

E-NEWS

EDITORIAL NOTE – May 2026

The E-News is the monthly newsletter of CUHMA, the primary outlet to share news/announcements, upcoming events, abstracts of recent publications, job postings, professional perspectives, and images of relevant professional scenes. Submission of applicable content is welcome. New issues are released on the last business day of each month. Past issues are available at <https://cuhma.ca>. Direct correspondence to info@cuhma.ca.

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NEWS/ANNOUNCEMENTS

Lifetime Achievement Award for George Harpur

Dr. George Harpur, with more than 50 years of service, including the role of medical director of the Tobermory hyperbaric unit, was honored with a lifetime achievement award by the Canadian Underwater Conference Committee. The virtual presentation was held on March 23, 2026 in conjunction with the Canadian Underwater Conference & Exhibition in Toronto, ON. The award was hand delivered to Dr. Harpur in Tobermory on March 27. We offer our congratulations for this well-deserved recognition.



Aaron Griffin (l) and George Harpur (r)

BMSC Subtidal Science Summer Field Course

The Bamfield Marine Sciences Centre was established as a field research and education station on the west coast of Vancouver Island in 1972. It operates as a not-for-profit joint venture of the five western universities - Victoria, British Columbia, Simon Fraser, Alberta, and Calgary. The 190-acre property was built on the site of the eastern terminus of the trans-pacific telegraph cable (1901-1959).

Spots remain open in a May 18-June 05 subtidal science course run by Dr. Isabelle Cote and Em Lim. The program will introduce the techniques and practical aspects of performing research underwater using scuba. Students will have the opportunity to try several subtidal research techniques. The course is intended for upper-level undergraduates and graduate students with an interest in subtidal ecology. Participants must have rescue diver qualification, first aid and CPR training, dive gear, and at least 12 dives logged in the past year. For more information: <https://bamfieldmsc.com/education/prospective-students/courses/detail/subtidal-science>

UPCOMING EVENTS

CUHMA Virtual Scientific Meeting 2026

The 2026 CUHMA scientific meeting will be held Saturday, May 02. The seven-hour program will address both hyperbaric and diving topics, delivered by include a panel of invited international speakers and original research presentations. Invited speakers include Nick Bird (US), Josh Boisvert (Canada), Peter Lindholm (Sweden), Chris Logue (US), Jeff McCurdy (Canada), Simon Mitchell (New Zealand), and Neal Pollock (Canada). Continuing medical education credit is being sought from the College of Family Physicians of Canada (Mainpro) and the National Board of Diving and Hyperbaric Medical Technology. Registration fees are \$100 (regular members), \$75 (associate members/students registered in academic programs), and \$150 (non-members). The registration portal is now open: <https://cuhma.ca/cgi/page.cgi/annual-scientific-meeting.html>.

UMC Introductory Diving Medicine Course

Undersea Medicine Canada will offer a Level 1 'Introductory Course in Diving Medicine - Fitness to Dive' May 11-15 in Halifax, NS. An optional half-day pre-course will be held May 10 for those wanting additional preparation for the program. Upon successful completion of the course, physicians will qualify as CSA Z275.2-15 Level 1 Diving Medical Examiners and can have their names listed with the Diver Certification Board of Canada (DCBC) to conduct commercial diver medicals in Canada. This 40-h course has been accredited for 35 MAINPRO+ CME credits by the College of Family Physicians of Canada. Contact Dr. Debbie Pestell (drdeb1@ns.sympatico.ca; 902-225-8214) or visit: <https://underseamedicine.ca> for more information.

Canadian Association of Wilderness Medicine 2026

CAWM is a non-profit organization with the goal of connecting Canadian practitioners and researchers with an interest in wilderness medicine, and in promoting the field as an area of focus and specialization. The seventh annual conference will be held September 11-13 in Whistler, BC and virtually in a hybrid format. Pre-conference workshops will also be offered. Visit: <https://cawm.ca/cawm2026>.

Divescapes Scuba Conference 2026

The Divescapes scuba conference and exhibition will be held October 16-17 at the Evario Events Centre in Edmonton, AB. The Alberta Underwater Council program includes international speakers, workshops, and trade show booths. Visit: <https://www.divescapes.ca>.

RECENT PUBLICATIONS

Aljowder AA, Ebrahim WY, Abusedera O, Alfadhli K, Jaragh N, Zghaier L, Alkhalidi AJ. Management of bilateral humeral head avascular necrosis in sickle cell disease using surgical intervention with adjuvant hyperbaric oxygen therapy: a case report. Am J Case Rep. 2026 Apr 27;27:e951902. doi: 10.12659/AJCR.951902. PMID: 42044072.

