

E-NEWS

EDITORIAL NOTE – May 2019

The E-News is the monthly newsletter of CUHMA used to share news and information. We invite relevant content, including announcements, upcoming conferences, new publication abstracts, job postings, professional perspectives, incident reports, and relevant images of related professional scenes. Feel free to share issues with interested colleagues. All past issues are available at <https://cuhma.ca>.

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NEWS/ANNOUNCEMENTS

Franklin Expedition and Inuit Heritage Artifacts

Artifacts from the Franklin expedition have been recovered by Parks Canada and Inuit Heritage Trust divers from the national historic site wrecks of the HMS Erebus (found 2014) and HMS Terror (found 2016). Once the preservation is complete, artifacts will be displayed from an Inuit perspective. Nunavut will be the home center, with temporary loan to other institutions possible. For more, see: https://www.ctvnews.ca/mobile/canada/inuit-heritage-trust-and-parks-canada-ink-deal-on-fate-of-franklin-artifacts-1.4382582?fbclid=IwAR0jpnBv2PN09yPd_7NVIgt4c3xK0xmiBoHrqsRjF2BNNBxg7UuMQJFOK-8

BBC Future: Worst Case Survival Series - Hypoxia

This April 23, 2019 story by Richard Gray discusses survival following prolonged hypoxia, framing it with Chris Lemons' experience of having his umbilical cut during a North Sea saturation dive at 100 msw in 2012. Visit: http://www.bbc.com/future/story/20190423-the-man-who-ran-out-of-air-at-the-bottom-of-the-ocean?fbclid=IwAR1FjMfpR_nSzA1LNRDaIkRKmme0drwNlohukX1MbwmVuU6-db2SOr3JhhA

Call for Original Research – CUHMA 2019

Both original research and review session abstracts will be considered for oral presentation at the 2019 CUHMA annual scientific meeting. The submission deadline is June 15. Submit abstracts to neal.pollock@kin.ulaval.ca.

Abstract Submission Guidelines (Word file)

Line 1 - informative title, bold and block capitals.

Line 2 - author(s) (surname followed by initials for each).

Line 3 - professional affiliations for author(s).

Lines 4+ (research abstracts) - maximum 250 words (introduction, methods, results, conclusions, funding acknowledgment), 10 pitch Times New Roman, block format (ie, no indenting), complete data but no references, tables or figures.

Lines 4+ (review session abstracts) - 150-250 words, 10 pitch Times New Roman, block format (ie, no indenting), overview of proposed presentation but no references, tables or figures.

UPCOMING EVENTS

UMC Level 2 Advanced Diving Medicine Course

Undersea Medicine Canada is offering a CSA Z275 Level 2 'Advanced Course in Diving Medicine: Diagnosis and Treatment'. This 6-day course will be held May 06-11 at the Canadian Museum of Immigration, Pier 21 in Halifax, NS. Augmenting classroom instruction and case-based learning, site visits will allow observation of commercial diver training and diving operations, as well as training at the Hyperbaric Medicine Unit at the QEII Health Sciences Centre in Halifax. A CSA Z275.2-15 Level 1 course or equivalent training is a prerequisite for this 45-h program. You can register at <https://underseamedicine.ca> or contact Dr. Debbie Pestell at drdeb1@ns.sympatico.ca or 902-225-8214 for more information.

CUHMA Annual Scientific Meeting 2019

The 2019 CUHMA ASM will be held October 03-06 in St. John's, NL, hosted by Memorial University Faculty of Medicine. Two days of pre-conference events will be followed by two days of scientific talks. Pre-conference events include:

- BLS/ACLS course
- Offshore Safety and Survival Centre tour (underwater helicopter escape training facility)
- Hyperbaric procedures simulation course
- Board of Directors meeting

A welcome reception will be held on Friday evening, and the awards banquet on Saturday evening. Visit our website for updates and registration: <https://cuhma.ca>.

UMC Level 1 Introductory Diving Medicine Course

Undersea Medicine Canada is offering a CSA Z275.2-15 Level 1 'Introductory Course in Diving Medicine - Fitness

to Dive' October 28-November 01 in Quebec City, QC. 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.

