CUHMA ACMHS
Canadian Undersea and Hyperbaric Medical Association
Association Canadienne de Médecine Hyperbare et Subaquatique

E-NEWS

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.

Neal W. Pollock, PhD
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NEWS/ANNOUNCEMENTS

Invitation to Participate in a Diving Safety Research Study

Djamdoudou Abdou Rahman, MD and Neal W. Pollock, PhD are conducting a research study focused on understanding diving incidents and identifying potential contributing factors. The project aims to gather insights and experiences from divers worldwide to assess and enhance the safety and well-being of the diving community. Support can be through participation and/or sharing the following survey link with any divers who may be interested.
The survey is voluntary and anonymous. It is expected to take 5 to 20 minutes to complete, depending on personal experience. Prerequisites include age ≥15 years, diving certification of any type, and an ability to complete the survey in English or French. Thank you in advance.
https://questionnaire.simplesurvey.com/f/s/diving_incident_survey.

UPCOMING EVENTS

EUBS Annual Scientific Meeting 2025

The annual scientific meeting of the European Underwater and Baromedical Society will be held September 02-06 in Helsinki, Finland. Program events include an advanced diving accident life support course (14 h classroom paired with 15-20 h of online self-study), and workshops addressing hyperbaric safety and diving medicine cases. Information will be posted on the dedicated conference website: www.eubs2025.com.

Canadian Association of Wilderness Medicine 2025

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 sixth annual conference - Prepared for the Unpredictable: Advancing Medicine in the Wild - will be held October 03-05 in Canmore, AB and virtually in a hybrid format. Pre-conference workshops include advanced wilderness life support, technical rope rescue, and wilderness airway management. Visit: https://cawm.ca/cawm2025-2.

Brazilian Congress of Hyperbaric Medicine 2025

The 10th Brazilian Congress of Hyperbaric Medicine & 2nd Brazilian Congress of Hyperbaric Medicine will be held October 16-18 at the Hotel Laghetto Viverone in the Serra Gaúcha region of Brazil. The conference will address six main areas: maritime medicine, diving, hyperbaric oxygen therapy, safety in maritime environments, safety in hyperbaric environments, and wound care. Visit: https://sbmh.com.br/evento/10o-congresso-brasileiro-de-medicina-hiperbarica-2o-congresso-brasileiro-de-medicina-maritima.

RECENT PUBLICATIONS

Krajčovičová Z, Zigo R, Meluš V, Králová E. Efficacy of hyperbaric oxygen salvage therapy for sudden sensorineural hearing loss after ineffective primary treatment in the Slovak Republic. Undersea Hyperb Med. 2025;52(2):109-15. PMID: 40819352.

We evaluated the efficacy of hyperbaric oxygen (HBO_2) therapy used to salvage sudden sensorineural hearing loss (SSNHL) at a short distance from ineffective primary treatment. We examined the data on 70 patients who suffered from SSNHL. The treatment was administered from 1 to 3 months after the onset of the hearing loss, i.e., after ineffective primary corticosteroid therapy. The monitored group was divided into three subgroups according to the degree of hearing impairment. Treatment success was assessed by using pre- and post-treatment audiograms. A statistically significant improvement in auditory threshold in all three frequency bands was observed in patients with severe hearing impairment of more than 60 dB, with mean auditory gains of 14.5 dB in low frequencies, 11.2 dB in middle (spoken speech) frequencies, and 13.2 dB in high frequencies. In this

subgroup, 54.17% of patients with severe hearing impairment experienced an improvement in hearing gain by 5 dB or more, 33.3% by >10 dB, and 25.0% by >20 dB. In patients with moderate and slight hearing impairments, the tendency to improve the hearing gain was not statistically significant. Based on our findings, we conclude that salvage HBO_2 treatment in patients with SSNHL is apparently most efficacious for individuals with severe hearing impairment. This finding is valuable for effective resource management in healthcare and public health.

Lindholm P, Wingelaar T. Should we abstain from routine use of radiologic imaging in fitness to dive assessments? A call for action. Undersea Hyperb Med. 2025 Second Quarter;52(2):179-81. PMID: 40819360.

This article calls for a critical reevaluation of routine radiologic imaging, particularly chest X-rays (CXR) and chest computed tomography (CT), in fitness-to-dive assessments for occupational, military, and commercial divers. While these assessments aim to prevent diving incidents by identifying medical risks, the frequent inclusion of radiologic imaging for asymptomatic divers raises concerns due to limited sensitivity and specificity, incidental findings, and potential disqualification without clear evidence of increased diving-related risk. The authors advocate for a community-driven consensus to establish evidence-based guidelines and address the necessity of routine imaging in this context.

