decreased reaction time 	<ul style="list-style-type: none"> • Decreased cold tolerance • Atrophic changes of skin • Decreased metabolic rate/weight gain • Decreased bone mass • Decreased response to stress • Altered drug metabolism • Decline of lean body mass 	<ul style="list-style-type: none"> • Impaired food, vitamin & mineral absorption • Increased urinary urgency, nocturia, frequency & incontinence • Delayed gastric emptying • Increased risk of DCS, greater risk for serious injury and higher percentage of incomplete recovery

1. Older age is not a contraindication for recreational SCUBA diving. Physiological rather than chronological age is the important consideration
2. When making decisions for older persons to SCUBA dive the domains of fitness, co-morbidities and mobility/strength must all be considered. As a person ages, these considerations become increasingly important
3. With increased judgment and reasoning ability from diving experiences, appropriate selection of diving sites, use of proper equipment and properly prescribed medications, etc. older age itself is not a contraindication for diving
4. When an older diver plans to initiate or resume SCUBA diving activities after a prolonged hiatus, the health care provider should thoroughly screen for co-morbidities and assess the patient's abilities to perform adequately in the areas covered on this presentation.

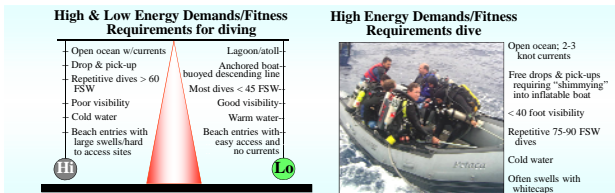
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Mobility/Strength

Definition Readiness, especially cardiovascular and respiratory, relating to the ability to perform tasks requiring increased expenditure of energy (e.g. extrication from diving emergencies)

Standards for Diving None exist for the recreational SCUBA diver; Bove recommends the ability to do 13 METS (metabolic equivalents) of exertion on a treadmill test for divers

Practical Considerations Pair the diving activity with the level of fitness anticipated to be necessary to safely do it. Pre-dive planning and dive site selection are practical considerations to match the divers level of fitness with the challenges of the dive. Some SCUBA diving can be anticipated to require more levels of fitness than others.



Our Recommendations

1. The older diver should select activities (types & locations) that are commensurate with his/her levels of fitness, mobility/strength and anticipated level of swimming needs for the dive
 - Limit depths of the dive to the distance that can be swum underwater easily in a pool after a single breath (e.g. 20 yard swim = 60 FSW depth)
 - Limit expected swimming distances for the dive to that which can be comfortably swum at a reasonable rate with fins (e.g. 100 yards in 2 minutes).
2. "Fitness to dive" should be based on "physiological" age and ability to do sustained aerobic activities (e.g. running, bicycling, swimming, kayaking, etc.) rather than chronological age
3. The older diver should assiduously adhere to diving safety practices (e.g. use most "conservative" settings on dive computers, do slow ascent rates and rest stops, carry safety/signaling equipment, take a break after several dives of diving, etc.)

Definition Other medical conditions that co-exist with the primary condition; for our purposes the primary condition is “older age” i.e. older than 50

Standards for Diving There is general agreement as to what medical conditions constitute absolute, temporary, relative & no contraindications for SCUBA diving

Medical Contraindications to SCUBA Diving (CSD)			
Absolute	Temporary	Relative*	No CSD
Altered mental state, psychotic disorders, severe personality changes, decompensated heart failure, chronic pulmonary cysts	Acute blood loss anemias	Asthma	Breast implant surgery
Chronic decompensated heart failure, chronic pulmonary cysts	Acute anginal infarction	Concurrent CVD conditions with medicines or surgery; Patent foramen ovale	Headed abdominal surgeries (e.g. appendectomy)
Dissecting aortic aneurysm, cardiovascular CVD conditions	Acute upper respiratory tract infection	Degenerative joint disease;	Hoisted ligament or muscle injuries
History of DCS/ARDS or residuals	Healing fractures or other surgical wounds	Diabetes Mellitus	Healed radial keratotomy/Lasik
History of TI/Arteriosclerosis of CVDs; debilitating neurological disorders	Pregnancy	Hypertrophic cardiomyopathy	Mild obesity
	Repaired tympanic membrane	Hematological abnormalities	Minimal disorder
	Severe deconditioning after inactivity or sedentary	Major limb amputation	Severe moderately impaired vision
Significant middle inner ear disease		Moderate-to-marked obesity	Menstruation

Note: While this list is comprehensive it is not all-inclusive; to be all-inclusive every disorder in a medical text would need to be addressed

*Relative CSD indicates that with special provisions/considerations recreational SCUBA diving is permissible

Practical Considerations Medical co-morbidities (above table) that impose absolute or temporary limitations for SCUBA divers are, in reality, independent of age

However, the older the diver, the more likely medical contraindications to continue recreational SCUBA diving will develop or already be co-existent

<>Older-aged Divers: 200 Chronological Years<>

Fitness Considerations A 65 year old male diver maintains an avid interest in SCUBA diving. Typically he dives four to five times a year at exotic dive locations doing as many as five dives a day.

Although not a "cardio" exercise fanatic, he maintains good health practices, weight control and exercise through his modeling activities in between dining activities.

He carefully selects dive locations that do not have high fitness demands such as reef, lagoon, warm water and excellent visibility and uses underwater lines for ascents & descents. He

follows recommended ascent rates and 15 foot/3 minute rest stops faithfully. He uses a dive computer set to the most conservative mode, does not dive over 60 foot depths and never

Comments: This diver exemplifies our age-related fitness recommendations. Diving fitness is maintained by his nearly

Co-morbidity Considerations A 67 year old male diver who exercises almost daily with kayaking, bicycling or swimming required coronary artery bypass stenting for angina.

He resumed his exercise activities with no restrictions including

SCUBA diving. The major concern from SCUBA diving was felt to be bleeding from anticoagulation should a traumatic injury occur. However, he felt that there was no more risk of this occurring with recreational SCUBA diving than with his

Comments: This diver's co-morbidity, i.e. a compensated CV condition, is a relative contraindication to diving. His work

conditioning makes fitness and mobility/strength considerations essentially "non-concerns" with respect to being an older SCUBA diver. Nonetheless, he dives conservatively limiting

Mobility/Strength Considerations A 68 year old male developed increasingly severe degenerative joint disease symptoms in his left hip. A cane became necessary for all walking activities.

the water, his swimming ability & conditioning compensated for the decreased mobility of his hip joint. While immersed, his hip pain symptoms were almost absent.

With each successive year of diving activities it became increasingly difficult to don and doff gear, carry the gear when suited-up and make water entries/exits. A beach-entry dive almost became an impossibility. For example, to do a beach entry is

With a total hip replacement the pain, strength and mobility problems were obviated.

Comments: The need for a total joint arthroplasty (TJA) is a relative contraindication to diving. When fitness and co-morbidity considerations are absent or well managed, a locked fixation



Diving platforms and equipment demonstrate a continuum of mobility/strength requirements for donning/doffing gear & for entering/exiting water

Our Recommendations

1. The older-aged diver should select non-diving exercise activities that help maintain joint flexibility and muscle strength as well as cardiac conditioning
2. Anticipate the older diver to stop diving activities when mobility/strength considerations no longer make diving "fun"