Medical Examination of Diving Fatalities Symposium

Dr. Tom Neuman, Moderator
Dr. Neuman is a co-editor of the 5th Edition of Bennett and Elliott's *Physiology and Medicine of Diving*, one of the most widely used textbooks in the world in the field of undersea medicine. He was also the Editor-in-Chief of the *Journal of Undersea and Hyperbaric Medicine*. Dr. Neuman is on the American Board of Preventive Medicine committee responsible for formulating the Board Examination in Undersea and Hyperbaric Medicine. The UHMS has awarded Dr. Neuman the Craig Hoffman Memorial Award for contributions to diving safety, the Merrill Spencer award for Lifetime Achievement, and the Albert Behnke Award for outstanding scientific contributions to advances in the undersea biomedical field. In 2011, Dr. Neuman was selected to be the DAN/Rolex Diver of the Year. Dr. Neuman continues to do research in gas exchange and exercise physiology and the causes of diving fatalities.

Why It May Not be Drowning
*The correct identification of the actual cause of death in divers allows us, as diving physicians, to try to deal with the root causes of these events and therefore help prevent such deaths in the future. There are also important legal ramifications to correctly identifying the cause of death. Emergency Department physicians probably see more sudden cardiac deaths than any other specialty, thus this presentation will include a discussion of sudden cardiac deaths in divers from the point of view of an experienced diving medicine and emergency medicine physician. We joke that all too often the average Medical Examiner's response to a diving death is - He's wet, he's dead; he drowned - but there is much more to it than that.*

Dr. Charlotte Sadler
Dr. Sadler is currently the Chief Resident of Emergency Medicine at the University of California, San Diego (UCSD). Next year, she will be doing a fellowship in hyperbaric medicine at UCSD. She is also a member of the San Diego Diver Death Review Committee.

Dilemma of Natural Death While Scuba Diving
*As we evaluate for alternative causes of death in divers, perhaps the most likely culprit is sudden cardiac death, either from arrhythmia or ischemia. The post mortem evaluation of these patients necessitates an interpretation of their heart weight and coronary arteries. The purpose of this talk will be to highlight the problems of so-called "normal" heart weights, as well as the pathophysiology of sudden cardiac deaths from arrhythmias and ischemia.*

Dr. Craig Nelson
Having recently taken a position as an Associate Chief Medical Examiner for the State of North Carolina, Dr. Nelson was previously a Deputy Medical Examiner for the County of San Diego. With a background including the 1996 Rolex Our World-Underwater Scholarship and experience in underwater body recovery, he joined the San Diego
Lifeguards and helped form the San Diego Diver Death Review Committee to further diver death investigation and promote local diver safety. With his new position located near DAN headquarters, he hopes to continue work in diver death investigation.

**Field Investigation; Preserving the Evidence**

*Diving conditions and diving equipment may cause or contribute to a diver's death, which makes field investigation and equipment preservation critical. Simple evidence preservation techniques and documentation can make the difference in understanding a diver fatality, but those in the field don't have to be divers or equipment experts in order to preserve information and items for later examination.*

**Dr. James Caruso**

Dr. Jim Caruso was recently appointed the Chief Medical Examiner and Coroner for Denver, Colo., after completing more 29-years of service in the United States Navy. Dr. Caruso’s Navy career included certification and tours as a Navy Diving Medical Officer, Navy Flight Surgeon and Armed Forces Medical Examiner. He was the Deputy Chief Medical Examiner for the Department of Defense and also the Regional Armed Forces Medical Examiner for the Pacific. Dr. Caruso is board-certified in Anatomic, Clinical and Forensic Pathology. In addition to his training in pathology, Dr. Caruso completed a fellowship in Diving and Hyperbaric Medicine at Duke University Medical Center and achieved board certification through the American Board of Preventive Medicine. Dr. Caruso has numerous journal articles, book chapters and formal presentations to his credit. He is a member of the Divers Alert Network medical staff as a consultant in Forensic Pathology and Clinical Diving Medicine. In addition to Dr. Caruso’s contributions to the technical diving medicine literature, he is the current medical editor for *Sport Diver* magazine and formerly had the same role for *Asian Diver* magazine.

