

# E-NEWS

## EDITOR'S NOTE – September 2023

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](mailto:info@cuhma.ca).

Neal W. Pollock, PhD  
Université Laval

## NEWS/ANNOUNCEMENTS

### Rebreather Forum 4 Presentations

One of the goals of the RF4 meeting was to release the relevant video lectures freely to the community. The release will be in small groups over the coming months. The first two batches are now available:

<https://rebreatherforum.tech/program>

or GUE.tv: <https://gue.tv/programs/rebreather-forum-4>

## UPCOMING EVENTS

### UMC Introductory Diving Medicine Course

Undersea Medicine Canada is offering a Level 1 'Introductory Course in Diving Medicine - Fitness to Dive' September 18-22 in Quebec City, QC. An optional half-day pre-course will be held September 17 for those wanting additional preparation for the program. For more info visit: <https://underseamedicine.ca>.

### WMS Diving and Environmental Medicine CME

The Wilderness Medical Society is holding a continuing medical education course September 30-October 07, 2023 in Cayman Brac (travel on Saturdays on both ends). Each of six days includes four hours of interactive lectures and two boat dives. Visit: <https://wms.org/DM23>.

### DEMA Show 2023

The Diving Equipment & Marketing Association (DEMA) show will be held November 14-17 at the Ernest N Morial

Convention Center in New Orleans, LA. This is a popular industry event. Visit: <https://www.demashow.com>.

## RECENT PUBLICATIONS

**Balbo A, Drommi M, Spigno F, Frigiolini FME, Barranco R, Ventura F. Fatal diving accidents in Genoa (North-West Italy) from 1968 to 2021: forensic approach and literature review. J Forensic Leg Med. 2023;99:102580. doi: 10.1016/j.jflm.2023.102580. Online ahead of print.**

Scuba diving is one of the most common and practised water sport activities in Genoa, especially in the more recent years. Although scuba diving is generally considered a safe activity, this does not exclude the possibility of serious or fatal accidents from happening. This retrospective study investigates the case history of deaths resulting from diving accidents recorded by the Municipal Morgue of Genoa over a period of 53 years, specifically from 1968 to 2021. Of the total 52 deaths covered by the study, 48 were male with an age range of 16-71 years. In 25 of these subjects, pre-existing pathological conditions of a cardiovascular nature, not recognised at the time of death, were reported. Out of the total deaths studied, 9 subjects died following a diving accident related to free diving, while 43 subjects died from scuba or rebreather diving. Among the latter subjects, the cause of death was attributed to drowning in 17 cases, arterial gas embolism (AGE) from pulmonary overdistension in 11 cases, cardio-circulatory arrest (CA) favoured by pre-existing and non-existing heart disease known prior to the death in 10 cases, decompression sickness (DCS) in 2 cases, a combination of DCS and AGE in 2 cases and oxygen intoxication in 1 case. Twelve of the fatal accidents occurred in the marine area near the village of Arenzano, where the shipwreck of the oil tanker, the "Haven", sank in 1991 and is today the largest shipwreck explored by divers in the Mediterranean Sea. In all cases of diving deaths, a multi-disciplinary approach is important: in particular, the role of the forensic pathologist is essential in order to accurately reconstruct the dynamics of the accident, thus identifying the predisposing or triggering factors that led to death, and defining the cause of it.

**Barski M, Jermakow N, Barska K, Siewiera J. Evaluation of the effects of hyperbaric on human attention functions based on eye movements recorded using an infrared camera. *Adv Clin Exp Med.* 2023 Aug 14. doi: 10.17219/acem/162923.**

