



Regulation 28 report - H.M. Senior Coroner for Gloucestershire - BDSG response

This document is prepared by the British Diving Safety Group ("BDSG" through its members) in response to a Regulation 28 report issued by HM Senior Coroner for Gloucestershire, Ms Katy Skerrett, dated 5 January 2022.

Members include:

Training Agencies:

- **BSAC** ([*British Sub-Aqua Club*](#))
- **IANTD** ([*International Association of Nitrox and Technical Divers*](#))
- **PADI** ([*Professional Association of Diving Instructors*](#))
- **PSAI** ([*Professional Scuba Association International*](#))
- **SAA** ([*Sub Aqua Association*](#))
- **ScotSAC** ([*Scottish Sub-Aqua Club*](#))
- **SSI** ([*Scuba Schools International*](#))
- **TDI/SDI** ([*Technical Diving International/Scuba Diving International*](#))

Other Diving Organisations:

- **BDSG** ([*British Diving Safety Group*](#))
- **DDRC** ([*Diving Diseases Research Centre*](#))
- **DDST** ([*Defence Diving Standards Team*](#))
- **IDEST** ([*Inspectorate for Diving Equipment Servicing & Testing*](#))
- **MCA** ([*Maritime and Coastguard Agency*](#))
- **RNLI** ([*Royal National Lifeboat Institution*](#))
- **SITA** ([*Scuba Industries Trade Association*](#))
- **UKDMC** ([*UK Diving Medical Committee*](#))

What is the BDSG?:

The BDSG was formed in 2002 to promote and improve safety for amateur sub-aqua divers in the UK and when diving abroad. The BDSG is made up of representatives from organisations involved in training, regulatory, governance, diving medicine and support of amateur sub-aqua diving.

Immersing yourself in a body of water is a hazardous activity, however, risks can be mitigated to reasonable and acceptable levels with proper training, well maintained equipment and an appropriate level of mental and physical fitness for the activity being undertaken.

In spite of a great deal of work undertaken by BDSG and others to promote an understanding of the symptoms of Immersion Pulmonary Oedema (IPO) and how it tends to manifest itself in diving incidents, the overall impression of the BDSG members is that there exists a significant disparity between recreational divers' awareness of DCI (Decompression Illness) and their awareness of IPO.

IPO:

[UKDMC - What is Immersion Pulmonary Oedema \(IPO\)](#)

IPO can occur whenever a person is immersed in a body of water. Some studies show that even very fit individuals such as tri-athletes, can suffer with IPO during the swim phase of their competitions. US Navy Seals have been found to suffer with IPO when they carry out long strenuous surface swims and in their cases, they often suffer the effect only in one lung because they swim "side-stroke", and the centroid of one lung is lower in the water than the other.

When did the BDSG begin discussing the risks of IPO?:

The BDSG and its members first discussed IPO on 10th November 2016. At that meeting, the BSAC officer responsible for preparing the National Diving Incident Report presented the report which raised concerns based on the research undertaken by Dr [REDACTED] (who we understand gave evidence at the inquest in which the Regulation 28 report arises), that IPO may have been a significant factor in diving fatalities. We agreed at that time that further investigation and monitoring was necessary.

Pre-testing for IPO:

There is no screening test that can definitively determine whether an individual will suffer from IPO, but there are a number of known factors which increase the likelihood of an individual being subject to IPO. Completing either the UHMS (Undersea and Hyperbaric Medical Society) or UKDMC (UK Diving Medical Committee) medical declaration form prior to any training/diving taking place helps in identifying the known risk factors.

With respect to diving medicals, assessments and the self-declaration tools, the UK diving population, who are members of a club or training organisation are divided into two groups, BSAC/ScotSAC and SAA, use the UKDMC medical self-assessment, while everyone else uses the UHMS tool.

Given that physical health is an important factor when diving, the two medical assessment forms have been updated in the past 2-3 years to include sections specifically to screen for a person's susceptibility to IPO.