Martins-Mendes D, Costa R, Rodrigues I, Camacho Ó, Coelho PB, Paixão-Dias V, Luís C, Pereira AC, Fernandes R, Lima J, Soares R. Microvascular, biochemical, and clinical impact of hyperbaric oxygen therapy in recalcitrant diabetic foot ulcers. Cells. 2025 Aug 4;14(15):1196. doi: 10.3390/cells14151196.

Background: Diabetic foot ulcers (DFUs) are a serious complication of diabetes and are often difficult to treat. Hyperbaric oxygen therapy (HBOT) has been proposed as an adjunctive treatment to promote healing, but its long-term clinical and biological effects remain insufficiently characterized. This study aimed to evaluate the impact of HBOT on systemic biomarkers, local microvasculature, and clinical outcomes in patients with DFUs. Methods: In this non-randomized prospective study, 20 patients with ischemic DFUs were followed over a 36-month period. Fourteen received HBOT in addition to standard care, while six received standard care alone. Clinical outcomes-including DFU resolution, recurrence, lower extremity amputation (LEA), and mortality-were assessed alongside systemic inflammatory and angiogenic biomarkers and wound characteristics at baseline and at 3, 6, 12, and 36 months. CD31 immunostaining was performed on available tissue samples. Results: The two groups were comparable at baseline (mean age 62±12 years; diabetes duration 18±9 years). At 3 months, the HBOT group showed significant reductions in erythrocyte sedimentation rate and DFU size ($p<0.05$), with downward trends observed in C-reactive protein (CRP), vascular endothelial growth factor (VEGF), and placental growth factor (PlGF), and an increase in stromal-derived factor-1 alpha (SDF1-α). No significant changes were observed in the control group. CD31+ microvessel density appeared to increase in HBOT-treated DFU tissue after one month, although the sample size was limited. Patients receiving HBOT had lower rates of LEA and mortality, improved wound healing, and sustained outcomes over three years. DFU recurrence rates were similar between groups. Conclusions: HBOT was associated with improved wound healing and favorable biomarker profiles in patients with treatment-resistant ischemic DFUs. While these findings are encouraging, the small sample size and non-randomized design limit their generalizability, highlighting the need for larger, controlled studies.

Masters T, Samson M, Tucci J, Lacey AM, Rogers C, Coward A, Punjab GV, Nygaard RM. The role of hyperbaric oxygen therapy for severe frostbite injury: insights from a retrospective cohort at a high volume burn center. Undersea Hyperb Med. 2025 Second Quarter;52(2):149-56. PMID: 40819356.

This retrospective study examines the effectiveness of Hyperbaric oxygen therapy in treating severe frostbite injuries. From October 2013 to March 2020, the study analyzed 214 patients, including 62 treated with HBO_2 therapy. This study aims to describe the impact of HBO_2 therapy on improving tissue salvage and reducing amputation rates in severe frostbite-injured patients. The data suggested that patients undergoing HBO_2 therapy were more likely to receive thrombolytics and have larger areas of tissue impacted. They tended to be younger and had longer hospital stays. A significantly larger proportion of HBO_2 therapy-treated patients required surgical interventions, including amputation and debridement, compared to those not treated with HBO_2 therapy, reflecting the severity of their initial injury. Results indicate a complex relationship between HBO_2 therapy treatment and patient outcomes, suggesting that factors such as severity of injury, patient demographics, and thrombolytic therapy treatment significantly influence severe frostbite outcomes. This study contributes valuable insights to the limited literature on HBO_2 therapy in frostbite management and underscores the need for further controlled trials to ascertain its effectiveness conclusively.

McKnight JC, Solms B, Jensen M, Turnbull J, Balfour S, Laagland M, Bronkhorst M, Lee HJ, Kang G, Lee JY, Bell A, Hastie G, Ilardo M. Diving behaviour and physiology of the Korean Haenyeo. Curr Biol. 2025 Aug 18;35(16):R797-R798. doi: 10.1016/j.cub.2025.06.066.

There is a long history of breath-hold diving cultures in East Asia, with references in Japanese chronicles as early

as the third century BC. Given evidence of genetic adaptations for phenotypes associated with enhanced diving capacity within such populations1, it is likely they hold the most prodigious human diving abilities - abilities that may be akin to semi-aquatic mammals, and even some marine mammals. Yet, a dearth of fine-scale information exists on the combined natural diving behaviour and physiological responses within these diving populations. One such extraordinary population is the all-female Haenyeo. Here, we assess the fine-scale diving behaviours and physiological responses of these women during natural harvest diving. Our results show that Haenyeo divers demonstrate the highest proportions of time underwater of any humans, also exceeding those of semi-aquatic mammals and being comparable with some marine mammals. Additionally, they do not exhibit an overt cardiovascular depression, or 'dive response', classically associated with consummate diving mammals.