BACKGROUND: Avascular necrosis (AVN) is a disabling musculoskeletal complication of sickle cell disease (SCD), resulting from recurrent vaso-occlusive episodes and chronic microvascular ischemia. Although weight-bearing joints such as the femoral head are most commonly affected, humeral head involvement can lead to significant pain and functional limitation. Management of AVN in SCD remains challenging, and interest has grown in adjunctive therapies such as hyperbaric oxygen therapy (HBOT), which can enhance tissue oxygenation, promote angiogenesis, and support bone remodeling. Evidence regarding its role in non-weight-bearing joints remains limited. **CASE REPORT:** A 32-year-old woman with homozygous SCD (HbSS) presented with a 2-month history of progressive bilateral shoulder pain and restricted motion. Magnetic resonance imaging (MRI) demonstrated stage II pre-collapse AVN of both humeral heads. Baseline laboratory evaluation showed stable chronic anemia consistent with SCD, without evidence of acute infection or inflammatory elevation. Following perioperative exchange transfusion to reduce hemoglobin S concentration, she underwent arthroscopic-assisted core decompression with ipsilateral fibular strut autografting of both shoulders in staged procedures. Postoperatively, she completed 40 sessions of HBOT at 2.5 atmospheres absolute for 60 min each, in addition to oral alendronate 70 mg weekly for 6 months. During clinical follow-up, she reported complete resolution of pain and restoration of full, pain-free range of motion bilaterally. Post-treatment MRI

demonstrated preserved articular architecture with improvement in marrow signal. **CONCLUSIONS:** This case report shows that a multimodal joint-preserving approach combining surgical decompression and adjunctive HBOT can be associated with meaningful clinical improvement in early-stage humeral head AVN secondary to SCD. However, as multiple concurrent interventions were employed, the independent contribution of HBOT cannot be determined. Larger studies are required to clarify its adjunctive role.

Alshurafa A, Abdulgayoom M, Wafi JR, Abouzeid T, Altooq J, Yassin MA. Hyperbaric oxygen therapy in sickle cell disease: a narrative review of mechanisms, clinical applications, and future directions. Hemoglobin. 2026 Apr 23;1-8. doi: 10.1080/03630269.2026.2658568. Epub ahead of print. PMID: 42026908.

Sickle cell disease (SCD) is characterized by recurrent vaso-occlusion, hemolysis, and chronic inflammation, leading to acute painful crises and progressive organ damage. Despite standard supportive and disease-modifying therapies, many complications remain difficult to manage. Hyperbaric oxygen therapy (HBOT) increases dissolved oxygen delivery to hypoxic tissues and may reduce sickling and ischemia-reperfusion injury. This narrative review summarizes the mechanistic rationale and available clinical evidence for HBOT in SCD-related complications, including bone disease, chronic leg ulcers, ophthalmic ischemia, and priapism. Current evidence is limited to case reports, small series, and early-phase studies with heterogeneous protocols. Reported benefits include improved pain control and tissue healing in selected patients. HBOT appears generally well tolerated, but its role remains undefined. Prospective, controlled trials are needed to establish efficacy and optimal use.

Bindi VE, Sunshine MD, Fuller DD. Daily hyperbaric oxygen therapy increases diaphragm electromyographic activity and alters diaphragm gene expression after cervical spinal cord injury. Exp Neurol. 2026 Apr 25;115801. doi: 10.1016/j.expneurol.2026.115801. Epub ahead of print. PMID: 42044831.

Hyperbaric oxygen (HBO) therapy can enhance motor recovery when initiated shortly after spinal cord injury (SCI). HBO can also induce a biphasic ventilatory response that includes hypo- and hyperventilation, but this has not been evaluated after SCI. We studied adult Sprague-Dawley rats with cervical SCI to determine how an acute bout of HBO impacts diaphragm activation and to test the hypothesis that daily HBO treatment can accelerate recovery of diaphragm activation. Indwelling electromyogram (EMG) electrodes were placed in the mid-costal diaphragm prior to lateral mid-cervical contusion injury. Rats were treated with HBO (10 days, 1 h/day, 100% O₂, 3 atm, n=10) or normobaric normoxia (NORM, n=9) beginning the day of SCI. EMG was recorded daily in

freely behaving rats before and during HBO. The diaphragm EMG inspiratory burst rate and peak amplitude (ipsi- and contralateral to SCI) decreased during HBO ($p < 0.05$) on days 1-10. Daily HBO increased baseline (recorded prior to HBO on days 1-10) ipsilateral "minute EMG" output (area under curve \times rate; $p = 0.038$). RNAseq evaluation of ipsilateral hemidiaphragm tissues harvested at day 11 revealed SCI-induced changes in gene expression related to muscle structure and function, some of which were normalized by HBO treatment. We conclude that acute exposure to HBO reduces diaphragm activity after cervical SCI, and daily bouts of HBO may increase the rate of diaphragm recovery.

