Emerging Science and Technology to Address Naval Undersea Medicine Needs: A Workshop

Committee

Kenneth W. Kizer

Chair

Kenneth Kizer, MD, MPH (NAM) (Chair) is a former US Navy Undersea Medical Officer and diving medical expert who is widely known as an internationally acclaimed physician executive in health system transformation. His expertise and accomplishments lie in patient safety and quality improvement, population health management, and Veterans health issues. Dr. Kizer's engineered the internationally acclaimed transformation of the Veterans Healthcare System – the nation's largest healthcare system – in the late 1990s when serving as the VA's Undersecretary for Health. This transformation implemented numerous systemic changes that produced dramatically improved quality of care, service satisfaction and operational efficiency. Dr. Kizer was also the founding President and CEO of the National Quality Forum, considered by many as the nation's premier health care quality improvement organization. Early in his career, he orchestrated California's response to the then new HIV/AIDS epidemic, established the internationally renowned California Tobacco Control Program, pioneered Medicaid managed care, and was the architect of California's statewide Emergency Medical Services system. He is the founding Director of the Institute for Population Health Improvement in the University of California Davis Health System and served as the inaugural Chief Medical Officer for the former California Department of Health Services. Dr. Kizer has the rare distinction of being an elected member of both the National Academy of Medicine (NAM) and the National Academy of Public Administration. He is an experienced Chair of NASEM's convening activities and has presided in this role on numerous occasions as part of expert panels and committees on Veteran and military health issues. He is a former member of NASEM's Board on Naval Studies, the National Roundtable on Health Care Quality, and the Board on Population Health and Public Practice. Dr. Kizer graduated with honors from Stanford University and earned his MD and MPH from the University of California, Los Angeles. He is board-certified in six medical specialties and sub-specialties, is a fellow or distinguished fellow of 12 professional societies, has authored more than 500 original articles, book chapters and other reports in the professional literature, and is the recipient of numerous national awards and recognitions.

Olujimi Ajijola

Member

Olujimi Ajijola, MD, PhD, is an Associate Professor in the Departments of Medicine-Cardiology, and Molecular, Cellular, & Integrative Physiology at the University of California-Los Angeles (UCLA). He serves as Director of the Neurocardiology Research Program and Co-Director of the UCLA-Caltech Medical Scientist Training Program. His clinical training in internal medicine and cardiovascular diseases/cardiac electrophysiology were performed at the Massachusetts General Hospital/Harvard Medical School and at UCLA, respectively. His clinical and research interests revolve around innovative methods to control life-threatening cardiac arrhythmias by modulating the autonomic nervous system. His lab utilizes cutting-edge electrical, genetic, and computational tools to examine how cardiac injury remodels the autonomic nervous system, and how this dysregulation drives arrhythmogenesis. He is also an alumnus of the National Academies' New Voices Program, Howard Hughes Medical Institute's Medical Fellows Program, a recipient of the NIH Director's New Innovator Award (DP2), and a Young Physician Scientist Award from the American Society for Clinical Investigation. He is involved in several national initiatives to diversify the medical and scientific workforce. Dr. Ajijola reports ownership of NeuCures LLC, equity holdings in Anumana and nFerence, and honoraria from several health technology development companies. He has filed a patent for intellectual property owned by the University of California Regents in the areas of catheter ablation and neuromodulation. Dr. Ajijola received his BA with Distinction from the University of Virginia, his medical degree from Duke University, and his PhD in Molecular, Cellular, and Integrative Physiology from UCLA.

