A Reimagining of Kidney Dialysis

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Abstract

There are 450,000 people in the US on kidney dialysis (worldwide: 3,000,000+ people). Numbers of patients on dialysis have been estimated to double by 2030. At this time, kidney dialysis costs 1% of the entire US budget ($45B) (possibly $130B worldwide). And, it does not work very well. It sustains life, but life can be short and unpleasant for dialysis patients. There has been no substantial change in how we do kidney dialysis since the basic ideas of chronic dialysis were developed in the late 1950’s in a collaboration between an MD nephrologist, a bioengineering and a chemical engineer. It is 2020 — with modern technology, can we imagine improved ways to address kidney failure that better address the needs of the patient and reduce costs? The Center for Dialysis Innovation (CDI) was launched at the University of Washington in 2017 as a partnership between a bioengineer and an MD nephrologist to address these goals. With teams from many engineering departments (bioengineering, chemical engineering, materials science and engineering, mechanical engineering, human-centered design and engineering), we are rethinking kidney dialysis. Our vision is a wearable artificial kidney working 24/7 on cleaning the patient’s blood (like a kidney does). We call this device the ambulatory kidney to improve vitality (AKTIV). To develop the AKTIV, we need improved blood access, novel ways to remove uremic toxins, enhanced blood compatibility, infection control, sensors and system control strategies and human-centered design. Updates on a number of the technological developments going into the AKTIV will be presented in this talk.