DAN
RECOMPRESSION CHAMBER NETWORK

THE RCN BULLETIN

A Newsletter of the DAN Recompression Chamber Network

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THE RCN WELCOME LETTER

An eventful year has passed in which DAN handed over ownership and management of the last of a series of island-based chambers to new organizations. Our outreach and empowerment initiative lasted more than a decade, and we're happy to say that there are now 9 operational recompression chambers in both the Caribbean and Oceania, fully owned and operated by highly capable recompression chamber teams. This is part of our Recompression Chamber Assistance Program (RCAP) known to some as Hyperbaric Partners Ltd (HPL). We will of course continue to support these facilities to ensure that they remain operational, competent, and available to treat injured divers in some of the most remote places.

Another part of our RCAP initiatives took place in the Caribbean, where a team of DAN staff performed 7 team-training and technical assistance engagements at a range of facilities over a 3-year period. Our hands-on engagements now number more than 200 facilities around the world. These are all in the interest of both safety and operational competence.

This edition provides a diverse collection of articles, with the usual international flavor, and we have tried to introduce new topics with each newsletter you receive. We're always grateful for contributions from team members around the world, who all share an interest in our field of medicine.

In particular, we have two fascinating articles covering training – a very topical activity at this time.

Electrical safety also remains a topic where we get numerous questions from the industry. This time we have included two technical articles that will hopefully better explain how we should be approaching safety in this regard.

When we issued our newsletter last year, we had news of a tragic event here in the USA, where a child lost his life in a chamber fire. Sadly, the year progressed with another fire – another fatality, and then two chamber ruptures.

There are fundamental lessons to be learned here. Firstly, the safety practices that are taught when it comes to fire safety must be followed, without exception. Both fires were as a result of safety practices being ignored. Then the design of a hyperbaric chamber, a pressure vessel for human occupancy (PVHO), must follow the very thorough design, manufacture, testing, and certifications requirements that we, as an industry, have put in place. Both hyperbaric fire and engineering codes are a result of our input into code committees. We have decades of operational experience and advanced technical knowledge and have shared these extensively. We appeal to all hyperbaric chamber manufacturers, owners, and operators to follow these carefully and comprehensively. Thus far, almost every accident over the past century have been as a result of human engagement – from careless operational practices to inadequate construction. It is we who let

THE RCN WELCOME LETTER

us down, and not the rules.

Finally, while we were expecting to have the new edition of the DAN Risk Assessment Guide for Recompression Facilities (5th) published in 2025, our plate was filled with too many other activities. We're almost done and we should have it out in the second quarter of this year. We hope to share this milestone with you as soon as it goes live.

This is our 11th RCN Newsletter, and next year will make it a decade since the first one. These provide a full library of information and guidance for all of you readers. They remain online, and there is also a separate list of all the frequently asked questions extracted for ease of locating them. Please be sure to take a look as we have already covered several of your questions.

Enjoy reading our latest edition and let us know if you have any questions or comments.

-Francois Burman, PE, MSC
and the DAN RCN Team

Hyperbaric Medicine in Practice: Navigating a Rare Complication

Dr Eddelene Bouwer

In June 2025, our hyperbaric facility received a referral for a 30-year-old tourist from Germany who had developed symptoms consistent with decompression illness (DCI), including possible cerebral arterial gas embolism (CAGE).

She had spent the week engaged in recreational repetitive diving in Scottsburgh, off the coast of KwaZulu-Natal. The incident occurred during the final dive of the last day, a group dive that reached a maximum depth of 34 metres.

She did not have a dive computer and became separated from the dive leader during the dive. Her ascent was controlled but not aligned with decompression protocols, and she only spent an estimated three minutes at 5 metres before surfacing.

After surfacing, she began to feel unwell, initially with mild confusion and nausea. These symptoms were attributed to stress at first. However, during the long drive inland immediately after the dive, her condition worsened. She experienced generalised muscle pain, fatigue, and further cognitive symptoms. She reached a hospital in East London (South Africa) more than 24 hours after the dive, but was discharged without being assessed by a doctor. At midnight, with symptoms persisting and worsening, she returned to the hospital and was referred to our centre for urgent hyperbaric oxygen therapy.

By the time she arrived at our hyperbaric facility in Gqeberha, about 48 hours after surfacing from the dive, she was stable and able to communicate clearly. She complained that her mind "is not right". We performed a full assessment and excluded complications such as pneumothorax. Based on her clinical picture, history and dive profile, we initiated recompression therapy in our multi-place chamber using the U.S. Navy Treatment Table 6 protocol.

We found no abnormalities on her neurological examination, with her only complaint being cognitive in nature. To monitor her recovery throughout the course of hyperbaric treatment we conducted the Trail Making Test and Symbol Substitution Test before and after each session. Initially, she was unable to complete even the one-minute assessment and became tearful, expressing frustration that her mind didn't feel as if it was functioning normally.

Suddenly, at the end of the third oxygen breathing period at 18 metres depth, the patient experienced a generalised tonic-clonic seizure. This was consistent with oxygen toxicity, a recognised, though uncommon risk in hyperbaric therapy, especially in patients with suspected gas embolism, where cerebral tissues may be more sensitive to oxygen due to underlying injury or temporary disruption of the blood-brain barrier.

The oxygen mask was removed immediately, and the chamber attendant assisted in placing her in the recovery position. The seizure was brief, lasting less than one minute, followed by a postictal phase of approximately 20 minutes, which is longer than we expected. During this period, she appeared more emotional and fatigued than anticipated. When we resumed oxygen, she was awake but too restless and anxious to tolerate the headbands securing the bib, and too tired to maintain a proper seal herself. As a result, the chamber team assisted by holding the bib in place while she rested and continued to breathe oxygen comfortably. The remainder of the session was completed without incident, and the patient was admitted in hospital for observation under the care of a physician. She underwent two further hyperbaric sessions over the next two days, which were uneventful.

REFLECTIONS FROM INSIDE THE CHAMBER

Oxygen toxicity is a well-known but rare complication in hyperbaric medicine. This was the first time I had encountered oxygen toxicity first-hand during a treatment. Over the past four years, our practice has overseen approximately 1,400 chamber dives. From a clinical standpoint, it was handled exactly as per protocol. From a professional perspective, it was a valuable experience, one that reinforced the importance of calm, preparation, and teamwork inside the chamber.