Serena Maria Auñón-Chancellor

Member

Serena Auñón-Chancellor, MD, MPH, is an Associate Professor of Clinical Medicine for the LSU Internal Medicine Residency Program in Baton Rouge, LA in partnership with Our Lady of the Lake Regional Medical Center where she continues to actively teach and lead hospital teams with residents and medical students. She is also the current UTMB Aerospace Medicine Residency Program Director and focuses on the training of physicians to serve this nation's space program as well as the burgeoning commercial space industry. Dr. Auñón-Chancellor maintains an active role in the Astronaut Office where she covers medical issues and provides guidance for ISS, Lunar, and Exploration-Class missions. From 2006-2009, Dr. Auñón-Chancellor served as a Johnson Space Center Flight Surgeon, where she supported medical operations for International Space Station crew members in Russia, served as the Deputy Crew Surgeon for STS-127 (2009), and as Deputy Lead for Orion - Medical Operations (2009-10). In 2009, Dr. Auñón-Chancellor was selected as one of 14 members of the 20th NASA astronaut class. She graduated in 2011 from Astronaut Candidate Training, which included scientific and technical briefings, intensive instruction in space station systems, spacewalks, robotics, physiological training, T-38 flight training and water and wilderness survival training. In 2018 during NASA Expeditions 56 and 57, where she served as Flight Engineer, her crew completed over 150 different experiments in multiple fields including: biology & biotechnology, cancer, Parkinson's, and Alzheimer's research, materials science, nuclear physics, physical sciences, and Earth science. Investigations were led into new cancer treatment methods and algae growth in space. The crew also installed a new Life Sciences Glovebox, a sealed work area for life science and technology investigations that can accommodate two astronauts. Dr. Auñón-Chancellor participated as an aquanaut in the NEEMO 20 crew in 2015, and piloted a DeepWorker 2000 submersible as part of the NASA/NOAA NEEMO 16 underwater exploration mission off Key Largo, Florida in 2021. She holds a BS in Electrical Engineering from George Washington University, an MD from the University of Texas Health Science Center at Houston, and an MPH from the University of Texas Medical Branch. She is board-certified in internal medicine and aerospace medicine. At NASEM, she serves as a member of the Standing Committee on Aerospace Medicine and the Medicine of Extreme Environments.

John Florian

Member

John Florian, PhD, is the Scientific Director for the Navy Experimental Diving Unit (NEDU) in Panama City, Florida where he serves as the most senior scientific civilian, leading a critical unmanned and manned science and technology program to expand the U.S. military's advantage in undersea and extreme environments. Prior to his current position, Dr. Florian served as NEDU Warfighter Performance Division Head, where he led a long-term, strategic line of research to enable warfighters in extreme environments to meet current and future operational requirements. Detailed to the Pentagon in 2018 as part of a Naval Sea Systems Command program, Dr. Florian served the Chief of Naval Operations N95 and Deputy Assistant Secretary of the Navy for Research, Development, Test & Evaluation where he facilitated a better link between resource sponsors, requirements, future capabilities, and transition of novel research deliverables to support the Fleet. Dr. Florian's research has spanned spaceflight, aviation, and diving, including overall human performance and resilience, thermoregulation, environmental physiology, oxygen toxicity, and biometric monitoring. Dr. Florian holds a PhD in Integrative Human Physiology with a minor in Gerontology from the Pennsylvania State University, and Bachelor of Science in Exercise Physiology from the Florida State University.

David Fothergill

Member

David Fothergill, PhD, is the Scientific Director and former Submarine Medicine and Survival Systems Department Head at the Naval Submarine Medical Research Laboratory, (NSMRL), Groton, CT. For the past 31 years Dr. Fothergill has conducted research in support of undersea warfighter health, readiness, and performance at the Naval Medical Research Institute (NMRI), Bethesda, MD (1992-1997) and NSMRL (1997-present). Dr. Fothergill also served as Senior Research Scientist at the Center for Research and Education in special environments, State University of New York at Buffalo from 1994 - 2009. His research interests and publications cover a wide range of topics including inert gas narcosis, CO_2 toxicity, pulmonary O_2 toxicity, nitric oxide physiology in extreme environments, underwater breathing apparatus design and evaluation, bioeffects of underwater sound, submarine escape and rescue, biomechanics of human strength, human thermal physiology, and environmental exposure monitoring. Dr. Fothergill's education includes a BSC(Hons) in Sport Science from Liverpool John Moores university, UK, an MSC in Kinesiology from Simon Fraser University, Canada, and a Ph.D. in Occupational Biomechanics from the Royal Free Hospital School of Medicine (University of London), UK. From 1992-1994, he was a national research council resident research associate at NMRI where his research focused on diver work performance under extreme hyperbaric pressure. He is also a qualified U.S. navy trained diver.

William F. Hoeft, Jr.