Moayedi S, Gizaw A, Sweet S, Sethuraman K, Witting M. Pseudoephedrine prophylaxis does not prevent middle ear barotrauma in hyperbaric oxygen therapy. Undersea Hyperb Med. 2025;52(2):101-7. PMID: 40819351.

A common complication of hyperbaric oxygen (HBO_2) treatment is middle ear barotrauma (MEB), which can lead to pain, treatment abandonment, or delay in treatment. Studies have shown that pseudoephedrine decreases MEB for pressure changes in scuba divers and airplane travelers. We conducted a randomized, double-blind, placebo-controlled trial to determine if pseudoephedrine effectively decreases MEB rates in patients receiving their first HBO_2 treatment. There was no statistically significant difference between the pseudoephedrine and placebo groups concerning ear pain ratings, tympanic membrane injury, or rescue medication to help equalize ear pressure. Pseudoephedrine prophylaxis, given between 45 minutes and two hours before multiplace HBO_2 treatment, does not mitigate MEB or treatment delays.

Murphy-Lavoie H, Butler F, Hagan C. Arterial insufficiencies: central retinal artery occlusion. Undersea Hyperb Med. 2025;52(2):187-201. PMID: 40819361.

Central retinal artery occlusion (CRAO) is a relatively rare emergent condition of the eye resulting in sudden painless vision loss. This vision loss is usually dramatic and permanent, and the prognosis for visual recovery is poor. Patients particularly at risk include those with giant cell arteritis, atherosclerosis, and thromboembolic disease. A wide variety of treatment modalities have been tried over the last one hundred years with little to no success, with the exception of hyperbaric oxygen therapy (HBO_2).

Onodera K, Ishikawa M, Homura M, Takahashi K, Hoshino K, Morimoto Y. Factors related to the prognosis of hyperbaric oxygen therapy for postoperative paralytic ileus. Undersea Hyperb Med. 2025 Second Quarter;52(2):93-9. PMID: 40819350.

Postoperative paralytic ileus is one of the most common complications associated with abdominal surgery. Although the Japanese Society of Hyperbaric and Undersea Medicine officially approves paralytic ileus as an indication for hyperbaric oxygen therapy, the factors related to the prognosis of this therapy have not been determined. Accordingly, in this study, we evaluated factors that may be related to the prognosis of this therapy in patients with postoperative paralytic ileus. Patients in gastroenterological surgery, obstetrics and gynecology, and urology who underwent hyperbaric oxygen therapy for postoperative paralytic ileus from April 1, 2017, through March 31, 2022, were retrospectively evaluated. We set the primary outcome as the number of days to oral intake after the start of the therapy. First, we compared the differences in the number of days for various factors possibly related to its prognosis. Next, multivariate analysis using multiple linear regression analysis was performed. We evaluated 110 patients. Younger age, no prevalence of diabetes mellitus, the kind of surgery, no history of previous abdominal surgery, a shorter number of days from the onset to the start of therapy, and higher mean pressure of therapy had at least 1.5 fewer days of nothing by mouth. Multiple linear regression analysis revealed that only the mean pressure of therapy was a factor associated with the prognosis of hyperbaric oxygen therapy. Only the mean pressure of therapy is related to the prognosis of hyperbaric oxygen therapy. Further prospective studies adopting higher pressure therapy will be necessary to evaluate the efficacy of this treatment.

Orwig DM, Wang J, Li Z, McGlynn JJ, HajAissa N, Davis A, Hovingh M, Packard L, Kooistra JS, Min J. The effects of hyperbaric oxygen treatment for non-arteritic central retinal artery occlusion (HBOT-CRAO). Am J Emerg Med. 2025 Aug 5:98:1-5. doi: 10.1016/j.ajem.2025.07.065.