RECENT PUBLICATIONS

Faunø Thrane J, Ovesen T. Scarce evidence of efficacy of hyperbaric oxygen therapy in necrotizing soft tissue infection: a systematic review. *Infect Dis (Lond)*. 2019 Apr 15:1-8.

BACKGROUND: Necrotizing soft tissue infection (NSTI) is a rare and potentially life-threatening disease. Rapid surgical intervention, antibiotics and intensive care are the mainstay of treatment. Hyperbaric oxygen therapy (HBOT) is used as adjuvant therapy in some centres but there is a lack of research-based evidence of efficacy. **METHODS:** Following the PRISMA guideline we conducted a systematic review on the efficacy of HBOT on NSTI with mortality as primary outcome. Through January 2019 major databases were searched and relevant literature assessed. The criteria for study inclusion were research of any design and any period of time comparing HBOT vs non-HBOT in a population of NSTI-patients. Studies were analysed using the modified Delphi method and risk of bias in non-randomized studies - of interventions tool. Relative risk (RR) on mortality was calculated for each study individually. **RESULTS:** A number of 1733 studies were identified through database search. Ultimately, 21 studies were included of which 19 were case series with a control group. The majority of the studies performed poor in quality assessment and all featured a high to critical risk of bias. The association of HBOT on mortality was generally reported as positive, however, the results should be considered with great scepticism. **CONCLUSIONS:** The evidence of HBOT in NSTI is poor and biased. There is a strong need for randomized controlled trials (RCTs) to shed light on a potential life-saving treatment.

Golledge J, Singh TP. Systematic review and meta-analysis of clinical trials examining the effect of hyperbaric oxygen therapy in people with diabetes-related lower limb ulcers. *Diabet Med*. 2019 Apr 19. doi: 10.1111/dme.13975. [Epub ahead of print]

AIM: To examine the efficacy of hyperbaric oxygen therapy in healing diabetes-related lower limb ulcers through a meta-analysis of randomized clinical trials. **METHODS:** A literature search was conducted to identify

appropriate clinical trials. Inclusion required randomized study design and reporting of the proportion of diabetes-related lower limb ulcers that healed. A meta-analysis was performed to examine the effect of hyperbaric oxygen therapy on ulcer healing. The secondary outcomes were minor and major amputations. **RESULTS:** Nine randomized trials involving 585 participants were included. People allocated to hyperbaric oxygen therapy were more likely to have complete ulcer healing (relative risk 1.95, 95% CI 1.51-2.52; $P < 0.001$), and less likely to require major (relative risk 0.54, 95% CI 0.36-0.81; $P = 0.003$) or minor (relative risk 0.68, 95% CI 0.48-0.98; $P = 0.040$) amputations than control groups. Sensitivity analyses suggested the findings were dependent on the inclusion of one trial. Adverse events included ear barotrauma and a seizure. Many of the trials were noted to have methodological weaknesses including absence of blinding of outcome assessors, lack of a justifiable sample size calculation and limited follow-up. **CONCLUSIONS:** This meta-analysis suggests hyperbaric oxygen therapy improves the healing of diabetes-related lower limb ulcers and reduces the requirement for amputation. Confidence in these results is limited by significant design weaknesses of previous trials and inconsistent findings. A more rigorous trial regarding the efficacy of hyperbaric oxygen therapy is needed.

Kaldırım H, Yazgan S, Ceylan B, Atalay K. The effect of hyperbaric oxygen therapy on retinal thickness and progression of retinopathy in patients with type 2 diabetes: a prospective cohort study. *Cutan Ocul Toxicol*. 2019 Apr 22:1-22. doi: 10.1080/15569527.2019.1608226. [Epub ahead of print]