Member

William Hoeft, Jr., PhD, is the Fellow for Undersea Strategy at Systems Planning and Analysis (SPA), Inc., in the Washington D.C. area. He is responsible for the full range of undersea system-related recommendations in support of our U.S. government national security clients. His areas of emphasis include future capabilities in manned undersea platforms, unmanned systems, weapons, sensors, operational profiles, operational and employment concepts, survivability, deterrence, stealth, and defensive systems. Prior to his time at SPA, where he has been for 19 years, he served as a US submarine officer for 24 years where he operated in all theaters – including 11 deployments on four different attack submarines, and command of the USS SALT LAKE CITY (SSN-716) from 1998 to 2001. His submarine service through command included comprehensive exposure to crew health-related issues, including radiation health, Personnel Reliability Program, injury treatment, mental health, atmosphere control/contamination, sanitation, food service, and prospective mass casualty treatment. Presented at and served as session chair for the premier U.S. undersea technology forum. He has previously presented to the NASEM Board on Naval Studies as a technical expert in Unmanned Systems in support of the Navy Director of Submarine Warfare. He earned his BS in Systems Engineering from the US Naval Academy, his MA in National Security Studies from Georgetown University, and his PhD in Political Science and International Relations from Georgetown University.

William Johnson

Member

William (Bill) Johnson is the founder of a defense industry consulting practice, WMJ Associates, LLC, from which he advised government, academic, and industry leaders on enterprise leadership, program management, and business transformation as it relates to modernization and the acquisition of complex systems. He has over 50 years of experience in this field, including 35 years of government service. Johnson has received numerous honors and awards for his service to the Navy, including the Distinguished Civilian Engineer by both the Navy (2008) and the Naval Submarine League (2018). Johnson graduated from Cornell University with a BS(‘70) and MEE(’75) in electrical engineering. Johnson began his Navy service in 1970, serving as an Oceanographic Research Watch Officer during the Vietnam War years. After completing active duty, he served as a civilian engineer for the Naval Engineering Center in Hyattsville, MD, where he performed software certification testing for the onboard systems of the U.S.S. Virginia, the Navy’s most advanced surface ship at the time. He was subsequently recognized by Naval Sea Systems Command for his exemplary leadership over the certification of the Navy’s largest software system in operation. After successful assignments on various surface ship modernizations, Bill was promoted to system engineer with the Submarine Combat System Program Office, where he incorporated new capabilities into the submarine combat systems for acoustic and combat control. Here, he oversaw the design, development, and production of revitalization initiatives for the Navy’s submarine sonar programs. A significant transformation that Johnson envisioned and successfully led was the transition from a traditional acquisition approach to an open-system acquisition approach. This new strategy was massively successful in providing timely improvements to the Navy’s submarine sonar systems at a greatly reduced cost. Johnson’s approach has since been adopted by both Navy and DoD leadership in their published acquisition policy.

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Simon Mitchell

Member

Simon Mitchell, M.B., Ch.B., Ph.D., DipOccMed, DipAdyDHM (ANZCA), FUHM, FANZCA, is Professor and Head of the Department of Anaesthesiology at the University of Auckland Medical School, and a consultant anesthesiologist and diving physician at Auckland Hospital. He is Editor-In-Chief of Diving and Hyperbaric Medicine Journal. His primary interests are diving medicine / physiology, and human factors in complex hazardous tasks, and he receives funding support from the US Office of Naval Research. He is a leading technical diver using mixed gases and rebreathers to explore shipwrecks and caves, with a record that includes the world's deepest wreck dive (at the time) in 2002 and supervision of the first deep rebreather dive using hydrogen in 2023. He received the Undersea and Hyperbaric Medicine Society's highest award for scientific contributions to the field in 2010 and their 'Excellence in Diving Medicine' Award in 2016. He was conferred Fellowship of the Explorer's Club of New York in 2006, and the Rolex Diver of the Year in 2015. He provides consultation services to industry dive groups on issues in dive operations, safety, and practice, was ranked by Expertscape as the world's foremost expert in decompression sickness and arterial gas embolism in 2022, and has been invited to provide medicolegal commentary on diving accidents in the U.S. and Australia. Dr. Mitchell received his medical degree from the University of Auckland. His PhD thesis addressed gas embolism and neuroprotection in cardiac surgery, and he holds specialist qualifications in anesthesiology and diving and hyperbaric medicine.

