Ongoing Research at the Dalio Institute of Cardiovascular Imaging: Disease, Data and Data Science

James K. Min, M.D.
Dalio Institute of Cardiovascular Imaging (ICI) at NewYork-Presbyterian/Weill Cornell Medical Cent

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Abstract

In addition to the HeartHealth clinical cardiovascular medicine program, the Dalio ICI focuses on three (3) major research efforts. First, the Dalio ICI leads the design and implementation of more than 15 active multicenter clinical trials. These trials aim to address pivotal questions in cardiovascular care that aim to identify the most effective methods to diagnosis and treat coronary heart disease. For these trials, cardiovascular images are collected for anatomic and physiologic analysis, which permits identification of novel imaging biomarkers that augment diagnostic accuracy or improve risk stratification of individuals at risk of coronary ischemia, myocardial infarction or sudden coronary death. Second, the Dalio ICI develops intra-cardiac endovascular hardware devices to treat an array of cardiovascular conditions. Numerous devices are in development, including: a transcatheter mitral valve, which can serve as a minimally invasive alternative to surgery; a left atrial appendage occluder device as a method for stroke prevention that precludes the need for use of anti-coagulant medications; and an endovascular aortic aneurysm stent graft, which can reduce the risk of aortic rupture in a minimally invasive fashion. These devices are distinct from current generation devices by utilizing cardiovascular images to custom tailor devices to each individuals anatomy and physiology. Third, the Dalio ICI evaluates computational methods that can augment diagnosis or prognostic risk stratification of cardiovascular disease. Active efforts are focused on computational fluid dynamics and machine learning methods. Computational fluid dynamics are applied to cardiac CT scans to determine coronary flow and pressure non-invasively, and fluid-structure interactions are being pursued to better understand the impact of coronary atherosclerosis and arterial wall material properties on coronary flow. Machine learning applications currently being pursued include those for auto-diagnosis of stroke, auto-diagnosis of coronary ischemia and prediction of future myocardial infarction and death.

Bio

James K. Min is Professor of Radiology and Medicine at Weill Cornell Medical College and the Director of the Dalio Institute of Cardiovascular Imaging (ICI) at NewYork-Presbyterian/Weill Cornell Medical Center. He is a board-certified cardiologist with a clinical focus on cardiovascular imaging and cardiovascular disease prevention. Min received his BA from the University of Chicago, and his medical degree from Temple University Medical School. He completed his internship, residency and cardiovascular medicine fellowship at the University of Chicago Hospitals. In addition to the generous gift from the Dalio Foundation, Mins research is supported by several grants from the National Institutes of Health, as well as through industry partners such as GE Healthcare. Through this support, he has published over 300 peer-reviewed scientific manuscripts and served as Principal Investigator on more than 20 multicenter clinical trials. He recently founded HeartHealth, a state-ofthe- art cardiac prevention program that evaluates novel risk factors for the development of coronary heart disease. This program integrates the latest advances in cardiovascular research and directly translates them to clinical care, using tools as hand-held ultrasound, advanced lipoprotein analysis, computational fluid dynamics applied to coronary CT angiograms, positron emission tomography and magnetic resonance imaging. Min is a Past President and a member of the Board of Directors of the Society of Cardiovascular Computed Tomography, where he served as Chair for the Annual Scientific Sessions meeting for numerous years. He is a leader in the American College of Cardiology where he serves on the Task Force for Clinical Expert Consensus Documents, which serve to guide clinical decision-making and treatment for newer technologies and less understood disease states. He previously served on the Task Force for the ACC Appropriate Use Criteria, which takes an evidence-based approach to guide use of cardiovascular testing and treatments. Min serves as Associate Editor for the Journal of the American College of Cardiology: Cardiovascular Imaging, Journal of Nuclear Cardiology, and the Journal of the Society of Cardiovascular Computed Tomography. Min has received numerous awards and distinctions, including recently being elected into the American Society of Clinical Investigation and the Academy of Radiology Research.

Faculty Host: Dimitris Metaxas