**Post Mortem, How To**

*A meticulous, thorough postmortem examination with toxicology is essential to investigating any diving-related death. A few modifications in protocol will maximize the information gleaned from the autopsy and the autopsy findings must be put into the context of the dive profile and the circumstances surrounding the death.*

**Dr. John R. Clarke**

For 23 of his 35 years working for the U.S. Navy as a respiratory physiologist and physical scientist, John R. Clarke, Ph.D., has directed numerous forensic diving equipment investigations, authored investigative reports on the most complicated diving accidents, and served as a subject matter expert in Coast Guard investigations and at trial. He lectured on Rebreather Accident Investigations at DAN’s 2008 Technical Diving Conference, and is on the Diving Control Board for the Florida State University Advanced Scientific Diving Program and Crime Scene Investigation Program. He’s been the Scientific Director of the Navy Experimental Diving Unit (NEDU) since 1991. He is a prolific blogger, writing on diving, aviation, nature, science and technology at [JohnClarkeOnline.com](http://www.JohnClarkeOnline.com).

**What the Medical Examiner Needs to Know About Rebreather Diving**

*Of all the divers a Medical Examiner might encounter, rebreather divers may be the most enigmatic. I know*
at least one diver who asks his rebreather before every dive, “How will you try to kill me today?” His rebreather might just answer through a perversion of Elizabeth Barrett Browning’s poem by saying, “How do I kill thee? Let me count the ways...” We will enumerate all the ways a rebreather can send even a cautious diver to the Medical Examiner’s table. Seldom is the root cause of death obvious on autopsy.

**Dr. Petar Denoble, Moderator**

Dr. Petar Denoble is Vice President of Research at Divers Alert Network and leads the DAN Injury and Fatality Survey. He joined DAN 22 years ago after a career in Naval and Diving Medicine in former Yugoslavia. In his research with DAN, Dr. Denoble studied prospectively exposure and outcomes in recreational scuba diving and introduced a root cause analysis in scuba fatality monitoring. His current research focus is on cardiac risk factors for scuba fatalities and efficacy of preventive interventions for human errors.

**Looking for Preventable Causes of Death**

The main purpose of diving fatalities monitoring is to acquire knowledge necessary for preventive intervention that will reduce risk of deaths in diving. The first step toward success is to acknowledge that mishaps are not accidental but rather a consequence of root causes that are preventable. Medical examination should aim to establish possible root causes in individual cases as well as possible risk factors identified at a group level. Preventable causes are those that precede drowning, and thus medical examiners should look beyond drowning.

**Robert Wong**

Robert Wong is at present Emeritus Consultant, Department of Anesthesia & Pain Management, Royal Perth Hospital and Emeritus Consultant, Hyperbaric Medicine, Fremantle Hospital. In his professional carrier he served in various leadership roles in military, commercial and recreational diving, including: Consultant in Underwater Medicine to the Director General, Naval Health Services and to the Royal Australian Navy. Diving, Medical Consultant for Australian Pearling Industry, Examiner in Physiology for Australian & New Zealand College of Anaesthetists, Examiner and Chairman in Diving & Hyperbaric Medicine, Australian & New Zealand College of Anaesthetists. Among numerous awards for his work, dr. Wong received UHMS Craig Hoffman Memorial Award for major contributions to safety and health of divers, UHMS Oceaneering International Award for contribution of increased productivity and performance of divers, Western Australian Fishing Industry Council Safety Award for contribution to safety in pearl diving, Australian & New Zealand College Council Citation for contribution to education in Western Australia and Australian and New Zealand College Medal for outstanding contribution to diving and hyperbaric medicine. As an editor, reviewer and writer, he contributed to several workshops, scientific journals and books about diving medicine.

**Diving Medicine Expert Witness Perspective**
I have been requested as an expert witness in diving fatalities for the Coroner’s court in the past decades in Western Australia, I have to admit that I have seen mostly "less than helpful" autopsies for the diagnosis of the cause of death. Sadly, the pathologists do not seek out diving physicians for assistance or advice, and most of them are not divers and are usually not familiar with compressed air diving injuries or deaths. They tend to perform standard autopsies for any fatality rather than to seek out information specific for diving. No consideration appeared to be given to dive profiles, circumstances surrounding the deaths, and little liaison with the Water Police who do the dive equipment testing. And because the victims are found in water, the most common cause of death was labelled as “immersion” or “drowning”.

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Expert Panel Review of Investigation and Autopsy Findings
Check your ego at the door, because we’re all smart here: pathologists, diving medicine doctors, equipment experts, scuba instructors, lifeguards, police, Coast Guard personnel, recovery divers, and death investigators each have their own skill sets that can either conflict and muddle a diver death investigation if they don’t communicate, or complement each other well to form an expert review panel. A model committee formed in San Diego brings together representatives from all of these groups for review of diver deaths to maximize the knowledge and experience of everyone for the benefit of the investigation and to promote safety for the local diving community.