While these events are not common, they serve as important reminders that even standard treatments can involve some degree of unpredictability. For the patient, the seizure did not lead to any long-term effects or additional complications. For me, it was a slightly unsettling but proud moment, an unexpected event that brought a surge of adrenaline, but also reassurance. We knew exactly what to do and managed the situation calmly and effectively. Having my mentor immediately available by phone was invaluable; it helped steady my nerves and reinforced the protocols we had trained for.

KEY TAKEAWAYS FOR DIVERS

This case also highlights a few broader lessons relevant to the diving community:

- Divers should always use personal dive computers and avoid relying entirely on others for depth and time awareness.
- Divers should review and discuss the dive plan beforehand, and whenever possible, plan dives conservatively within the limits of standard dive tables rather than relying solely on dive computer algorithms.
- Even minor post-dive symptoms should be taken seriously, particularly if altitude exposure is expected soon after diving.
- Medical personnel unfamiliar with dive medicine may overlook subtle symptoms of DCI. Early referral to a hyperbaric facility is key.
- And finally, while hyperbaric oxygen therapy is a safe and effective treatment, complications such as oxygen toxicity, though rare, are possible and should be anticipated by chamber staff.

Dive Profile

Date: June 2025
Max Depth: 34 m
Average Depth: 18.8 m
Bottom Time: 31 minutes
Water Temperature: 21 degrees C
Required Decompression (Per USN Air Table 7): 38 minutes at 6 m
Decompression Performed: Approx. 3 minutes at 5 m

Case Study: The Transport Dilemma- Driving or Flying a DCI Patient

Matias Nochetto, MD, FUHM

BACKGROUND

A 42-year-old recreational diver developed neurological symptoms consistent with a spinal cord hit after a week of diving on the west coast of Mexico. The diver had completed up to three air dives per day for seven days, all reportedly within no-decompression limits but on the aggressive side of safe profiles. The diver denied any relevant past medical history and was considered fit to dive.

About 30 minutes after surfacing from the final dive, the diver perceived mild constitutional symptoms, but did not report anything. Later on noticed bilateral numbness and tingling on both feet, which over the course of a couple of hours progressed to bilateral lower extremity weakness. This resulted in an unsteady gait. At this point the diver contacted the dive operator, who immediately contacted Divers Alert Network (DAN) for medical guidance.

INITIAL MANAGEMENT

Following DAN's consultation, the diver was transported to a nearby free-standing hyperbaric facility with limited diagnostic capabilities. Once at this facility, further interactions with the receiving physician revealed there was also urinary retention, elevating the level of suspicion for a spinal cord hit. The team set up the chamber and initiated recompression therapy with a US Navy Treatment Table 6 within an hour after being received, approximately 4 hours after the last dive. Treatment was completed without complications, but the treating physician did not see the need to prescribe extensions to that treatment, even when they might have been indicated. The diver showed partial improvement but retained some lower extremity weakness. Urinary function could not be assessed as the diver was now catheterized.

Given the persistent neurological symptoms and the limited local resources for advanced care and rehabilitation, DAN and the treating physician jointly determined that transfer to a tertiary care center in Mexico City (CDMX) seemed like the best course of action. The diver was also a resident of Mexico City, making transfer there both medically and logistically appropriate.

Transportation could be arranged about four hours after the completion of the first recompression, prompting the question: Should the diver be flown or driven to Mexico City?

TRANSPORTATION DILEMMA

Option 1: Ground Transportation

Driving from the coastal town west of Mexico City required about eight hours, climbing from sea level to a final destination set at around 2,400 meters above sea level (7,800 ft of altitude).
At that altitude, barometric pressure is roughly 0.76 ATA, which is comparable to the cabin altitude of a typical commercial aircraft.

While driving might seem safer by avoiding flight, the road route involved continuous ascent through mountainous terrain, exposing the diver to sustained hypobaria for many hours. Moreover, because Mexico City lies in a high-altitude valley, the highway passes over mountain summits exceeding the city's elevation, exposing the diver temporarily to even lower pressures, near 0.74 ATA.

In short, a ground transfer would extend the duration of low-pressure exposure and delay access to recompression therapy, increasing the risk of symptom progression.

Option 2: Air Transport

A 1.5-hour commercial flight to Mexico City maintains a cabin altitude between 0.75 and 0.8 ATA, which is equivalent to the ambient pressure in Mexico City itself.

At first, the diver and family were puzzled by DAN's recommendation to fly, believing it contradicted standard "flying after diving" guidelines. DAN's physicians explained that these guidelines should be understood as "altitude exposure after diving" guidelines, and that in this case, both routes involved ascent to altitude. The key difference was duration of exposure.

The road trip would impose longer exposure to lower pressure and everything that comes with it (comfort, dehydration, delayed logistical times, the risk of clotting with immobilization, etc.), while the flight would impose a shorter exposure to equivalent pressure and an earlier arrival and access to proper treatment. This reasoning helped the family understand that flying imposed a lesser physiological insult than driving.

DECISION AND OUTCOME

After reviewing the pros and cons, DAN and the treating physician agreed that air transport was the safer option. The diver was flown to Mexico City under supervision of a medical escort four hours after the initial recompression, receiving supplemental oxygen throughout the flight.

Upon arrival, the patient underwent repeat recompression therapy and neurological evaluation at a tertiary facility. Over the next 3 days, the diver showed significant improvement, with near-complete recovery at follow-up, and a good long-term prognosis.

KEY LESSON

This case underscores an important concept in dive medicine: When ground transport to a high-altitude destination involves prolonged ascent, air transport may present the lesser physiological risk for a DCI patient.

The "Flying after diving guidelines" should be interpreted as altitude exposure guidelines, not merely as prohibitions against flight itself. In this instance, flying was both faster and represented a shorter and lesser hypobaric exposure than the overland route. Immediate access to definitive care upon landing outweighed the risks.

On cases of spinal decompression sickness, prompt recognition of symptoms often results on an early diagnosis. Once the diagnosis is made, timely and aggressive definitive treatment is key to maximize the chances of a full recovery.

RCAP and Training in Chamber Operations: the ChAtt & ChOp programs

Manuel Preto, CHT, DMT, ECHSM

HOW TRAINING IN REMOTE AREAS IMPROVES DIVING SAFETY

Every dive begins with a sense of wonder, the promise of exploration, freedom, and connection to the ocean. Yet, in this world of breathtaking beauty, risk is always present. Diving injuries, though uncommon, can happen anywhere, and when they do, the difference between a swift, well-directed response and a serious consequence often comes down to preparation.