Jittanonta P, Vongvanich C, Premmaneesakul H. A 4-year retrospective descriptive study on treatment outcomes of decompression illness patients in various hyperbaric chamber centers in Thailand. *Int Marit Health*. 2026;77(1):13-22. doi: 10.5603/imh.105792.

Background: Thailand is situated between two abundant bodies of water, the Andaman Sea and the Gulf of Thailand. Therefore, multiple industries are based around these waters. One of the largest economic incomes is from tourism, where recreational diving is a popular activity with multiple dive sites scattered across multiple provinces in Thailand. Moreover, there are types of diving such as military diving, occupational diving, and traditional (fishermen) diving. Material and methods: A retrospective descriptive study reviewing medical records of 178 decompression illness (DCI) patients from various hyperbaric chamber centers in Thailand, between January 2020 to December 2023. Results: Out of all the patients, 73.6% achieved complete resolution of symptoms, while 26.4% had residual symptoms. Traditional divers were at a higher risk of having residual symptoms after treatment (42%). Missing safety stops showed significant association with incomplete treatment outcomes ($p = 0.008$), univariate logistic regression confirmed significance (OR=2.495, 95% CI: 1.263-4.926, $p = 0.008$); after multivariate logistic regression this factor lost its significance, but remained a strong predictor (adjusted OR=2.208, 95% CI: 0.962-5.069, $p = 0.062$). As for affected organs, spinal cord involvement was strongly related to incomplete outcomes ($p = 0.001$). First-aid high flow oxygen was given to only 18.5% of patients but had no significant associations with treatment outcomes. Conclusions: This study was one of the first multi-center studies in Thailand, it raises multiple concerns for the diving industry in both the traditional and recreational sector. Both sectors can benefit from targeted education for divers, creating safety standards, and providing proper first-aid and treatment.

Kayacık SN, Seleğ FZG, Aslan A, Karabakan R, Kirath Ü. Hyperbaric oxygen therapy in stroke-related sudden hearing loss: a case report. *Undersea Hyperb Med*. 2026 First Quarter;53(1):99-104. PMID: 41979530.

Introduction: Sudden sensorineural hearing loss (SSNHL) refers to a rapid decline in hearing of 30 dB or more that develops within three days, impacting at least three consecutive frequencies in one or both ears. Case report: This case report examines the improvement in hearing levels through hyperbaric oxygen treatment in a 74-year-old male patient who developed sudden hearing loss following a stroke. Discussion: After 15 days of neurological treatment, an audiological assessment revealed a 70 dB hearing loss in air conduction in the left ear. The patient initially received intravenous methylprednisolone for ten days, followed by five intratympanic steroid injections. Despite these treatments, no significant improvement in hearing was noted. The patient subsequently received 14 sessions of hyperbaric oxygen treatment, significantly improving hearing function.

Leys AM, Hans GH, Saldien V, Wildemeersch D. Hyperbaric oxygen therapy in managing chronic pain syndromes - a systematic review. *J Pain Res*. 2026 Mar 24;19:597243. doi: 10.2147/JPR.S597243. eCollection 2026.

Background: Chronic pain is a major global health problem for which current treatments often provide insufficient relief. Tissue hypoxia and redox imbalance may contribute to its pathophysiology, prompting interest in hyperbaric oxygen therapy (HBOT) as a potential adjunctive treatment. This review evaluates the therapeutic effects of HBOT in adults with chronic pain syndromes. Methods: A PRISMA-guided systematic review was conducted (MEDLINE, EMBASE, Cochrane Central Register of Controlled Trials; January 2000 - August 2025). Randomized controlled trials (RCTs) evaluating HBOT in adults with chronic pain were included. Primary outcomes were pain measures (intensity, distribution and sensitivity). Secondary outcomes included multidimensional pain-related outcomes (quality of life, functioning and psychological well-being), analgesic use, neuroimaging findings, and adverse events. Risk of bias was assessed using the Cochrane RoB 2 tool. Due to study heterogeneity, results were synthesized narratively. Results: Eleven RCTs (480 participants) were included, predominantly involving fibromyalgia ($n = 8$), with additional studies in complex regional pain syndrome (CRPS) ($n = 1$), idiopathic trigeminal neuralgia ($n = 1$) and radiation-induced brachial neuropathy ($n = 1$). Sample sizes ranged from 17 to 71 participants. Most trials showed some concerns or high risk of bias, mainly due to subjective outcomes and lack of blinding. In fibromyalgia, HBOT showed consistent within-group improvements in pain, functioning, and quality of life, with some studies

