Injury scenarios affecting multiple systems are associated with poorer outcomes, particularly when sensory systems are involved. Multisensory polytrauma associated with mild traumatic brain injury (mTBI) disrupts highly sophisticated neural messaging mechanisms and processes, causing functional deficits, inefficiency, and error. Associated diagnostic and treatment challenges are familiar to military researchers and practitioners, who are keenly aware of the need for new, better integrated models of research and treatment to overcome gaps in knowledge and practice and to improve collaborative research and care.

Existing models of medical science and practice promote highly specialized, “stovepiped” attention to the study and treatment of single systems in isolation of others. Too often, this results in the loss or disruption of opportunities for researchers and caregivers to coordinate efficiently across systems and specialties. This is to the detriment of patients’ rehabilitation and overall well-being. We envision more holistic models of care and research — in military as well as civilian health systems — based on efficient data management and dissemination, ingrained transparency, and collaborative communication among disciplinary specialties and across the continuum of care.

The articles in this issue consider TBI and polytrauma, emphasizing considerations and challenges in the diagnosis and management of TBI-related sensory system injuries and neuropsychiatric sequelae. It is difficult to differentiate all possible influences of multiple injuries on patient physical and behavioral health status. Our goal is to raise awareness of the inherent complexity of TBI, including mTBI, as can occur in combination with injuries to other neurological and psychological systems, and thus to improve care and attention to patients who report deficits that might otherwise be overlooked or misunderstood as unrelated or inconsequential.

Military TBI experts Victoria Tepe, PhD, Alison Cernich, PhD, ABPP-Cn, and James Kelly, MD (see page 308) provide an exploratory overview of TBI as a complex injury process associated with a variety of somatic, psychological, and behavioral comorbidities. The deleterious effects of TBI, even when it is initially classified as mild, can manifest as persistent deficits and may be difficult or impossible to differentiate from those of concurrent psychological maladies such as depression, anxiety, and posttraumatic stress disorder (PTSD). Mental health care providers should be alert to the possibility that neurotrauma can contribute to psychological, emotional, cognitive, and behavioral dysfunction weeks, months, or even years post-injury.

Observing that the problems of concussion and traumatic stress disrupt brain physiological, social, and/or cognitive stability, Army and Public Health Service officers CPT Thomas J. Patterson, MSC, USA, PsyD; CPT Michael B. Brennan, MSC, USA, PsyD; and CDR Richard P. Schobitz, PHS, PhD (see page 313) present a rationale and strategy for combined early neurologic and behavioral (psychological first aid) intervention to prevent the development of chronic symptomatology.

Neurosensory injuries and deficits are also common in relation to TBI and mTBI, particularly as the result of blast exposure. CAPT Michael E. Hoffer, MC, USN, MD; Carey Babban, PhD; Lt Col Rena Nicholas, USAF, MSC, PhD; Dawn Marcus, PhD; Sara Murphy, MPH; and COL (retired) Kim Gottshall, MSC, USA, PT, PhD (see page 318) review the evidence concerning neurosensory injuries and sequelae with specific attention to their incidence in concurrence with mTBI. A variety of therapeutic agents, interventions, and exercises can be used to treat neurosensory disorders when dysfunction persists beyond the acute injury phase.
Even mild injury to the head can cause injury to the vestibular system. Vestibular injury is a potential direct and indirect contributor to psychological and cognitive disorder. US Army researchers Ben D. Lawson, PhD, Angus H. Rupert, MD, PhD, and Amanda M. Kelley, PhD (see page 324) address the problem of vestibular pathology arising from head acceleration or barotrauma. They highlight the evidence for related neuropsychological disorder, observing that unusual vestibular processing demands can cause measurable cognitive deficits even in healthy individuals.

Neurologists Capt Alexis Nelson, USAF, MD; Paul A. Nyquist, MD, MPH; Alexander Razumovsky, PhD, FAHA; and MAJ Scott A. Marshall, MC, USA, MD (see page 328) present a case challenge and discussion to emphasize that cerebral vasospasm should be considered as potential contributor to nonspecific changes in mental status after neurotrauma. The authors review processes by which subarachnoid hemorrhage, vasospasm and ischemia can develop slowly, without evidence on early routine imaging, and encourage surveillance to avoid delayed neurological decline.

Research and treatments developed in military health and research facilities provide invaluabla medical knowledge that is translatable with broad application to civilian wellness. For example, the DoD Centers of Excellence are engaged to develop data registries to track injury incidences and outcomes and to identify patterns and overlap involving multiple sensory systems, and the effects of their rehabilitation. This information and resulting analyses will augment efforts to identify factors that reduce vulnerability and promote resiliency; design treatments that prevent or rescue from injury and insult; and establish metrics for effective rehabilitative strategies and programs.

With respect to TBI and polytrauma, military medical advances can improve clinical diagnosis and treatment for civilians exposed to sports injuries, motor vehicle accidents, and violent assault including exposure to blast as occurred at this year’s Boston Marathon. Although military threats and exposures can be quite different, and some aspects and priorities of the military health care system itself are not easily replicated in civilian care settings, lessons learned in the military medical environment can provide experience and modeling relevant to sports medicine, law enforcement, first responders, public safety, and other sectors of care involving occupational hazards similar to those encountered by military personnel. Ultimately, our hope is to promote integrated collaboration and holistic science to support improved understanding and care of all citizens who suffer TBI and polytrauma.

The opinions expressed in this document are solely those of the author(s) and do not represent an endorsement by or the views of the United States Air Force, the Department of Defense, or the United States Government.

doi: 10.3928/00485713-20130703-03

about the guest editors

Col Mark D. Packer, USAF, MC, MD, currently serves as the Executive Director of the Department of Defense Hearing Center of Excellence. He graduated from the Uniformed Services University of the Health Sciences in 1995 as a member of the Alpha Omega Alpha medical honor society. He successfully completed Air Force-sponsored training as a general surgery intern; otolaryngology head and neck surgery resident; and neurotology, skull base surgery fellow; and currently practices as a board certified neurotologist.

Victoria Tepe, PhD, serves as Research Portfolio Coordinator for the Department of Defense Hearing Center of Excellence through The Geneva Foundation. Dr. Tepe has 25 years of experience as a behavioral neuroscientist in academic, medical, and military medical research settings, including the US Air Force School of Aerospace Medicine, US Air Force Research Laboratory, and US Army Department of Military Medicine’s Military Operational Medicine Research Program and Telemedicine and Advanced Technology Research Center.