That´s the foundation of the Recompression Chamber Assistance Program (RCAP) developed under the Divers Alert Network (DAN). RCAP is a global initiative aimed at strengthening recompression treatment capabilities in locations where access is limited. It connects diving centers, hyperbaric chambers, and local diving professionals into a safety network, promoting readiness through training, planning, and shared protocols.

At the heart of RCAP is the appropriate training of the recompression facilities' teams, often based in diving centers (resorts), on liveaboard vessels and sometimes also in local clinics or hospitals.

ChAtt & ChOp

Training is provided in two modules: ChAtt focuses on the chamber (internal) attendant, and ChOps teaches the external operators to be able to manage the treatment effectively and safety from the control panel. Together, these modules provide the knowledge and skills needed to safely operate a recompression chamber, which is the only definitive treatment for decompression sickness (DCS).

The ChAtt course focuses on the chamber attendant's role, the "eyes and hands" inside the chamber. Trainees learn not only how to perform internal checks, handle communication, and monitor and respond to patients, but also how to manage emergencies in a pressurized environment.

On the other hand, the ChOp module aims to provide operators with the expertise to manage the external controls, the "brains" of the operation, overseeing pressure systems, gas flow, fire suppression, and overall safety procedures.

Together with the physician they form a cohesive safety ecosystem that ensures proper treatment response that can be carried out anywhere, even hundreds of kilometers from the nearest hospital.

WHY IS TRAINING IN REMOTE AREAS SO IMPORTANT?

Remote resort environments, idyllic islands, atolls, and coastal hideaways, offer divers some of the most spectacular underwater experiences on Earth. But these same destinations often lack quick access to advanced medical care. Evacuations may take hours, or even days, depending on weather, distance, and infrastructure. For a diver suffering from (DCS) or an arterial gas embolism (AGE), that delay can mean the difference between recovery from the disability, or possibly not. That's why training local staff in chamber operations isn't just a formality; it's a necessity.

Many resorts already have a hyperbaric or recompression chamber on site, often donated through joint ventures, governmental programs, or previous diving initiatives. Yet a chamber without trained personnel is little more than a metal cylinder. It's only useful in the hands of someone who knows how to use it confidently, effectively, and, most importantly, safely.

In this sense, ChAtt & ChOp training is transformative, delivering essential tools and practical knowledge directly to those who need it most; dive instructors, resort medics, technicians, and boat crews who are often first responders in diving incidents.

Trained local operators and attendants can initiate care, on injured divers, and run full treatment tables under direct medical supervision. This represents the essence of empowered readiness; individuals equipped with both knowledge and the confidence to respond decisively in critical moments, forming the crucial first link to the DAN Hotline and DAN Medical Services.

FROM THEORY TO PRACTICE

The ChAtt & ChOp structure is deliberately built around two pillars; theory and hands-on practice, ensuring that graduates are not just informed, but competent in real-world operations.

THEORY MODELS

The theoretical part provides the foundation where the participants explore:

- Physics and physiology of diving: understanding how pressure affects the body, gas absorption, decompression theory and models.
- Hyperbaric chamber mechanics: How entire systems look like; compressors, gas storage tanks, valves, regulators, and built-in breathing systems (BIBS) work.
- Decompression and treatment tables: The most used and validate treatment protocols for the condition being treated.
- Fire safety and contamination risks: Learning why oxygen-rich environments can turn minor oversight into serious risky places, as well as how minor contamination at surface can turn in serious hazardous under pressure.

Each concept links directly to practice. Knowing the difference between a quarter-turn valve and a needle valve, for instance, isn't just technical trivia, but rather it's about preventing incidents which can lead to serious consequences.

By the end of the theory part, trainees speak the same "safety language," whether they are operators, attendants, or medical staff. That shared understanding forms the backbone of an effective teamwork inside and outside the chamber.

HANDS-ON TRAINING

Once the theory is grounded, participants move into the chamber environment itself. There, they practice real procedures, with physical drills designed to build the most adequate responses to each situation faced.

- Pre-dive checks: inspecting compressors, gas tanks, valves, communication systems, oxygen lines, and fire suppression readiness.
- Compression and decompression: learning smooth, controlled pressurization techniques while monitoring patient comfort and environmental parameters.
- BIBS operation and oxygen administration: managing masks, hoods, and flow systems safely inside the chamber.
- Fire suppression and evacuation: practicing rapid and coordinated responses to smoke or ignition inside the chamber, arguably the most critical scenario in any hyperbaric training.
- Medical emergency drills: dealing with loss of consciousness, hypoglycemia, oxygen toxicity, or sudden illness under pressure.

Trainees are repeatedly challenged with scenario-based exercises that replicate the complexity of real incidents. Through repetition, they develop calmness, discipline, and muscle memory which leads to comfort and confidence in the operations.

The combination of ChAtt's, with an internal discipline and ChOp's, with external support ensures that, by the end of the course, both roles understand each other perfectly, which is a crucial factor in chamber operations where a second counts, and communication is the bedrock for the safety level required.

WHAT TRAINEES ARE EXPECTED TO ACHIEVE

The ChAtt & ChOp certifications are not symbolic; they are competency-based and internationally recognized under DAN's educational framework. Candidates are expected to leave the course with more than theoretical awareness; they are expected to perform.

By the end of the program, they will be able to:

- Operate hyperbaric chambers safely and independently following standard operating procedures (SOPs) aligned with international guidelines.
- Assist in the treatment of diving injuries, including monitoring patients during recompression.
- Conduct pre-dive and post-dive inspections, ensuring chamber readiness at all times.
- Communicate effectively between internal and external teams under stressful conditions.
- Apply accident and emergency procedures through pre-established

Emergency Action Plans (EAPs) with precision

Perhaps the most important achievement, though, is the confidence that comes from competence.

The moment an attendant or operator closes the chamber door, feels the hiss of compression, and sees a patient's ease under their watch, that's when they know they're truly ready for the real thing. That quiet assurance cannot be learned from books alone. It's earned through doing, feeling, and understanding every procedure.

SKILLS, SCENARIOS, AND A CULTURE OF PREVENTION

Safety under pressure is not just about technology, it's about mindset. Every ChAtt & ChOp trainee learns early that a hyperbaric chamber is both a healing space and a potential hazard. The same oxygen that may save lives can also feed flames; the same pressure that relieves symptoms can cause harm if handled carelessly.