demonstrating between-group benefits. Limited evidence in CRPS and trigeminal neuralgia suggested possible benefit, whereas the trial in radiation-induced brachial plexopathy showed no meaningful improvement. HBOT was generally well tolerated, with mostly mild adverse events. Conclusion: HBOT shows potential as an adjunctive intervention for selected chronic pain syndromes, particularly fibromyalgia. However, condition-specific effects, inconsistent superiority over controls, methodological limitations, protocol heterogeneity, and limited long-term follow-up constrain the strength of evidence. Larger, standardized trials with extended follow-up are needed before routine clinical implementation can be recommended.

Miyoshi Y, Watanabe S, Tsukazaki S, Sugiura T, Ikomi F, Tanaka T, Ogawa H, Sawamura T. Risk factors of dysbaric osteonecrosis in saturation diving identified through magnetic resonance imaging surveillance. Undersea Hyperb Med. 2026 First Quarter;53(1):35-46. PMID: 41979523.

Introduction: Only a few cohort studies have investigated dysbaric osteonecrosis (DON) in saturation diving (SD) divers using magnetic resonance imaging (MRI) to detect early-stage DON. We aimed to investigate DON in the Japan Maritime Self-Defense Force (JMSDF) deep SD divers using MRI and examined the relationship between DON and the risk factors. Methods: This study included 62 JMSDF SD divers. DON was diagnosed in the subjects' shoulders, hips, and knee joints using MRI and their clinical information. We analyzed subjects' diving records, including pre- and post-diving medical check information such as decompression sickness (DCS) and pain +/- . Data from the annual JMSDF health checks were analyzed to identify risk factors for DON based on divers' predispositions, lifestyles, and diving profiles. Results: Of the 62 saturation divers (mean age: 40.61±6.93 years), three (4.8%) showed evidence of DON. MRI showed a geographic lesion with symptoms or a history of DCS. Two divers with DON had knee pain and a history of DCS. Furthermore, one asymptomatic diver and another diver with pain were heavy drinkers. Regarding physical and biochemical examination, diastolic blood pressure and high-density lipoprotein-cholesterol were identified as significant risk factors in an unpaired t-test (DON+ vs. DON-). Discussion: Our findings suggest that SD is associated with a higher risk of DON, the early stage of which can be detected using MRI. The possible risk factors for DON were a previous history of DCS, diastolic BP, and HDL cholesterol, suggesting that ischemia could be involved in DON pathogenesis.

Mardanpour MM, Nicolau DV, Moon RE, Pollock NW, Eckmann DM, Nicolau DV. Gas embolism: fundamentals, diagnosis, and treatment. IEEE Rev Biomed Eng. 2026 Apr 28;PP. doi: 10.1109/RBME.2026.3677292. Epub ahead of print. PMID: 42048219.

Invasive medical interventions or abrupt reductions in ambient pressure can result in intravascular gas embolism. The accumulation of gas bubbles initiates a cascade of pathophysiological phenomena progressing from platelet activation to ischemia and neurological dysfunction. This review integrates current knowledge of the biophysical mechanisms of bubble nucleation, progression, and vascular occlusion into a framework aligned with the adverse physiological consequences on circulation. The discussion further addresses the present state of clinical practice, diagnostic approaches, and therapeutic interventions. Initial studies on gas embolism utilized in vivo models, and recent in vitro and in silico platforms have provided reproducible and cost-efficient experimental approaches. The initial symptoms of gas embolism often overlap with stroke, myocardial infarction, or sepsis. Reliable detection of intravascular gas bubbles is constrained by the sensitivity, resolution, and accessibility of existing imaging modalities, particularly in systemic cases. Current treatment frameworks emphasize hyperbaric oxygen therapy, while adjunct pharmacological strategies to improve clinical outcomes are under investigation. The challenges responsible for the persistent neglect of gas embolism in both clinical and academic contexts are discussed, and a forward-looking perspective on strategies to overcome these barriers is presented.

Paganini M, Giacon TA, Mrakic-Spota S, Martani L, Cialoni D, Zucchi L, Maffei V, Cifali R, Marmo M, Camporesi EM, Moon RE, Bosco G. Gas exchange and pulmonary stress variations during scuba and breath-hold diving in open seawater. J Physiol. 2026 Apr 13. doi: 10.1113/JP290397. Online ahead of print.

