Development of Wearable Sensors and Artificial Intelligence Algorithms for Monitoring Chronic and Infectious Diseases

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Abstract The majority of the health care costs related to the treatment of chronic and infectious diseases are attributed to direct care costs (e.g., hospital admissions and readmissions). The prevalence of chronic diseases and associated costs in the United States is growing at an alarming pace. The COVID-19 pandemic has further impacted the health of high-risk individuals by increasing the likelihood of more severe illness for those with underlying health conditions and associated healthcare costs. There have been ample efforts from researchers and clinicians to develop remote healthcare systems and wearable devices to manage patients with chronic and infectious diseases in home settings, which has reduced the burden on inpatient care facilities and gained further momentum during the COVID-19 pandemic. Yet, there is a lack of reliable wearable devices that can provide clinically acceptable information to healthcare professionals, as well as a lack of emphasis on validating wearable and artificial intelligence technologies in representative populations to enable a reliable and equitable remote health management system. This talk will present the challenges and potential solutions for developing tools (i.e., wearable sensors and computational algorithms) for reliable and equitable remote patient monitoring systems for chronic and infectious diseases. More specifically, the presenter will share the development and validation of wearable sensors and computational algorithms for cardiovascular health monitoring, particularly for patients with heart failure, and the development of an intelligent allocation method of diagnostic testing for COVID-19 in a resource-limited setting using commercial wearables.

Biosketch Dr. Shandhi is a Tenure-Track Assistant Professor with a joint appointment in the School of Electrical, Computer, and Energy Engineering and Biodesign Institute Center for Bioelectronics and Biosensors at Arizona State University. Before joining ASU, he finished his postdoctoral training in the Department of Biomedical Engineering at Duke University. He completed his Ph.D. in the Department of Electrical and Computer Engineering at the Georgia Institute of Technology. SHANDHI Lab is focused on developing reliable and equitable digital health technologies, e.g., wearable sensors and computational algorithms (AI/ML), that can enable personalized health care and remote patient monitoring for patients with chronic (cardiovascular, glycemic, and neurological) and infectious diseases (COVID-19). Dr. Shandhi has received multiple awards and grants for his research work, including the American Heart Association Postdoctoral Fellowship and Duke Heart Center and Translating Duke Health (TDH) cardio-oncology grant. Besides these grants as PI, he has received a National Institute of Health (NIH) mHealth Training Institute 2023 Scholarship, Early Career Fellowship, Best Paper award, Runner-up Best Paper award, First Place Research award, and Distinguished Poster Nominee for his work. Dr. Shandhi is an editorial board member of Nature (npj) Digital Medicine.