PURPOSE: Evaluation of the effect of hyperbaric oxygen therapy (HBOT) on the progression of retinopathy, choroidal and retinal thickness in patients with type 2 diabetes mellitus (DM). **MATERIALS AND METHODS:** This prospective non-randomized cohort study consisted of 60 eyes of 30 patients who received 30 sessions of HBOT for a diabetic foot ulcer. The participants were divided into 3 groups; group 1: mild-moderate non-proliferative diabetic retinopathy (DRP) ($n = 14$), group 2: severe non-proliferative DRP ($n = 20$) and group 3: DRP without active proliferative findings with the applied laser for at least 2 years ($n = 26$). The cases were examined on base-line (measurement-1), after the 10th session of HBOT (Measurement-2), after the 20th session of HBOT (Measurement-3), after the 30th session of HBOT (Measurement-4), and after 10 days of the last session of HBOT (Measurement-5). The changes in central macular thickness (CMT; subfoveal point [CMT-SF], nasal point [CMT-N] and temporal point [CMT-T]), central choroidal thickness (CCT; subfoveal point [CCT-SF], nasal point [CCT-N] and temporal point [CCT-T]) and the stage of DRP were compared. **RESULTS:** There was no significant difference between groups in terms of change ratio (CR

%) in CMT-SF and CMT-N values. However, in Measurement-3, the CR% in CMT-T was significantly higher in group 1 ($p=0.019$). A significant increase in CMT-N and CMT-T parameters over time was observed in Group 1 ($p < 0.05$). There was a significant decrease in CCT-SF, CCT-N, and CCT-T values with time in each of the 3 groups ($p < 0.05$). At the end of HBOT, there was no progression or regression in the stage of DRP in any group. **CONCLUSIONS:** Hyperbaric oxygen therapy has both a thinning effect on the choroid layer in the all three groups and a thickening effect on the macula in the mild-moderate nonproliferative diabetic eyes.

Lippert T, Borlongan CV. Prophylactic treatment of hyperbaric oxygen treatment mitigates inflammatory response via mitochondria transfer. CNS Neurosci Ther. 2019 Apr 11. doi: 10.1111/cns.13124. [Epub ahead of print]

AIMS: Hyperbaric oxygen therapy (HBOT) has been widely used as postinjury treatment; however, we investigate its ability to mitigate potential damage as a preconditioning option. Here, we tested the hypothesis that HBOT preconditioning mitigates cell death in primary rat neuronal cells (PRNCs) through the transfer of mitochondria from astrocytes. **METHODS:** Primary rat neuronal cells were subjected to a 90-minute HBOT treatment at 2.5 absolute atmospheres prior to either tumor necrosis factor-alpha (TNF-alpha) or lipopolysaccharide (LPS) injury to simulate the inflammation-plagued secondary cell death associated with stroke and traumatic brain injury (TBI). After incubation with TNF-alpha or LPS, the cell viability of each group was examined. **RESULTS:** There was a significant increase of cell viability accompanied by mitochondrial transfer in the injury groups that received HBOT preconditioning compared to the injury alone groups (44 ± 5.2 vs 68 ± 4.48 , $n=20$, $P < 0.05$). The transfer of mitochondria directly after HBOT treatment was visualized by capturing images in 5-minute intervals, which revealed that the robust transfer of mitochondria begins soon after HBOT and persisted throughout the treatment. **CONCLUSION:** This study shows that HBOT preconditioning stands as a robust prophylactic treatment for sequestration of inflammation inherent in stroke and TBI, possibly facilitating the transfer of resilient mitochondria from astrocytes to inflammation-susceptible neuronal cells in mitigating cell death.

Ponganis PJ. State of the art review: from the seaside to the bedside: insights from comparative diving physiology into respiratory, sleep and critical care. Thorax. 2019 Mar 2. pii: thoraxjnl-2018-212136. doi: 10.1136/thoraxjnl-2018-212136. [Epub ahead of print]

Anatomical and physiological adaptations of animals to extreme environments provide insight into basic physiological principles and potential therapies for human

disease. In that regard, the diving physiology of marine mammals and seabirds is especially relevant to pulmonary and cardiovascular function, and to the pathology and potential treatment of patients with hypoxaemia and/or ischaemia. This review highlights past and recent progress in the field of comparative diving physiology with emphasis on its potential relevance to human medicine.

Van Wijk CH. Personality profiles of divers: integrating results across studies. Int Marit Health. 2018;69(4):297-303.