**Background:** This study aimed to assess the influence of elevated atmospheric pressure on the functions of attention of medical personnel working in hyperbaric chambers. We enrolled 15 participants who met the inclusion criteria. The test consisted of performing the same medical procedure under 2 conditions. For each of these test conditions, right eye movements were recorded using an oculograph. The obtained results revealed a relationship between elevated atmospheric pressure and the ability of medical personnel to focus. **Objectives:** To assess the influence of hyperbaric oxygen (HBO<sub>2</sub>) on visual attention in medical personnel during medical activities performed under normobaric (1 absolute atmosphere (1 ATA)) and hyperbaric (4 ATA) conditions inside a hyperbaric chamber. **Material and methods:** Each participant had a valid license to act as a medical attendant during therapeutic hyperbaric sessions. Fifteen individuals, 10 men and 5 women aged between 28 and 65 years, participated in the study. The participants were asked to perform a medical procedure involving the preparation of a syringe with a drug administered by an infusion pump under 2 test conditions: 1 ATA corresponding to the atmospheric pressure on land, and 4 ATA corresponding to an underwater depth of 30 m. The order of test conditions was random. Both test conditions were performed inside a hyperbaric chamber. **Results:** The number of fixations in the area of interest (AOI) varied between stages (1, 2 and 3) and task conditions (1 ATA and 4 ATA), with lower values for the 4 ATA condition. Under 1 ATA, 30% of eye fixations were in the AOI, as compared to only 6% under 4 ATA. **Conclusions:** The obtained results indicate that elevated atmospheric pressure has negative effects on the attention of medical personnel.

**Fothergill DM, Gertner JW. Exhaled nitric oxide and pulmonary oxygen toxicity susceptibility. *Metabolites.* 2023;13(8):930. doi: 10.3390/metabo13080930.**

Individual susceptibility to pulmonary oxygen toxicity (PO<sub>2 tox</sub>) is highly variable and currently lacks a reliable biomarker for predicting pulmonary hyperoxic stress. As nitric oxide (NO) is involved in many respiratory system processes and functions, we aimed to determine if expired nitric oxide (F<sub>E</sub>NO) levels can provide an indication of PO<sub>2 tox</sub> susceptibility in humans. Eight US Navy-trained divers volunteered as subjects. The hyperoxic exposures consisted of six- and eight-hour hyperbaric chamber dives conducted on consecutive days in which subjects breathed 100% oxygen at 202.65 kPa. Subjects' individual variability in pulmonary function and F<sub>E</sub>NO was measured twice daily over five days and compared with their post-dive values to assess susceptibility to PO<sub>2 tox</sub>. Only subjects who showed no decrements in pulmonary function following the six-

hour exposure conducted the eight-hour dive. F<sub>E</sub>NO decreased by 55% immediately following the six-hour oxygen exposure (n=8, p<0.0001) and by 63% following the eight-hour exposure (n=4, p<0.0001). Four subjects showed significant decreases in pulmonary function immediately following the six-hour exposure. These subjects had the lowest baseline F<sub>E</sub>NO, had the lowest post-dive F<sub>E</sub>NO, and had clinical symptoms of PO<sub>2 tox</sub>. Individuals with low F<sub>E</sub>NO were the first to develop PO<sub>2 tox</sub> symptoms and deficits in pulmonary function from the hyperoxic exposures. These data suggest that endogenous levels of NO in the lungs may protect against the development of PO<sub>2 tox</sub>.

**Moreira Monteiro A, Alpuim Costa D, Mareco V, Espiney Amaro C. The effectiveness of hyperbaric oxygen therapy for managing radiation-induced proctitis- results of a 10-year retrospective cohort study. *Front Oncol.* 2023 Aug 11;13:1235237. doi: 10.3389/fonc.2023.1235237.**

**Introduction:** Despite modern radiotherapy (RT) techniques, radiation-induced proctitis (RIP) remains a significant complication of RT for pelvic organ malignancies. Over the last decades, an enormous therapeutic armamentarium has been considered in RIP, including hyperbaric oxygen therapy (HBOT). However, the evidence regarding the impact of HBOT on RIP is conflicting. This study aims to evaluate the effectiveness and safety of HBOT in the treatment of RIP. **Methods:** Ten-year (2013-2023) retrospective analysis of all consecutive patients with RIP treated with HBOT at Centro de Medicina Subaquática e Hiperbárica (CMSH) (Armed Forces Hospital - Lisbon, Portugal). Patients were exposed to 100% oxygen at 2.5 ATA, in a multiplace first-class hyperbaric chamber, for 70-min periods, once daily, five times per week. Fisher's exact test was performed using SPSS (version 23.0); p<0.05 was accepted as statistically significant. **Results:** Of a total of 151 patients with RIP, 88 were included in the final analysis, of whom 38.6% evidenced other concurrent radiation-induced soft tissue lesions. The most reported primary pelvic tumor treated with RT was prostate cancer (77.3%), followed by cervical cancer (10.2%). Hematochezia was the most observed clinical manifestation (86.4%). After a median of 60 HBOT sessions (interquartile range [IQR]: 40-87.5), 62.5% and 31.8% of patients achieved a clinical complete and partial response, respectively, with a hematochezia resolution rate of 93.7% (complete or partial). While partial and complete responses require fewer than 70 sessions of HBOT in terms of overall RIP symptoms (p=0.069), isolated hematochezia tends to require at least 70 sessions (p=0.075). Individuals with at least two concurrent late radiation tissue injuries were associated with a complete response to HBOT (p=0.029). Only about 5.7% of patients did not respond to the treatment. Eighteen patients (20.5%) developed reversible ear barotrauma. The