Background and purpose: Central retinal artery occlusion (CRAO) is a rare form of acute ischemic stroke that causes severe visual loss, which is a relatively rare emergency but devastating eye condition. There is currently no guideline-endorsed treatment for CRAO. Data on hyperbaric oxygen therapy (HBOT) for CRAO is minimal. We aimed to investigate the benefit of HBOT in patients with non-arteritic CRAO. Methods: We conducted a retrospective study from two medical centers that recruited patients with diagnosed non-arteritic CRAO from January 2019 to December 2024. HBOT was offered to CRAO patients who presented to the emergency room within 24 h from symptom onset. Seventeen patients underwent a full course of HBOT (twice a day for five days with a total of 10 HBO treatments). Sixteen CRAO patients received partial HBOT (from 1 to 7 treatments); HBOT was discontinued per

patients' request, either due to varied reasons or no noted visual improvement. Thirty-two CRAO patients did not undergo HBOT due to being outside of the treatment window. The primary outcome was visual improvement at the time of discharge. Student's t-test, Mann-Whitney U (Wilcoxon rank sum) test, and Chi-square test were used to compare the change in LogMAR best-corrected visual acuity (BCVA) in patients before and after HBOT. Results: There was no statistical difference among the three groups in patient demographic and clinical characteristics (vascular risk factors). In the HBOT group, patients who received a full course of HBOT (twice a day for five days) revealed significant visual improvement at discharge evaluation with LogMAR BCVA (p=0.01). The benefit was not found in patients with partial or no HBOT. Only one patient developed an episode of seizure while receiving HBOT; no complications occurred in the rest of the patients. Conclusions: HBOT improves visual outcomes in CRAO patients who received an entire course of therapy. The benefit from HBOT does not improve the visual outcome in patients who receive partial or no treatment HBOT. Our results suggest that HBOT is safe and may be considered as a treatment option for patients with CRAO who present to the hospital within 24 h of symptom onset.

Paganini M, Tarsia L, Bosco G, Camporesi EM, Biffi M, Martignani C, Ziacchi M, Boriani G, Vitolo M, Diemberger I. Technical suitability of implantable cardiac devices for recreational diving. Undersea Hyperb Med. 2025;52(2):169-77. PMID: 40819359.

Background: Diving is a diffused recreational activity, and the number of divers carrying cardiac implanted devices is similarly growing. Due to the lack of guidelines or technical indications, the suitability of such devices for diving or the fitness to dive for these patients still needs to be determined. Objective: This work summarizes implantable cardiac devices' suitability for recreational diving, technical vulnerability factors, and recommendations to improve implanted divers' safety. Methods: Between May 1, 2021, and March 20, 2022, three interventional cardiologists retrieved the technical documentation of selected implantable cardiac devices. In particular, any suitability and tests conducted in hyperbaric environments were tracked. Results: Technical documentation was recovered for four companies. Most devices were tested in hyperbaric conditions in single, prolonged, or repeated exposures to pressurized air; underwater tests were not mentioned. No company expressly disclosed the suitability of the devices for underwater activities. Conclusion: In the absence of technical indications or guidelines, a multidisciplinary evaluation between cardiology, diving medicine, and sports medicine is essential to establish the suitability for underwater sports in implanted patients. Before each diving trip, device control is advisable, and underwater physiological adaptations should be considered, especially in the cardiovascular domain. Stressors other than water and pressure must be considered during diving, such as lead strain caused by arm movements and pressure exerted by suits or buoyancy control devices on the chest. Future directions point towards a follow-up of implanted, active divers and developing leadless devices and underwater telemonitoring.

Park JH, Kim KW. Research on Haenyeo: insights into human adaptations to extreme environments. Psychiatry Investig. 2025 Jul;22(7):737-740. doi: 10.30773/pi.2024.0394. Epub 2025 Jul 10.

Haenyeo, Korea's traditional female breath-hold divers, represent a unique model for studying brain adaptation to extreme environmental stressors. Diving daily without breathing equipment, they endure hypoxia, hydrostatic pressure, and cold exposure, often well into their senior years. Research on Haenyeo has broader implications for fields such as aging research, space exploration, and underwater medicine. Haenyeo provide an extraordinary lens through which to explore human brain resilience and adaptability. Their experiences demonstrate the brain's capacity for enduring and adapting to extreme physical and cognitive demands over a lifetime. Studying haenyeo offers valuable insights into protecting brain health in extreme environments and aging populations.

Quarato A, Di Cianni S, Germano F, Filaferro L, Lo Re F, Manni MS, Magliulo G, Greco A, De Virgilio A, Pace A, Bellizzi MG, Croce E, Gatti L, Iannella G. Eustachian tube dysfunction in professional navy divers workers. Acta Otolaryngol. 2025 Aug 21:1-6. doi: 10.1080/00016489.2025.2546389. Online ahead of print.