BACKGROUND: There are numerous reports on diver personality, spanning across five decades, across national boundaries, and using a range of measures to describe diver profiles. However, the range of reports poses challenges to interpreting new studies, particularly when having to compare findings across generations, measurements, and national/cultural contexts. This paper aimed to review and integrate diver personality descriptions, drawing on the available studies that reported trait theory based data for naval and sport divers. **MATERIALS AND METHODS:** Available studies on diver personality - associated with trait theory - were tabulated and the specific traits associated with divers described. Their findings were then integrated into a synthesised description of personality traits. **RESULTS:** The results suggest remarkably stable military diver profiles across generations, measures, and navies, with some unique differences observed due to national-cultural variables. It was of particular interest that different measures of personality appeared to present related constructions of diver profiles. Navy divers share, among others, a propensity for adventurousness, a strong sense of self-agency, and low trait anxiety. Unsurprisingly, personality profiling could not be generalised across military-civilian diving contexts, and the same clear profile differentiation of navy divers was not visible among sport divers. **CONCLUSIONS:** Contemporary local data - in the context of military diving - could productively be compared to the body of existing reports, at least where similar theoretical models are used.

Xuejian W. Clinical research of early hyperbaric oxygen therapy on patients with hypertensive cerebral hemorrhage after craniotomy. Turk Neurosurg. 2018 Dec 11. doi: 10.5137/1019-5149.JTN.25044-18.3. [Epub ahead of print]

AIM: To observe the effect of early hyperbaric oxygen (HBO) therapy on the improvement of consciousness and prognosis of patients with severe brain damages after craniocerebral craniotomy. **MATERIAL AND METHODS:** Eighty-one patients who had cerebral hemorrhage and underwent clearance of hematoma and decompressive craniectomy from August 2013 to August 2016 were retrospectively analyzed. The patients were divided into HBO and non-HBO therapy groups. The

treatment effects were scored and subjected to corresponding statistical analysis. RESULTS: There were significant differences in the Glasgow coma scale (GCS) scores at 3 and 5 weeks ($t=2.293$ and $t=3.014$, respectively, $P<0.05$), and in Glasgow outcome scale (GOS) scores at 5 weeks and 3 months between the two groups ($P<0.05$). CONCLUSION: Early HBO therapy could improve the consciousness and prognosis of patients with cerebral hemorrhage after craniotomy.

Zhang XC, Golden A, Bullard DS. Neurologic deep dive: a simulation case of diagnosing and treating decompression sickness for emergency medicine residents. MedEdPORTAL. 2016 Sep 28;12:10473. doi: 10.15766/mep_2374-8265.10473.

INTRODUCTION: Decompression sickness (DCS) is a rare and dangerous complication from a rapid decrease in environmental pressure, commonly seen in patients leaving a compressed-air environment, such as scuba divers, aviators, and deep tunnel workers. Failure to clinically diagnose and adequately treat DCS with hydration and supplemental oxygen before bridging to hyperbaric oxygen (HBO) therapy can result in permanent residual symptoms or, in rare cases, death. Despite the increasing incidence of DCS, there are limited published simulation case studies discussing this perilous environmental exposure. METHODS: This fictional simulation case is written for emergency medicine residents to diagnose and manage DCS from a live-actor patient presenting with unilateral neurologic symptoms and concealed cyanotic mottling (cutis marmorata). This case ran for four separate iterations at a simulation center, with a resident, fellow, and attending acting as specific confederates for their respective roles. Following each case, the learners were debriefed at bedside, discussed a PowerPoint presentation, and underwent a question-and-answer session. RESULTS: Based on postsimulation qualitative assessments, junior and senior residents correctly identified DCS, but junior residents alone were less likely to elicit pertinent social history or to fully physically examine the patient without the presence of senior residents. Both resident groups were able to verbally explain the fundamental DCS pathophysiology to the patient, but junior residents were unable to specifically direct oxygenation, hydration, and HBO protocols for DCS. After case completion and debriefing, all learners demonstrated achievement of primary learning objectives. DISCUSSION: Overall, we noted this case worked well for junior EM residents with senior-resident backup. Both learner groups appreciated the concealed elements of case, including scuba diving history and exposed dermatologic findings, and reported that these were invaluable learning moments for all future patient encounters, not just those limited to DCS.

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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