That's why the program emphasizes safety awareness as active, continuous practice. It's not only a checklist, but rather a culture.

FIRE RISK, PREVENTION, AND TRAINING

Inside the chamber, oxygen levels can easily soar. Even materials considered non-flammable at normal atmospheric conditions, can ignite rapidly when compressed. Participants learn to mitigate those risks through checks and procedures, which can include verifying clothing fabrics, banning unauthorized items, cleaning contaminants, and enforcing strict oxygen handling protocols.

They also practice the ultimate "what-if" a fire happens drill. Isolate oxygen supplies, deploy deluge systems, and coordinate rapid decompression, are actions needed and repeatedly trained.

By performing these scenarios, safety becomes second nature, and lack of confidence is replaced with readiness.

EMERGENCY SCENARIOS

ChAtt & ChOp courses culminate in comprehensive emergency scenarios as realistic as possible and emotionally charged. These may include a diver presenting with neurological DCS, who then experiences a seizure during treatment, or a simultaneous external systems alarm that forces a split-second decision-making.

The goal isn't to overwhelm trainees, but to help them stay calm. The more they practice under controlled stress, the better they'll handle real operations stress.

CONTINUOUS READINESS

After certification, competence must be maintained. DAN recommends refresher courses, at least every two years, echoing the guidance from the original Chamber Attendant and Operator manuals. Regular drills, logged exercises, and periodic re-evaluations ensure that trained staff remain "in-date" and operationally sharp.

BUILDING SAFER DIVING COMMUNITIES

The ChAtt & ChOp programs go beyond individual or team training. Their impact spreads outward, strengthening the diving community, from small island resort to regional medical facilities. Resorts that invest in these training programs, gain measurable advantages:

- Operational credibility: demonstrating compliance with international hyperbaric standards and guidelines.
- Enhanced reputation: dive clients naturally place greater trust in operations that prioritize safety.
- Liability: documented SOPs, AEPs, and certified staff, resorts show due diligence.
- Team cohesion: by training together, staff develop a shared "safety" mindset that extends to safe operations every day.

Ultimately, this training isn't just about chambers, it's about creating resilience. Every trained attendant or operator becomes a node in the industry safety network, capable of apply knowledge to enhance all advantages referred previously

FINAL THOUGHTS

Remote doesn't have to mean unprepared.

Through RCAP and the ChAtt & ChOp programs, diving communities worldwide are showing that with knowledge, training, and confidence, they can thrive anywhere.

From the turquoise lagoons of the Maldives to the volcanic coastlines of the Azores, or a bord of a vessel sailing on the Pacific Ocean. It's the commitment to each other's safety that counts. Each chamber drill, SOP rehearsal, and fire response scenario builds toward something bigger, a shared culture of safety and care which transforms knowledge into confidence, and confidence into action.

Antigua Hyperbaric Chamber in High Demand by Divers After Opening in April 2025

Sheryl Shea, RN, CHT

The launching of the hyperbaric chamber at Mount St. John's Medical Center in April was front-page news. Until last April, decompression illness cases had to be evacuated to the nearby island of Guadeloupe for treatment, even though there was a chamber on Antigua, waiting to be used since 2018. Now both tourists and local fisherman have access to a hyperbaric chamber for emergency treatment of DCI right at the local hospital.

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It was a long time in the making but was finally made possible by the combined forces of Julie Esty of Antigua & Barbuda Search and Rescue, Jamilla Kirwan of the Ayre Foundation, the DAN Recompression Chamber Assistance Program, and Dr. Benjamin Bridge, the chamber medical director, with his dedication and boundless enthusiasm for "the baby", which is how he refers to the hyperbaric chamber.

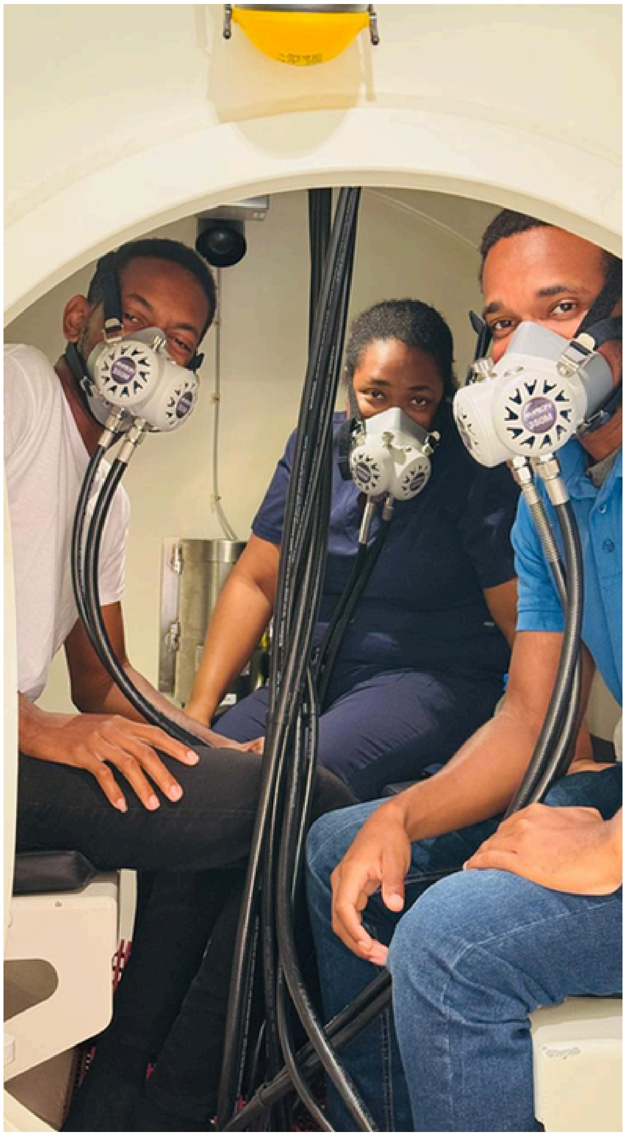
The island is surrounded by coral reefs and is a popular recreational diving destination, with about 50 dive sites and several dive operators offering boat diving and dive training courses. Artisanal fishing is important for domestic consumption and helps meet the demand from tourism, which makes up more than half of the local economy. Surface-supplied diving systems and scuba are both used. Local fishermen carry out deep, repetitive dives, to catch fish, lobster and conch. The larger the catch, the bigger the paycheck, which encourages risky diving profiles.

