Suggested assessment for divers with diabetes

(Extract from The SPUMS diving medical 6th edition,2025)

Introduction

Diving by individuals with diabetes has been one of the most controversial issues in 'fitness to dive' for several decades. A report from a joint UHMS/DAN workshop in 2005, has summarised the position.

Diabetes and diving

Selection of appropriate individuals with diabetes, including Type 1, Type 2 and prediabetes who could be considered suitable for diving is important because many of the acute and chronic complications of diabetes have potentially profound risks during and after diving. A summary of the major concerns is given in Table 1.

Complication	Potential interaction with diving
Hypoglycaemia	- May be precipitated by stress, cold and exercise during diving - Potentially catastrophic consequences due to impaired mentation and consciousness underwater - Impending symptoms may be less likely to be noticed during diving - Potential for confusion with symptoms of DCI or other possible problems such as hypothermia or sea sickness
Hyperglycaemia	- May augment dehydration stress; a possible risk factor for DCI - May worsen outcome in neurological DCI
Coronary artery disease	- Impairment of exercise tolerance - Possibility of myocardial ischaemic event
Resetting of hypothalamic glucose control	- Release of adrenaline during hypoglycaemia occurs after neuro-glycopenia and patient may become incapacitated before noticing hypoglycaemic symptoms: a phenomenon known as "hypoglycaemia unawareness"
Autonomic neuropathy	- Blunting of adrenaline release expected when blood glucose falls thereby worsening potential for hypoglycaemia
Peripheral neuropathy	- Possible confusion with signs of DCI
Peripheral vascular disease	- Impairment of exercise tolerance
Renal impairment	- Multiple possibilities depending on severity

Table 1. Acute and chronic complications or associations recognized in diabetes, and potential interactions with diving

Diabetes is associated with an increased risk of cardiovascular disease, particularly coronary artery disease, which is the leading cause of death among diving fatalities. Diabetes is also

associated with peripheral vascular disease, peripheral neuropathy, autonomic neuropathy, kidney disease and eye disease that may all impact an individual's ability to dive safely. The progressive nature of many complications of diabetes suggests there should be longitudinal health surveillance and periodic reassessment of suitability over the period of the individual's participation in diving.

Divers with diabetes should always have immediate access to the surface and adopt a strategic approach to management of blood glucose during a diving day.

Which people with diabetes may be able to dive?

The following criteria are appropriate for recreational dive training for a candidate with diabetes:

1. Aged 18 years and over.
2. At least three months have passed since the initiation of treatment with oral hypoglycaemic agents (OHAs) or one year since the initiation of treatment with insulin; an appropriate observation period has been imposed after introduction or major change of medication.
3. No hypoglycaemic episodes requiring intervention from a third party for at least one year, and no history of hypoglycaemia unawareness, where there has been significant hypoglycaemia that has not been recognised by the individual.
4. HbA1c ≤ 9% when measured no more than three months prior to initial assessment and at each annual review.
5. No admissions or emergency visits to hospital for any complications of diabetes for at least one year.
6. There are no known microvascular complications (microalbuminuria, peripheral or autonomic neuropathy, any retinopathy greater than background retinopathy) or any macrovascular complications such as significant coronary artery disease or peripheral vascular disease.
7. Prior to the first diving medical assessment (see 8) and at each annual evaluation, a review must be conducted by the candidate's physician managing their diabetes who must confirm that:
    - criteria 3 – 6 are fulfilled
    - the candidate has a good understanding of the relationship between diet, exercise, stress, temperature and blood glucose levels.
    - where appropriate, the candidate demonstrates accurate use of a personal blood glucose monitoring device glucose monitoring device
8. Prior to commencing diving for the first time and at each annual review, a diving medical examination must be performed by an appropriately trained diving medical examiner. This examination will include appropriate assessment of exercise tolerance. For candidates over 45 years of age, a referral to a cardiologist should be strongly considered. (See Appendix A) The report from the physician managing the diver's diabetes must be available.
9. As part of the assessment by the diving medical examiner, the candidate must acknowledge (in writing);

- receipt of and intention to use the recommended diabetic diving protocol (see below).
- the need to seek further guidance if there is any material that is incompletely understood.
- the need to cease diving and seek review if there are any adverse events in relation to diving suspected of being related to diabetes.