The Matter of Concern #1:

“Whether there is sufficient awareness of the risks & affects of Immersion Pulmonary Oedema (IPO) by those engaged and/or participating in the activity of diving?”

Report #1:

IPO was first discussed at the BDSG on 10th November 2016. It was agreed at that meeting, further investigation and monitoring was necessary.

Since 2016, almost every meeting has included further discussions and updates on IPO, with specific action points for members. Those members tasked with action points are then required to report on their progress at the following meeting(s).

The BDSG members believe that whilst IPO presents a significant risk to divers, fatalities can be prevented. However, it is difficult to build a convincing case to show the dangers of IPO and get people to acknowledge and take the risk seriously, without evidence to properly quantify the risk and the sheer scale of the issue.

Furthermore, the BDSG members believe IPO has been the cause of death, or the provocative factor (the trigger that leads to death), in a number of diving fatalities, but may have been misdiagnosed as drowning or barotrauma. Dr [REDACTED] certainly shares this view.

BDSG’s concern

The BDSG is concerned that the number of IPO cases has been greatly understated. A review of historic incidents is being carried out and the “IPO implicated” number shown below are cases where there is a clear indication of IPO involvement. That review is continuing, so the number where IPO was implicated is likely to increase.

From the National Diving Incident Reports compiled since 1964:-

Total incidents:.....	8725
Confirmed IPO (not only the fatal case):.....	30
IPO implicated (undiagnosed, but show the key features of IPO):.....	183

In order to properly quantify the risk of IPO, it is imperative that the Police, who often take primacy of diving investigations, properly preserve and collate the necessary evidence to help Pathologists and Coroners make more accurate diagnoses and conclusions. Whilst the HSE (as they have a specialist and dedicated diving team) know how to preserve evidence properly in diving cases e.g. diving equipment, the Police do not have the requisite knowledge to do this and the BDSG members fear that vital evidence is often not gathered or overlooked.

More accurate statistics will help build a convincing case that IPO is a significant and real danger – which in turn should make people take IPO much more seriously.

BDSG – Preservation of Evidence:

The BDSG has created, and is continuing to compile a pack for use at an incident to help preserve evidence:

[BDSG Serious Accident Guide for Divers v1.0](#)
[BDSG - General handling equipment post-incident](#)
[General - Rebreather post-incident investigation guidelines](#)
[Ambient Pressure \(AP\) - post-incident inspection guidelines](#)
[RESA - Hollis Explorer SR Lockdown](#)
[RESA - Hollis Prism2 - post-incident lockdown](#)
[RESA - KISS - post-incident procedure](#)
[RESA - rEvo - post-incident investigation guidelines V1.1](#)
[RESA - Shearwater - post-incident guidelines](#)

The pack uses instructions drafted by the equipment manufacturer to describe how to shut down specific diving equipment safely and what information to collect and preserve.

Safely shutting down complex closed circuit rebreather systems and interrogating the electronic monitoring devices is beyond the scope of a normal Police Officer. The pack also describes the types of evidence from witnesses that would be relevant to a Pathologist and Coroner in their determinations.

E.g. "...incident began at depth and the casualty gave an out of gas signal...",
"...the casualty rejected their primary and alternate air supplies...",
"...casualty made a rapid ascent to the surface after an out of gas signal..",
"...we found N bar of gas in the system...",
"...checks showed gas was available and no equipment faults..." etc.

BDSG "lookback test":

We've used this report as an opportunity to audit and review the work undertaken by BDSG members to promote the risks of IPO. The members have made an outstanding effort to raise awareness of the risks of IPO and those members who operate internationally, have made it clear, how far ahead the UK is with reference to the rest of the world in raising awareness of the risks. This is something BDSG members are extremely proud of, although it acknowledges there is more work to be done.