Decompression illness patients, especially the fishermen, would not always consent to be transferred to Guadeloupe for treatment. Even though the island is only 70 miles away, the expense of the private air charter, visa and passport requirements, language barrier and the cost of treatment on Guadeloupe made it difficult, if not impossible.

The "baby", a brand-new basic DDC (Deck Decompression Chamber), was donated by the Calvin Ayre Foundation in 2018, but went unused until 2025. In November 2023 and March 2025, the DAN RCAP team carried out week-long hyperbaric chamber operator and attendant training courses, and a hyperbaric chamber risk assessment. The Antigua team of doctors, nurses, and EMT's, led by Dr. Benjamin Bridge, each completed one week of chamber training: 3 days of virtual training, and 3 days of hands-on intense training which included operating the chamber – set-up, pre-dive chamber checks, running treatments, locking personnel in and out, using the medical lock, post-dive chamber checks, and loading a patient into/out of the chamber. Emergency drills were created and practiced, as well as standard operating procedures. Each student was given a detailed explanation of all the equipment and taught basic maintenance procedures. Everyone was required to carry out each step of the process under observation by the trainers, Francois Burman PE and Sheryl Shea RN, CHT.

Refresher training sessions were also provided for the 2023 students during the 2025 sessions.

Technical issues that arose during the chamber risk assessment were resolved with the help of the DAN team and Dave Martin, and the financial assistance of the Ayre Foundation. The main issue was that oxygen breathing system was not functional and needed replacement, at a cost of several thousand dollars. Now, the chamber is in top-notch operating condition.



Upon completion of the training, the Antigua Hyperbaric Facility joined the DAN Recompression Chamber Network as a 24/7 emergency chamber.

The new chamber team practiced diving the chamber while awaiting their first diving patient.

One would hope that they would have the good luck to get their feet wet with a minor case or two – maybe joint pain, cutis marmorata or a bit of tingling. But this was not to be. Their very first patient was a serious neurological decompression sickness case.

On May 31st, a 37 y.o. local fisherman who had completed 3 days of diving to 90-110 ft. using a surface-supplied diving system came to the ER, after experiencing shortness of breath, limb weakness, vomiting, and numbness in the lower extremities within minutes of surfacing. He had a seizure in the ER. He was diagnosed with Neurological Decompression Sickness. A USN TT6 was prescribed, and the new chamber team gathered to commence their first solo chamber treatment. The patient improved, but not yet 100%. A second USN TT6 was prescribed and carried out the next day. He was discharged after the second chamber treatment with no neurological symptoms, and made a full recovery.

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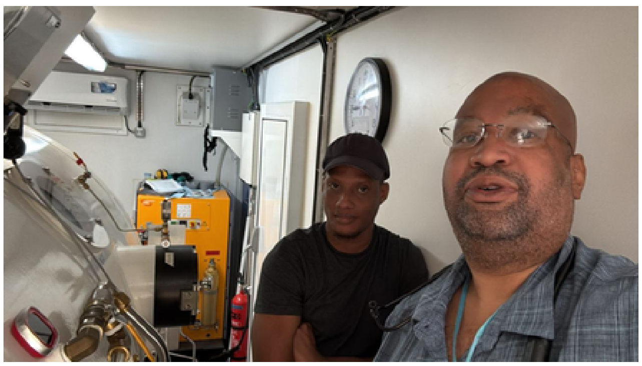
Dr. Benjamin Bridge in the chamber with Akeam

In early August, another fisherman arrived at the Mount St. John's Medical Centre ER. He developed lower extremity weakness and urinary retention shortly after surfacing after from diving with a surface-supplied diving system. Neurological decompression illness was diagnosed, and a USN TT6 was prescribed and carried out with good progress. After a second USN TT6, his lower extremity strength returned to normal, 5/5, and the urinary retention was completely resolved.



Kamaro Andrew and Dr. Benjamin Bridge at the helm

In late August, a 66 year-old recreational dive tourist arrived at the ER with acute dizziness, imbalance, and unsteady gait following two consecutive dives to 19 meters, which developed shortly after surfacing. Neurological assessment revealed an ataxic gait and positive Romberg test. He was diagnosed with neurological decompression sickness type II and underwent a USN TT6 in the hyperbaric chamber. His symptoms resolved completely. He was discharged and cleared to fly home after a short recovery period.

In mid-October, another 66 year-old male recreational tourist diver came to the ER with acute vertigo, nausea, and imbalance occurring shortly after surfacing from the

Demi Halstead, RN, ICU nurse

last dive of 10 dives over 5 days. He described feeling "off balance" and was mildly disoriented. He was diagnosed in the ER with Decompression Illness Type II – Vestibular/Neurological. A USN TT6 was prescribed and carried out with complete resolution.

Padmore Irish & Kamaro Andrew diving the chamber

Dr. Benjamin Bridge

In November, a 49-year-old female recreational diver presented to the local emergency department with shortness of breath, generalized weakness, tingling sensations, tremors, and unsteady gait. She had been diving for 5 days, 2 dives per day, at depths between 50 and 60 feet, and completed safety stops on each dive. After the second dive on the last day of diving, she developed a headache upon surfacing which resolved within ten minutes. 45 minutes later, she developed weakness and paresthesia of both upper and lower extremities, tremors, instability while walking, chest tightness and difficulty breathing. Symptoms continued to intensify. Based on symptom onset shortly after ascent, neurological findings, improvement with high-flow oxygen, normal CT brain, and absence of cardiopulmonary pathology, she was diagnosed with Decompression Sickness Type II (Neurological Type), and a USN TT6 was promptly commenced. A second USN TT6 was carried out the next day, with significant improvement. She then returned to her home country for ongoing treatment, and has since fully recovered.

In December, instead of sending a diver away to another island for treatment, the Antigua Hyperbaric Facility had the opportunity to receive and manage their first international patient with suspected Type 2 decompression sickness (DCS) following a recreational scuba dive in the British Virgin Islands, where there is no hyperbaric chamber. The patient, a 34-year-old female recreational diver, developed neurological symptoms; weakness, dizziness, tingling in one hand, and unsteady gait, after a dive to approximately 80–90 feet. She was evaluated at an emergency room in Tortola, where she was diagnosed with DCS.