number of HBOT sessions was a predictor of HBOT side effects (odds ratio: 1.010; 95% confidence interval, 1.000-1.020;  $p=0.047$ ). Conclusion: The HBOT proved to be an effective and safe treatment for RIP refractory to medical and/or endoscopic treatments. This real-world evidence study adds value to published data on the management of RIP with HBOT.

**Neel OF, Mousa AH, Al-Terkawi RA, Bakr MM, Mortada H. Assessing the efficacy of hyperbaric oxygen therapy on facelift outcomes: a case-control study comparing outcomes in patients with and without hyperbaric oxygen therapy. *Aesthet Surg J Open Forum.* 2023;5:ojad065. doi: 10.1093/asjof/ojad065.**

Background: Wound healing remains among the most concerning complications in aesthetic surgery. The use of hyperbaric oxygen therapy (HBOT) is an accepted method of supporting wound healing. Objectives: The aim of this study is to assess the role of HBOT in postoperative healing and complication rates following facelift surgery. Methods: This case-control study comprised facelift patients who received HBOT and those who did not between 2019 and 2022. Data were extracted from the patients' medical records, with the primary outcomes being the presence of complications, wound-healing duration, and patient satisfaction. Results: The authors recruited 20 female patients who underwent facelift for this study, with 9 patients in the HBOT group and 11 patients in the control group. The average number of HBOT sessions received was 7.22, and each session lasted an average of  $78\pm 5$  min. The duration of wound healing in the HBOT group ranged from 7 to 30 days (mean of 13.3 days), whereas the control group ranged from 6 to 90 days (mean of 36.9 days). This indicates a statistically significant shorter time to wound healing in the HBOT group compared to the control group ( $P<0.001$ ). Conclusions: Future prospective randomized controlled trials with larger sample sizes and blinding are needed to further evaluate the potential benefits of HBOT in the postoperative period. Nonetheless, our findings suggest that HBOT may be a promising adjunctive therapy for patients undergoing facelift surgery.

**Schmidt T, Reiss N, Olbrich E, Chalabi K, Hagedorn T, Tetzlaff K. Scuba diving after a heart transplant: excessive daring or calculable risk? *Am J Physiol Heart Circ Physiol.* 2023;325(3):H569-77. doi: 10.1152/ajpheart.00332.2023.**

Over the past 50 years, outcomes after heart transplantation (HTX) have continuously and significantly improved. In the meantime, many heart transplant recipients live almost normal lives with only a few limitations. In some cases, even activities that actually seemed unreasonable for these patients turn out to be feasible. This article describes the encouraging example of a patient returning to recreational scuba diving after HTX. So far, there were no scientific experiences documented in this area. We worked out the

special hemodynamic features and the corresponding risks of this sport for heart transplant recipients in an interdisciplinary manner and evaluated them using the patient as an example. The results show that today, with the appropriate physical condition and compliance with safety measures, a wide range of activities, including scuba diving, are possible again after HTX. They illustrate again the significant development and the enormous potential of this therapy option, which is unfortunately only available to a limited extent.

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.

**Canadian Undersea and Hyperbaric Medical Association**

10 Plumtree Place, Portugal Cove-St. Philips,  
Newfoundland and Labrador, A1M 3T1  
[info@cuhma.ca](mailto:info@cuhma.ca) <https://cuhma.ca>

Editor: Neal W. Pollock, PhD - [neal.pollock@kin.ulaval.ca](mailto:neal.pollock@kin.ulaval.ca)

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