Virginie Papadopoulou

Member

Virginie Papadopoulou, PhD, is a Research Assistant Professor in the Department of Biomedical Engineering at UNC Chapel Hill in 2017, where her research aims to bridge the different areas dealing with bubbles and ultrasound. Her current interests lie in: a) refining the imaging and analysis of ultrasonically detected decompression emboli in the context of decompression sickness; b) using oxygen microbubbles to modulate tumor hypoxia and improve radiotherapy; and c) enhancing topical drug-delivery using phase-change contrast agents, most recently in the context of chronic wound biofilm infections. Her work has resulted in over 40 journal papers, 100 conference presentations and 17 invited presentations to date. She has been awarded the 2017 Divers Alert Network/Bill Hamilton Memorial Grant by the Women Divers Hall of Fame, the 2020 Undersea and Hyperbaric Medicine Society's "Young Scientist/Medical Doctor Award", as well as the title of Divers Alert Network Scholar since 2018, for her on-going work creating a dynamic ultrasonic assessment of decompression bubbles. She is also the recipient of the 2022 University of North Carolina Women's Leadership Council "Faculty to Undergraduate Mentoring Award". She currently serves as the Principal Investigator (PI) of three diving-related research grants awarded by the nonprofit organization Divers Alert Network (DAN) and the US Department of Defense's Office of Naval Research (ONR), mentoring one postdoctoral student, two graduate students and three undergraduates, and recently completed an ONR STEM planning grant aiming to support graduate students focused on optimizing human performance in extreme environments. Dr. Papadopoulou is also PI, or co-PI, of two early commercial development grants from the North Carolina Biotechnology Center (NCBC) and a newly funded R01 grant from the National Institute of Health (NIH) related to improving wound infection treatment using ultrasound-stimulated phase-change contrast agents. She is a physicist by background and received her PhD in Bioengineering in 2016 from Imperial College London.

David Regis

Member

David Regis, MD, received his commission as Ensign in the U.S. Navy upon matriculation to the Uniformed Services University of the Health Sciences (USU) F. Edward Hébert School of Medicine. He completed his residency in Pediatrics in 1998 as part of the first Joint Class of the National Capital Consortium (NCC) and served his utilization tour at the USNH Guam as a Staff Pediatrician and Head of Pediatrics before returning to NCC to complete a Fellowship in Pediatric Infectious Disease. CAPT Regis completed one year as Chief of Pediatric Infectious Diseases at then National Naval Medical Center Bethesda in 2004 before taking over as Director of Clinical Trials for the Navy's Malaria Vaccine Program at the Naval Medical Research Center (NMRC) in Silver Spring, MD where he was responsible for testing one of the first adenovirus vectored malaria vaccines in humans. He then went on to complete Undersea Medical Officer training and was assigned to various Undersea Medicine research positions including Head of Biomedical Research at the Navy Experimental Diving Unit, Panama City, FL and Head of Undersea Medicine at NMRC where under his leadership the program expanded its research portfolio to include a new alternobaric research suite. He was then selected for a two year tour as an Undersea Medicine Exchange Officer to the Royal Navy at the Institute of Naval Medicine in Alverstoke, UK after which he successfully screened and was assigned as the Executive Officer to the Naval Submarine Medical Research Laboratory, Groton, CT. He currently serves at the Naval Sea Systems Command as the UMO for the Navy Supervisor of Diving & Salvage (SUPSALV) as well as the Program Manager for the Deep Submergence Biomedical Development Program. He is also a voting member of the Navy Bureau of Medicine Undersea Medicine Working Group. He has taught various lectures at USU in infectious diseases and diving medicine and has served as a member of the NASA Human Research Program Human Health Countermeasures Decompression Sickness Risk Standing Review Panel among other committees.

Karen Van Hoesen

Member

Karen Van Hoesen, MD, is a board-certified emergency medicine physician who specializes in undersea and hyperbaric medicine. She co-founded the San Diego Center of Excellence in Diving (SDCED) and serves as Director of the UCSD Diving Medicine Clinic. Since 1998, she has served as Director of UCSD's Undersea and Hyperbaric Medicine Fellowship - one of the first fellowships in diving medicine to train physicians how to recognize and treat diving injuries and fitness to dive exams. She serves on the Scripps Institution of Oceanography Diving Control Board, has served on the board of directors for Divers Alert Network (DAN). She has a special interest and personal experience in high-altitude medicine and wilderness medicine. Dr. Van Hoesen has also served on Undersea and Hyperbaric Medical Society committees and held leadership positions at the local and national level. She has co-authored numerous research papers, book chapters and abstracts and frequently speaks to divers, instructors, scientific diving officers and physicians about all aspects of diving medicine and safety. She has been a NAUI diving instructor since 1983 and has dove on all seven continents. Her honors include the 2014 DAN/Rolex Diver of the Year Award, 1988 Our World Underwater Scholarship Recipient, and inaugural member of the Women Divers Hall of Fame. She is board certified in Emergency Medicine and subspecialty certification in Undersea and Hyperbaric Medicine. Dr. Van Hoesen earned her medical degree from Duke University School of Medicine and completed a residency in emergency medicine at UC San Diego School of Medicine.