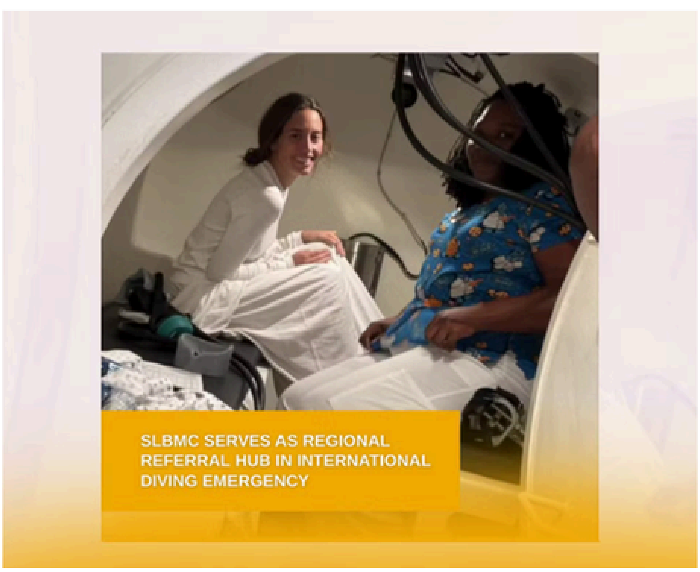
A chamber exists closer to the British Virgin Islands than Antigua, however they were unable to receive the diver due to immigration issues. After her initial evaluation, Dr. Bridge ordered a USN TT6,

Padmore Irish and Dr. Bridge

which commenced without delay. Afterward, the diver was completely asymptomatic.

Antigua Hospital Provides Urgent Hyperbaric Care to Diver From British Virgin Islands

December 18, 2025



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By the end of the year, they had successfully treated 7 diving patients; 4 recreational divers, and 3 local fishermen, all with neurological or type II decompression illness.

The doctors are keen to start treating other conditions, particularly diabetic foot and leg ulcers. Since this is the only hyperbaric facility on the island, this important option for limb preservation has not been available yet to the local residents. Approval for the chamber to be used for other than diving patients must be granted by the local authorities, and has been requested. Once the approval is granted, they can start saving not just divers, but also feet and toes.

Please direct inquiries about the Antigua Hyperbaric Facility to Dr. Benjamin Bridge, Senior Registrar, Internal Medicine & Hyperbaric Medical Director
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Multiplace Chamber Grounding

Francois Burman, PE, MSC

In our last newsletter, we discussed electrical safety in the hyperbaric chamber, and we answered a question related to the need to ground occupants in an air-filled multiplace chamber.

This leads to a more fundamental question, which is: why do we ground air-filled multiplace chambers if not for static protection? We already discussed ground-fault protection in the last newsletter, but a chamber is not intended to be any form of electrical conductor. Why then should it be grounded?

You can do an AI or Google search on this topic and find references to the US National Electrical Code (also entitled NFPA 70), and to the International Electrotechnical Commission (IEC). Most of these references will tell you how and perhaps why, but they are not applicable to hyperbaric chambers.
Let us explain, starting with the **why.**

There are three good reasons to ground a chamber, excluding for static electricity discharge:

(1) The chamber and many of its systems are built from some form of metal, which makes the system a highly effective electrical conductor. The resistance through this 'conductor' can be measured in single digit ohms (Ω).

If any live conductor from the main power supply makes contact with the chamber, the chamber becomes 'live'. The chamber ground wire will, however, very efficiently take this 'live' voltage to the level of lowest potential, meaning to earth, or zero volts. The over-current safety device, or circuit breaker, will immediately respond due to a significant flow of current (a short circuit), and shut off further current flow.

So, in effect, a grounded chamber system cannot become live, and we have achieved safety level number one.

(2) What if someone inadvertently touches a live conductor and the grounded chamber at the same time – like when working on the chamber CCTV system? You should never work on a live circuit, but let's say one does in this case.

We have grounded the chamber and have introduced a pathway for the current to travel through the person to ground. The impact on the person depends on whether they are wearing protective clothing (gloves, shoes) and whether they are dry or wet. Without protective clothing, they could experience a current flow through their body of as much as 120 milliamps (120 mA), which can be lethal.

Fortunately, a well-designed electrical system will incorporate an earth leakage protection device[1], which trips at between 4 – 6 mA within 0.1 second. One will get a significant jolt, but can easily survive this form of electrocution. Safety level number two achieved.

(3) Lastly, we need to consider stray voltages and the stability of the electrical systems. While seemingly the least likely, this is actually what we test for when we follow the rules in NFPA 99 Chpt 14: "The resistance between the grounded chamber and the electrical supply system shall be less than 1Ω."

This makes sure that the chamber is indeed grounded, and that there is no difference between the grounded chamber and the earth wire that would be found behind the wall outlet socket - the third electrical pin. Safety level number three achieved.

We then need to understand the difference between the ground that we connect the chamber to, and the electrical ground. These are two different connections, but it is confusing as there should be no difference in a well-designed and properly constructed building.

We connect the chamber to the building ground. You may recall that term 'earth', that is used interchangeably with 'ground' by some? Well, a building needs to be grounded using some form of electrical conductor buried deep in the ground, literally the earth.

There are rules that apply to these, but think of an underground, metallic water pipe, or a long copper spike driven deep into the ground. We connect our metal building frame, above ground metal piping, metal electrical conduit, installed equipment like HVAC systems and water heaters, and yes, our hyperbaric chamber to this ground.

This is a separate system that is not part of the three wires that make up most electrical leads that we use to connect to electrical equipment – like the equipment mounted on our chambers.

Electrical ground starts with the ground wire that comes into the building from the electrical service supply and is connected to a metal connector strip (called a bus).

Now for the confusing part. The neutral wire is also connected to this same bus, as is the building ground. The illustration below does its best to show the different connections. All three conductors (electrical ground, neutral and building ground) are meant to be at the same potential or level, i.e., zero volts at this point.

