Editor's Corner

Would you like to know the health state of your brain? Have you ever assessed your intelligence quotient (IQ)? Soon, in addition to measuring your IQ we will also be able to determine your brain's health with quantification just like those used in the assignment of IQ levels. This depends to a large extent on how many resources, including clinical engineers, will focus on the research about the intricacies of the human brain.

In the book "The Tell-Tale Brain," a *New York Times* bestseller, Ramachandran, director of the Center for Brain and Cognition at the University of California in San Diego investigates the working of the mind through malfunctions of the brain. He states that in the 50s we were able to decipher the human genetic code, but by comparison, the science of the mind languishes and that, for most of the 20th-century neuroscience, was still young upstart. "As heady as our progress has been, …we have only discovered a tiny fraction of what there is to know about the human brain."

To help initiate, last October, the celebration of the 2019 Global Clinical Engineering Day, I invited distinguished faculty members to share with me in the program hosted in China. Recognized experts such as Tobey Clark from the University of Vermont, Ilir Kullolli from Stanford/Children's Hospital and currently ACCE President, Dr. Kallirroi Stavrianou from Warwick University in the UK, and Dr. Howard Derman, a neurologist chief of the Concussion Center at the Methodist Hospital in Houston, Texas. Each member of the faculty shared their unique expertise, and all were received with roaring success https://www.youtube.com/watch?time_continue=16&v=yQ1DuSlSfvQ&feature=emb_logo. It was a perfect set-up for the initiation of the global celebration recognizing all that clinical engineers do every day around the world to better patient care outcomes!

Specifically, I wanted to include physician/neurologist to our Global Clinical Engineering program because not too many clinical engineers know of the specific neurology based challenges healthcare practitioners face in the management of brain conditions. Dr. Derman did an excellent job of connecting a wide spectrum of clinical needs with expectation that future technological tools will meet.

Over years of working with neurology based researchers, I personally observed how much they struggled to overcome the inability to quantify changes in the health state of the brain when they were faced with the challenge of managing or diagnosing brain injury, trauma, or diseases. In several studies, where I joined as a clinical engineer with a team that included pediatric neurologists and other scientists, we all experienced firsthand the difficulty of developing and applying experimental technological tools to diagnose and quantify brain functions. Not only such instrumentation was rare but more often the interpretation of the results produced by these tools set a new frontier for wide interpretation of new brain mapping data. These studies included instruments such as near-infrared spectroscopy to measure cerebral blood flow ("Correlation of Near Infrared Spectroscopy Cerebral Blood Flow Estimations and Microsphere Quantitations in Newborn Piglets" https://www.karger.com/Article/Abstract/14056), and scalp temperature sensors that measured and correlated with predicted brain decay ("Rectal-Scalp Temperature Difference Predicts Brain Death in Children, Pediatric Neurology April 1999; 20(4);267–9) https://www.academia.edu/6751649/Rectal-scalp_temperature_difference_predicts_brain_death_in_children, and cortical electrodes in "Computer-Controlled Electrical Stimulation for Quantitative Mapping of Human Cortical Function," https://www.ncbi.nlm.nih.gov/pubmed/19061348.

The pharmaceutical field is in a similar situation. The cover story in *The Scientist*, December 2019, "Markers of Alzheimer's," Michelle Mielke, a neurologist at the Mayo Clinic in Rochester, Minnesota, who studies cognitive decline states, "At this point, I do not think we have the best idea in term of what biomarker is exactly going to be used for what". Essentially suggesting that pharmaceutical industry and the technological solutions are at the same situation.

However, Dr. Derman's presentation directed at clinical engineers described the physiology of injured brain following with observed symptoms from such injuries suffered in combat, motorbike accident, or during contact sport. His message was that engineers need to focus on solving how to equip healthcare providers with tools that help form a quantified diagnosis so that they can know how to better manage the patient condition/progress. As reported in a study by geriatrician Sharon Inouye at Hebrew SeniorLife and Harvard Medical School "20–30% of patients over the age of 70 who have a major surgery will experience delirium that is associated with long-term cognitive decline and increased risk for developing Alzheimer's disease." Again, still a non-quantified condition. (*Wall Street Journal*, December 10, 2019, page A12).

Improving the arrival at the correct diagnosis is a key aspect of good health care. It provides an explanation of a patient's health problem and informs proper subsequent health care decisions, states the Institute of Medicine's report, September 2015, on "*Improving Diagnosis in Health Care.*" One way to achieve that is through closer collaboration between clinical engineers, physicians and researchers to guide and enable the focusing of technological innovation on addressing challenges not only in neurology but in every medical/surgical and rehabilitation discipline.

It is important to insert scientific exchanges such as Dr. Derman's presentation within clinical engineering meetings and this *Journal* will continue to facilitate that as reflected by the membership of the *Global Clinical Engineering Journal* Editorial Board. Having neurologist, orthopedic surgeon and anesthesiologist reviewing submissions together with clinical engineers. What do you think can increase clinical engineers' participation in finding and evaluating tools to quantify the health status of our brains?

Together we can do it better and I am looking forward to your feedback!

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