Actions taken to increase the awareness of IPO:

There are too many individual items to list here so the individual responses from members can be made available, but in more general terms activities include but are not limited to:

- In 2017 at the National Diving Conference, Dr [REDACTED] made the first of several presentations to raise awareness among the most influential members of the diving community.
- Every year, the Annual National Diving Incident Report mentions IPO specifically and its possible involvement in diving incidents and fatalities.
- Multiple articles appear in diving magazines and periodicals e.g. Diver, Scuba and X-Ray magazines.
- Frequent references to IPO on social media and websites.
- Engagement with the National Water Safety Forum (NWSF) to raise awareness of IPO as it is not exclusively a sub-aqua issue.

- Guidance materials produced by the BDSG members targeting divers and instructors.
- IPO has been raised in safety bulletins issued by the training agencies, trade bodies and other interested parties.
- All training agencies have either amended or appended sections of their training materials to focus on both the causes and presentation of the condition, focussing on the 'gas hungry at depth' to differentiate IPO from other forms of ascent related conditions.
- Webinars and online seminars either specifically on IPO or including IPO. Most of these are still available online for further access.
- Most training agencies have either produced their own or refer to the BDSG materials available online.
- "Return to diving - safely" material has been created and shared by the training agencies and the BDSG which includes an abundance of refresher material and references to IPO as a risk.
- The medical questionnaires have both been updated to included specific reference to IPO.
- IPO is discussed at all levels of training. More emphasis is made where dives are deeper or using either closed circuit equipment or mixed gases.

The Matter of Concern #2:

“Whether sufficient consideration has been given to the requirement for a ‘fitness to dive’ medical certificate as a prerequisite to participation in diving activities?”

Report #2:

In an “at work” environment there are regulations which govern the type and frequency for medical examinations. This response refers to amateur diving where other arrangements are in place.

Current arrangements:

All the significant training agencies and the sports’ governing body, use one of two self-guided questionnaires to screen for medical conditions which require referral to a Diving Medical Referee for consultation and advice e.g. epileptics requiring medication or diabetics with recent hypoglycaemia are advised not to dive because of the risk of unexpected loss of consciousness which could be fatal underwater.

The UKDMC explain the reasons why there was a change from periodic diving medical examinations to a self-declaration screening tool and the study which was carried out which recommended the change can be found here: [UKDMC Medical self-declaration system explanation](#)

UKDMC questionnaire:

[UKDMC Recreational diver medical declaration form](#)

BSAC/ScotSAC and SAA use the UKDMC screening tool. IPO is specifically covered at question 15.

UHMS questionnaire:

[UHMS Recreational diving medical screening system](#) (available in 27 languages).

Most of the other training organisations, use the medical screening tools listed on the UHMS site. IPO is covered in these tools, particularly in the Diver Medical Participant Questionnaire (page 2, Box A) and in the Cardiovascular Systems section of the Diving Medical Guidance.

Previous arrangements:

Prior to the introduction of self-assessment questionnaires between 2000-2002, medical examinations were carried out based on these age bands, <40, 40-50 or >50 at 1, 3 or 5 year intervals respectively. The examinations were carried out by GPs using guidance supplied by the relevant medical committee.

Why the change from periodic medicals to screening questionnaires:

A detailed study, [Medical supervision of sport diving in Scotland: reassessing the need for routine medical examinations](#), was carried out on 3,000 ScotSAC members and published in the British Journal for Sports Medicine in October 2000.

The study’s conclusion:

“Diving is a safe sport requiring medical supervision, but routine clinical examination of all divers is unlikely to detect significant abnormalities relevant to their fitness to dive. A carefully designed questionnaire will allow most relevant conditions to be identified and save unnecessary expense for both divers and doctors.”

There was a 3 year follow-up study:

The follow-up study was to assess the effect of the new medical system on medical referee workload, diver exclusion rates, and diving incident frequency.

Here is the link:

[Three year follow up of a self certification system for the assessment of fitness to dive in Scotland](#)

The follow-up study's conclusion:

"In summary, the introduction of a self-administered questionnaire appears effective after three years of follow up, and there has been a reassuring increase in failure rates for divers, confirming the safety of the new screening system. Divers now have the benefit of direct assessment by doctors with diving medicine experience."