Understanding of pulmonary gas exchange measurements in divers at sea is incomplete. In this study, arterial blood gases (ABGs) were measured in scuba divers breathing compressed air and pedalling at depths of 15 or 40 m in seawater (msw). In breath-hold divers (BHDs), ABGs were obtained before, at 15, 25 or 40 msw, and at the surface before breathing. Lung ultrasound was also performed in both groups before, at 15 msw, and after all the dives. Blood syndecan-1 (SDC-1) and heparan sulfate (HS) were also measured. Among 10 scuba divers (one female; ages 32-57), P_aO_2 increased at depth as predicted. Among 12 BHDs (three female, ages 33-62), P_aO_2 rose at depth and decreased on surfacing; two participants at 15 msw and one at 25 msw did not develop bottom hyperoxaemia. Lung ultrasound was normal at 15 msw, while interstitial oedema or pleural irregularities were found after surfacing in most scuba divers and BHDs. In scuba divers,

significant post-dive increases occurred in SDC-1 and HS; in BHDs, a significant increase was found in HS after the 15 and 25 msw dives, while SDC-1 increased after all depths. Compared with warm-freshwater experiments, ABG values in scuba divers were similar, while in BHDs relative hypoxaemia at depth was less common. Elevated levels of glycocalyx markers were consistent with endothelial stress, possibly providing a mechanism for fluid to accumulate in the pulmonary interstitium and explaining the ultrasound abnormalities. **KEY POINTS:** The understanding of lung-environment interactions during open-sea diving remains limited. We integrated underwater and surface arterial blood gases, lung ultrasound and endothelial glycocalyx markers (syndecan-1, heparan sulfate) to quantify gas-exchange perturbations and lung stress in scuba and breath-hold divers (BHDs). Scuba: arterial oxygen (P_aO_2) increased at depth and returned to baseline at the surface; BHDs: P_aO_2 increased at depth (except in three participants), then values fell to hypoxaemia on surfacing. Post-dive lung ultrasound showed subclinical interstitial oedema - from focal B-lines to diffuse patterns - and pleural irregularities more marked after deeper dives and in BHDs than in scuba. Circulating glycocalyx markers increased post-dive, consistent with endothelial stress.

Perron L, Plourde R, Ross M-K, Pollock NW. Carbon monoxide contamination associated with field use of internal combustion sources. Wilderness Environ Med. 2026 Apr 23;10806032261444344. doi: 10.1177/10806032261444344. PMID: 42024024. Online ahead of print.

Introduction: Carbon monoxide (CO) poisoning is a public health concern. Devices relying on internal combustion represent a common source of contamination. The colorless and odorless nature of the gas reinforces the importance of active monitoring. Intoxication may be missed, with the potential of life-threatening compromise. The impact may be accentuated at high altitude, where lower barometric pressure reduces oxygen availability. CO hazards are a known and likely underreported issue in remote high-altitude facilities. We evaluated CO levels produced by internal combustion sources in various field camp environments. Methods: CO levels in kitchens, dining areas, shower spaces, cooking tents, and seasonal ice-fishing tents were opportunistically measured using portable CO detectors (Reed Instruments R9400). Normally distributed data are reported as mean±SD or, with small samples, as range values. Results: Measurements were taken in Nepal (n=24; altitude 3606±520 m), Argentina (n=3; altitude 3240-4950 m), and Canada (n=3; altitude 198 m). The highest CO levels were found in shower spaces. Half the shower measures (7 of 13) exceeded World Health Organization recommendations for a 15-min CO exposure (86 ppm), with a peak measure of 1036 ppm. Conclusions: Our

sample size was small, but CO levels were seen to vary widely across field facilities, peaking in enclosed shower spaces, where World Health Organization recommendations were frequently exceeded. Elevated levels may pose safety risks, highlighting the need for better monitoring and public education.

CUHMA-ACMHS is the Canadian voice for the advancement of hyperbaric and diving medicine throughout our country and beyond. Our activities include continuous medical education for physicians, nurses, respiratory therapists and anyone involved in the fields of hyperbaric and diving medicine. We are also promoting dissemination of clinical research, publishing position statements, liaising with related professional associations and government agencies. Our main goal is advocating on behalf of our patients. Our vision is to be the reference for the development and delivery of hyperbaric and diving medicine in Canada and beyond. Our mission is to promote excellence in hyperbaric and diving medicine through leadership in education, promotion of best practices and advocacy for our patients. Our values are excellence, leadership, collaboration, communication, and integrity.

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