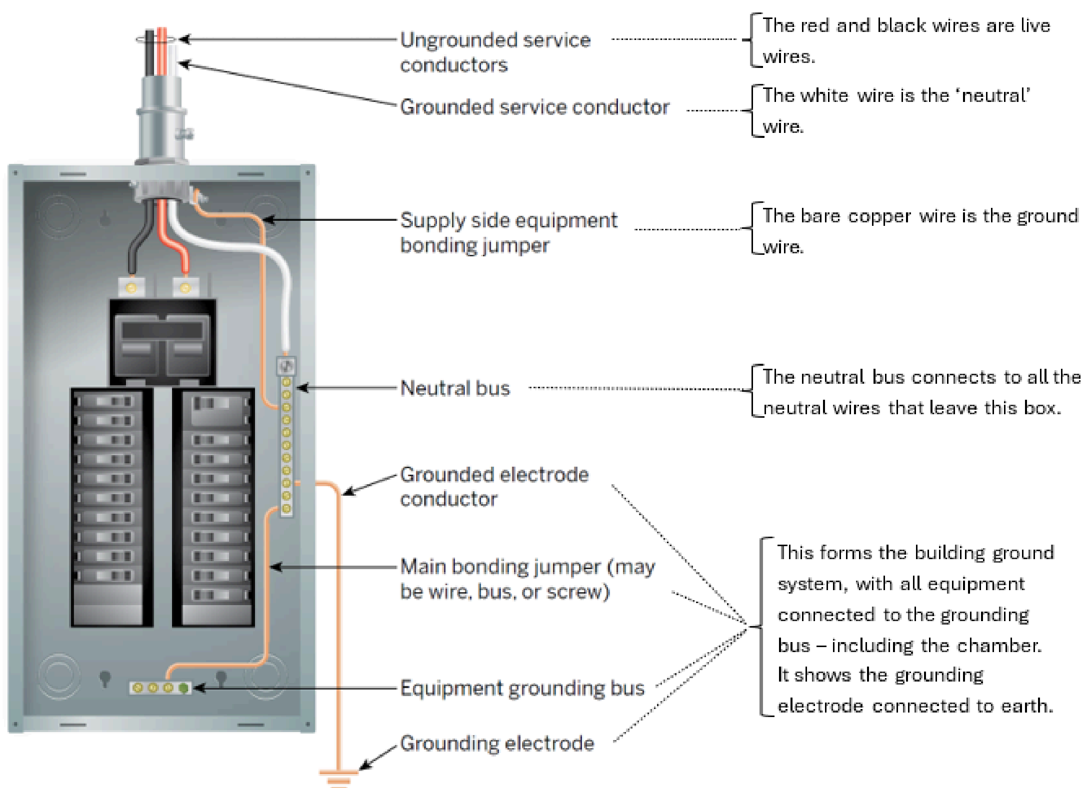
Once the electrical supply leaves this distribution board or junction box, it does so typically with three conductors for most of our regular low powered systems (110 V or 240 V depending on where you are located) - the live, the neutral, and the earth wires[2]. The building ground conductor is a separate conductor - usually a stiff, bare, solid copper wire.

The live and neutral conductors (wires) are used to power electrical equipment by making a loop that we call a circuit; the earth wire attaches to the metal housing or body of the equipment in order to provide protection from electrical shock through the GFCI or ELCB. We do not want the earth wire to be carrying any current as it will only do so if there is a fault. Then, using a different wiring connection, we attach the building ground conductor to all the items we mentioned above – our chamber fits in here.

So: is there a difference between building ground and electrical ground? If by the time we get to the chamber there is a difference in resistance (ohms) between the chamber ground and the electrical ground wire, we can introduce stray voltages to equipment, and experience physical tingling, electrical interference in our communications systems, and instability in electrical and electronic equipment. We can manage tingling, but permanent equipment damage is really undesirable.

As to the **how**, we check for the difference in resistance between the chamber and the electrical ground during our regular chamber ground checks and ensure that the difference is always less than 1Ω. Using a multimeter set to low range (unless it is an auto-ranging instrument), with one lead making contact with a metal part of the chamber, the other with the earth point at the wall outlet, your meter should read close to zero. If not, then there is a grounding problem that needs to be resolved by an electrician .

Final words: The requirement to ground a multiplace chamber appears in many of the regulatory documents, standards and specifications. The reasons, however, are rarely discussed. It all comes down to mitigating the risks associated with electrocution and damage to equipment, especially where sensitive electronic control and monitoring circuits are installed. We hope that this condensed explanation will help facilitate the correct configuration for grounding your hyperbaric chamber system and provide the rationale behind the requirement for regulator monitoring.



[1] A Ground Fault Circuit Interrupter (GFCI) and an Earth Leakage Circuit Breaker (ELCB) are both safety devices that detect any current leakage to ground. They perform similar functions, but in slightly different ways. The GFCI is usually found at the individual (wall) outlet socket, whereas the ELCB is usually found in the electrical distribution board – where the mains switch would be found.

[2] Note that we did not allocate colors to these wires. With the exception of the earth wire, which is either green or green & yellow, the live and neutral wires differ in color from region to region. See the Q&A section for additional information about the regional differences in wiring color codes.

Suggested Evaluation of the Paediatric and Adolescent Prospective Diver

Based on: Elliott E, Smart D, Lippmann J, Banham N, Nochetto M, Roehr S. South Pacific Underwater Medicine Society (SPUMS) position statement regarding paediatric and adolescent diving. Diving and Hyperbaric Medicine. 2024;54(4):338–43. https://doi.org/10.28920/dhm54.4.338-343. PMID: 39675742. PMCID: PMC11779525.

INTRODUCTION

The South Pacific Underwater Medicine Society (SPUMS) recommends that a medical health risk assessment should be undertaken on all prospective paediatric and adolescent divers from 10 years of age. Adult guidelines apply from 15 years of age.

A dive medical assessment should be conducted prior to any compressed air diving and following any significant health event by an experienced diving medical doctor with an interest in children / adolescent divers.

The primary goals of evaluating the paediatric and adolescent prospective diver are to:

- Assess for those children / adolescents who appear to be at increased risk of a potential adverse event during diving to provide risk mitigation, advice and guidance as to the appropriateness of diving;
- Seek additional specialist advice and information from reliable third-party sources should there be doubt in the child / adolescent's suitability or where there are complex health issues;
- Determine the child / adolescent's wish and motivation to dive, being mindful of any excessive coercion from care givers;
- Educate the child / adolescent's parents / care givers regarding the risks the child / adolescent will be exposed to when diving; and
- Educate the child / adolescent as to their responsibilities to the accompanying divers.

Which paediatric and adolescent divers should not dive?

Some of the more important ones:

- Any medical condition that could cause sudden incapacity, especially epilepsy
- ADHD
- Asthma
- Insulin dependent diabetes
- Tympanostomy ear tubes ("grommets")
- Can't swim!