Other benefits of a self-certification questionnaire:

- Screening for medical abnormalities and changes is carried out much more frequently than would be the case with a periodic medical examination.
- The screening tool can be modified quickly and easily e.g. specific questions are asked about IPO and the screening tools were recently changed to check for the impact of COVID.
- UKDMC list 58 [UKDMC Medical Referees](#), but some only carry out HSE diving medicals and in some parts of the UK there are very few Diving Medical Examiners ("DME") so access is further limited and long distances may be involved e.g. in Scotland, the only two DMEs are both located in the extreme SE of Scotland. The questionnaire removes the need to see a DME except where an abnormality has been highlighted by the questionnaire.

There were concerns:

The questionnaire is usually completed in isolation by the diver which has raised concerns that some divers may conceal information that is relevant to their fitness to dive.

There is guidance within the questionnaires which assists the diver complete the form accurately. A diver who does not answer the questions on the questionnaires accurately, is just as likely to do the same with a DME.

It is emphasised that the questionnaires are legal declarations, and if a diver is found to have been fraudulent in its completion, then his/her insurance is not valid.

Throughout a divers' training, they are encouraged to take responsibility for their own safety and their diving partner so it is hoped they would recognise the responsibility they have and will answer the questions accurately.

Information about IPO:

UK Diver Medical Committee paper on IPO for UK divers is made available by the training agencies to pass on to their GPs and Diving Medical Examiners.

[UKDMC - What is Immersion Pulmonary Oedema \(IPO\)](#)

BDSG recommendations:

- The current assessment questionnaires do ask about the diver's history of IPO, but embedded in a more complex question. A recommendation might be that both medical assessment questionnaires ask a simple binary question relating to IPO only e.g.
"Have you had IPO (Immersion Pulmonary Oedema) before. Y/N?"
 - **UKDMC** question 15:
"Have you ever had or suffered from: Decompression illness, immersion induced pulmonary oedema or other diver related problem?"
 - **UHMS** current question is on page 2, Box A:
"I have/have had: a problem or an illness that involved my heart such as: angina, chest pains on exertion, heart failure, immersion pulmonary edema, heart attack or stroke OR am taking any medication for any heart condition."
- Coroners and Pathologists are furnished with Dr [REDACTED] short guide to diagnosis of IPO as a factor in diving fatalities. More detailed explanations and materials are also available.
- Chief Constables pass on guidance to Police Officers about how to preserve and gather evidence at a diving incident and which key pieces of information would assist the Pathologist and Coroner in their diagnoses and conclusions.
- There should be a clear reporting pathway between Coroners and BSAC who are the custodians of the National Diving Incident database. The objective being to improve the quality of the information regarding the cause and contributory factors relating to diving fatalities.
- BSAC, the BDSG and/or the Coroner's Service should keep the National Water Safety Forum informed as IPO can affect all water users and is not limited to scuba diving.
- Within the diving community, Dr [REDACTED] is recognised as the leading authority on IPO. He has offered to assist Coroners and Pathologists if they feel they would benefit from his expertise in explaining the possible links in diving fatalities to IPO. There are other diving medical experts on the UKDMC and at the DDRC who have offered their assistance in explaining those links too.

Summary:

The awareness of IPO in the UK is significant greater in the UK compared to the rest of the world.

This, in part, is due to considerable efforts made by BDSG and its members in promoting the risk.

The BDSG members would very much welcome the assistance of the Coroner's Service and others (as outlined above) to help show the true extent/scale of the problem so that divers not only fully appreciate the risks associated with IPO but take the risks seriously.

As outlined above, there is no screening test that can definitively determine whether an individual will suffer from IPO, but there are a number of known factors which increase the likelihood of an individual being subject to IPO. Completing either the

UHMS or UKDMC medical declaration form prior to any training/diving taking place helps in identifying the known risk factors.

Whilst BDSG members fully appreciate the Coroner's concerns, it is not felt that a 'fitness to dive' medical certificate, as a prerequisite to participation in diving activities, is required.

A detailed study shows the value of the assessment form in the UK and other studies abroad support the same conclusion of the UHMS questionnaire.