Background: Eustachian tube represents the anterior part of the middle ear. Its role is to maintain the pressure balance between the external and middle ear, especially in some jobs such as divers. Objectives: This clinical study aimed to evaluate Eustachian tube (ET) dysfunction in a cohort of professional divers. The primary objectives were: 1) to compare the prevalence of ET dysfunction in experienced divers versus non-divers, and 2) to assess the potential impact of diving-related immersion factors on ET function. Materials and methods: This case-control study enrolled 34 professional divers from the Italian Navy (Group A) and 35 individuals with no diving experience (Group B). Both groups underwent clinical and physical examinations, assessment of ET function via tympanometry, and completed the Eustachian tube dysfunction questionnaire-7 (ETDQ-7). Results: Tympanometry revealed that 2.9% of participants in both groups had a pathological tympanogram, with no significant differences between groups. ETDQ-7 scores were similarly distributed. However, significant differences were found in tympanometric results after the Valsalva maneuver (p=0.004 for right ear pressure peaks and p=0.001 for left

ear pressure peaks, comparing Groups A and B). Professional divers showed a low risk of developing ET dysfunction, comparable to non-divers, and this risk was not associated with the duration or frequency of diving activity. Conclusions: Navy divers show a lower incidence of ET dysfunction.

Teifurova S, Rācenis K, Freijs Ģ, Skrastina S, Balodis A. Radiological findings of retrograde venous cerebral air embolism infarcts: a case report and literature review. Vasc Health Risk Manag. 2025 Aug 12:21:617-31. doi: 10.2147/VHRM.S537865. eCollection 2025.

Background: Cerebral air embolism infarction (CAEI) is a rare but life-threatening condition that can affect the venous or arterial blood supply to the brain. Its aetiology is mostly iatrogenic, often resulting from complications of cardiothoracic or neurosurgical procedures, as well as manipulations with peripheral or central catheters. If undiagnosed and untreated, cerebral air embolism infarction can lead to long-term neurological consequences or even death. Diagnosis relies on clinical presentation and neuroimaging findings from CT and MRI, which are time-sensitive and not well described in the current literature. Case presentation: We present a rare case of cerebral infarction as a complication of retrograde cerebral venous air embolism following haemodialysis catheter removal in a young patient, with management leading to a favourable outcome. The diagnosis was confirmed based on clinical manifestations and neuroimaging findings, with air emboli identified in the subarachnoid space on the CT scan, followed by characteristic MRI changes defined for cerebral air embolism infarcts. Timely diagnosis allowed for the rapid initiation of hyperbaric oxygen therapy and the rehabilitation process, resulting in positive outcomes. Conclusion: Timely neuroimaging - particularly CT within the first 2 hours - is critical for diagnosing CAEI. MRI findings, including cytotoxic and vasogenic oedema in a distal vascular distribution and leptomeningeal enhancement, further support diagnosis. Early identification and treatment initiation are essential for improving patient outcomes.

Weenink RP, Giannakopoulos GF, van Hulst RA. Clostridial myonecrosis (gas gangrene). Undersea Hyperb Med. 2025;52(2):203-209. PMID: 40819362.

Clostridial myositis and myonecrosis, or gas gangrene, is an acute, rapidly progressive, non-pyogenic, invasive clostridial infection of the muscle tissue characterized by profound toxemia, extensive edema, massive death of tissue, and a variable degree of gas production [1-2]. Gas gangrene is either an endogenous infection caused by contamination from a clostridial focus in the body (spontaneous, atraumatic) or an exogenous infection found mostly in patients with compound and/or complicated fractures with extensive soft tissue injuries after trauma (non-spontaneous, traumatic). The onset of gas gangrene may occur between one to six hours after injury or operation and begins with severe and sudden pain in the infected area before the clinical signs appear. In atraumatic clostridial myonecrosis there are certain predisposing risks such as colonic and gynecologic malignancy, radiation, chemotherapy, and neutropenia. Seemingly disproportionate pain in a clinically still-normal area must make the clinician highly suspicious for developing gas gangrene, especially after trauma or operation. In the early phases, the skin overlying the infected area appears shiny and tense. In the next phase it becomes dusky and progresses to a bronze discoloration. The infection can advance very rapidly, and the patient may become moribund within 12 hours [3]. Hemorrhagic bullae or vesicles may be noted. A thin, serosanguinolent exudate with a sickly, sweet odor is present. Swelling and edema of the infected area is pronounced. The muscles appear dark red to black or greenish. They are noncontractile and do not bleed when cut. The tissue gas seen on radiographs appears as featherlike figures between muscle fibers and is an early and highly characteristic sign of clostridial myonecrosis. Crepitus is usually present as well. Systemic toxicity presents as high fever and tachycardia, followed by shock and multiorgan failure [3].

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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