A more detailed list and the reasons behind them can be found here: South Pacific Underwater Medicine Society - SPUMS-Full Medical Appendix D

When diving, ensure:

- that a minimum of two adult certified, competent divers accompany the child / adolescent when diving; one of whom knows them well (e.g., parent or sibling);
- the focus of the adults is as supervisors to the child / adolescent only;
- the child / adolescent should be within arms-length distance from the adult and in direct view at all times;
- that the child / adolescent diver is not expected to rescue their adult supervisor(s).

FAQ

Q: We have an old recompression chamber that was donated by a UK organization back in 1985. The wiring from the old chamber electrical power supply system has red, black and green wires leading to the plug that goes into the wall socket.

Our new communications system has black, grey, and green-yellow wires. Our new chamber cooling system has yellow, blue and green-yellow wires. Our new analyzer has brown, grey and green wiring. The replacement compressor, which is a used unit, has brown, orange, grey and bare copper wires.

Some of these items had plugs that we had to remove, to replace with plugs suitable for our wall power outlets.

This is so confusing, and while we are waiting for an electrician to help, we wondered if you could help with understanding what the correct colors should be.

A: This is a great question, as many of our RCN facility members have chambers which are built in one country, have been retrofitted with equipment coming from other countries, and then installed in yet another country – which can make the wiring configurations confusing.

While we can provide you with the best information we are aware of, you will need to consider the age of your equipment, as even within some countries, changes have been made.

With some luck, much of the world as we know it will eventually adopt the IEC (International Electrotechnical Commission) color coding. However, there may be a few countries that do not migrate over.

The table on the next page contains most of what you need to know, but we do need to clarify your compressor requirements.

As the replacement compressor has 4 wires, this tells us that the compressor uses what is known as a two-wire single phase configuration. Often domestic hot water heaters and stoves use this method of providing more and better-balanced power, such as 240 volts (V) in the USA (where it is usually 110 V), and 240 V in many other countries even though the normal domestic supply is also 240 V. Yes, this is confusing. Anyway, in the table we have provided for up to 3 live (hot) wires, in the event someone requires up to 3 phase power.

This resource chart is for educational purposes only. Please be sure that only a qualified electrician does the work for you. and please consult the instructions!

Electrical wiring color codes applicable to some diving regions. For countries in Asia, some such as Indonesia use the USA configuration, others the UK code, with variations. The Philippines use a very different code according to their electrical code requirements.

FAQ

	IEC Europe	USA, Mexico	IEC Europe	UK, Malaysia, Maldives	India	China	Australia, New Zealand
Live 1	Brown	Black (Brown)	Brown	Brown (Red)	Red	Yellow	Brown (Red)
Live 2	Black	Red (Orange)	Black	Black (Yellow)	Yellow	Green	Black (White)
Live 3	Grey	Blue (Yellow)	Grey	Grey (Blue)	Blue	Red	Grey (Blue)
Neutral	Blue	White (Grey)	Blue	Blue (Black)	Black	Blue or Black	Blue (Black)
Earth	Gr-Ye	Green	Gr-Ye	Gr-Ye	Green, Gr-Ye	Green, Gr-Ye	Gr-Ye

Notes:

Colors in parenthesis apply to the old color scheme for that country or region. Most countries commenced with transitioning from 2000 onwards, so as a general rule, equipment older than 25 years would likely still retain the old wiring color configuration.

Some countries may also allow the green, or green with yellow stripe (Gr-Ye) wiring to be replaced by a bare copper wire

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Chamber Operation Safety website .... chamber-operational-safety

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Dr Eddelene Bouwer is a hyperbaric physician practicing in Gqeberha, South Africa, at an accredited facility providing emergency treatment for diving injuries. The centre follows internationally accepted protocols under the guidance of SAUHMA and the UHMS.

Dr. Matias Nochetto (United States)

Dr. Matias Nochetto is a diving and hyperbaric medicine physician and serves as Executive Vice President of Global Medical Affairs at Divers Alert Network (DAN). With more than two decades of involvement with DAN, he provides strategic direction for the organization's global medical programs, partnerships, and initiatives in support of diver safety worldwide. He previously led DAN's Medical Services Department, where he led its expansion into a multinational, 24/7 medical support network.

Originally from Argentina, Matias has lived and worked in Argentina, Brazil, Mexico, and the United States, bringing a strong international perspective to his work. His career has focused on improving and expanding access to care, advancing international collaboration, and strengthening the role of DAN within the global diving community.
A former diving instructor, he remains closely connected to divers and is committed to DAN's mission of improving safety through research, education, and medical support.

Manuel Preto, CHT, DMT, ECHSM (Portugal)

Manuel Preto holds a BSc in Sports Management and is a certified Instructor Trainer in both recreational and technical diving.
Since 2006, he has specialized in hyperbaric medicine, working as an instructor and technical consultant for chamber setup and operations.
Currently based in the UAE, he supports the Dubai Police as a Hyperbaric Project Manager and serves as Vice President of EBAss.
He joined DAN Europe in 2008 and still plays an active role as an Instructor Trainer and Area Manager, contributing regularly to both the Training and Safety Committees.

ABOUT THE AUTHORS

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Sheryl is an RN, BSN, a Certified Hyperbaric Technologist, and works with the Safety Services Department at Divers Alert Network. She has worked as a chamber operator and attendant, trained chamber personnel, worked for many years at a dive shop, has received extensive training in hyperbaric facility safety and technology, performed chamber safety assessments, and serves as both the chamber medical resource and diving medicine information specialist.

Francois Burman, PE, MSC (United States)

Francois is a registered professional engineer and Vice President of Safety Services at Divers Alert Network, based in Durham, NC (USA). He is the author of the Risk Assessment Guide for Recompression Facilities, first published in 2001, and has performed over 150 on-site recompression chamber safety assessments around the world. He has over 35 years of experience in designing, manufacturing, installing, supporting, and providing training in recompression chambers, has been with DAN since 1996, and is very active in supporting recompression chambers, especially through education and training.

South Pacific Underwater Medicine Society (Australia)

The South Pacific Underwater Medicine Society (SPUMS) arose out of informal discussions between two doctors in the cluttered shed which served as the Royal Australian Navy School of Underwater Medicine. They decided to create a medical society with a focus on matters significant to recreational divers. Being Australian, they opted to be both flippant and accurate and called it the South Pacific Underwater Medicine Society. SPUMS was founded in the wardroom of HMAS Penguin on Monday, 03 March 1971.