Title: Role of Renal Imaging in the Kidney Precision Medicine Initiative

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Abstract:

Imaging of molecules, cells, and whole organs have an integral role in advancing medical science in the age of "Precision Medicine". At this time, nephrologists perform simple urine and blood tests to diagnose changes in kidney function and then wait, in the case of AKI, or start an ACEI or ARB, in the case of CKD. We know how to control diabetes and blood pressure, and we know that APOL1 gene mutations pose a significant risk for ESRD, but despite our best efforts, we can merely slow progression of the disease. Nephrologists rarely biopsy patients with diabetes or AKI, and there are few validated human targets to push drug development. In contrast, oncology has coupled multi-omics data with histology to tease out subgroups, pathways, and targets. This approach offers the opportunity to change Nephrology's culture and advance the study of kidney with not only phenotypic data but new histological approaches coupled with a human cell atlas and cell specific omics.

The Kidney Precision Medicine Project (KPMP) has three major components: recruitment sites, tissue interrogation sites, and a central hub to coordinate data and sample collection, digital pathology and collaboration. Recruitment sites will explore ways to safely obtain kidney tissue, and in vivo imaging will be correlated with the histopathology, the phenotype, and the genomic study of the tissue. Several speakers in this conference will address the different methods of study from elastography to MRI. Newly developed MRI tracers offer the promise of measuring the number of glomeruli or the degree of fibrosis and monitoring the response to potential therapies. The Tissue Interrogation Sites will receive the tissue from the Recruitment Sites and will use state of the art techniques and develop/optimize the "next generation" tissue interrogation methods. Some examples of these techniques will be discussed in this conference: single cell analysis using multi-color fluorescence fluctuation spectroscopy, optical coherence tomography, and use of Forster Resonance Energy Transfer Biosensors. All of these techniques have potential application in the KPMP tissue interrogation. This is an exciting time for nephrology and biomedical science.