10. Steps 2 – 9 of this protocol must be fulfilled on an annual basis. Where possible the same diabetic physician and diving medical examiner are used for these annual reviews.
11. Divers with diabetes are unsuitable for occupational diving, which involves focus on a task or purpose that demands attention and concentration. This will inevitably detract from self-monitoring and is not recommended.

Scope of diving

The following restrictions should apply to persons with insulin requiring diabetes undertaking recreational diving.

1. In between dives there should be a minimum surface interval of 1 hour. It is recommended that there be longer surface intervals between subsequent dives after the 2nd dive of the day.
2. Ensure that no meals are missed and that there is adequate fluid intake during the day.
3. Dive with a dive partner without diabetes who must be informed of their condition and aware of appropriate response in the event of hypoglycaemia. Use of appropriate hand signals, such as an "L" sign (signifying "Low") for potential hypoglycaemia is encouraged.
4. No diving where immediate safe access to the surface is not possible. No dives with mandated decompression stops that are deeper than 30 metres or dives with an overhead environment. This allows for unrestricted access to the surface in case of hypoglycaemia.
5. Avoid dives longer than 1 hour duration or circumstances that may provoke hypoglycaemia (such as arduous dives in cold water or those involving very strenuous exertion).
6. Carry oral glucose in a readily accessible and ingestible form at the surface and during the dive. Ensure parenteral glucagon is available at the surface and the dive partner or other persons on the surface are knowledgeable in its administration.
7. Divers with diabetes should undergo training within a programme designed specifically for that purpose, or with a training facility that has experience in teaching diabetic divers requiring insulin.

Hypoglycaemia and diving

All individuals with Type 1 diabetes and those with Type 2 diabetes who are taking insulin are at risk of having a hypoglycaemic episode while diving. The risks of a hypoglycaemic episode with a blood glucose level of <4 mmol/L include confusion, seizures and death.

Symptoms of hypoglycaemia including confusion and a slowing of responses to tasks may be confused with other conditions such as nitrogen narcosis, oxygen toxicity and

decompression illness. Signs of hypoglycaemia such as sweating and a fast heart rate may be masked underwater.

Blood glucose management on the day of diving for insulin requiring diabetics

The following protocol is taken from the Divers Alert Network guidelines for divers with diabetes and is reproduced with permission.

Divers with diabetes with either Type 1 diabetes or Type 2 diabetes who take insulin should use this protocol to manage their health on the day of diving:

1. On every day on which diving is contemplated, the diver must assess themselves in a general sense. If they are uncomfortable, unduly anxious, unwell in any way (including sea sickness), or blood glucose control is not in its normal stable pattern – DIVING MUST NOT BE UNDERTAKEN.

2. The diver should establish a blood glucose level (BSL) of at least 8 mmol/L and ensure that this level is either stable or rising before entering the water. Measurements should be taken 3 times before diving: at 60 minutes, 30 minutes and immediately prior to gearing up. Diving should be postponed if blood glucose is < 8 mmol/L, or there is a fall between any two measurements.

3. Attempts to comply with the requirements at 2 (above) should not result in a blood glucose level greater than 14 mmol/L, and diving should be cancelled for the day if levels are higher than 16 mmol/L at any stage.

4. Divers must carry oral glucose in a readily accessible and ingestible form at the surface and during all dives. We strongly recommend that these divers also have parenteral glucagon available at the surface. If premonitory symptoms of hypoglycaemia are noticed underwater, the diver must surface, establish positive buoyancy, ingest glucose and leave the water. An informed buddy should be in a position to assist with or initiate this process, including the administration of glucagon should this be required.

5. Blood glucose levels must be checked at the end of every dive. The requirements for blood glucose status outlined at point 2 remain the same for any subsequent dive. In view of the recognised potential for late decrements in blood glucose levels following diving, BSL should be checked 12–15 hours after diving.

6. Divers are strongly recommended to drink between 1000 and 1500 ml of extra water over a period of several hours prior to their first dive of the day.

7. Divers must log all dives, associated diabetic interventions, and results of all blood glucose level tests conducted in association with diving.

This protocol should be combined into an information package to be given to the diver with diabetes by the examining doctor on completion of their diving medical examination.

Refer to The SPUMS diving medical