Clinical Intensive course: Pediatric Body MRI Course Syllabus for Evaluation of Renal Function with MRI in Pediatric Patient

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1. Review of basic renal anatomy and physiology- glomerular filtration, secretion and re-absorption

2. Traditional non-imaging based tracer methods for measurement of renal function and their limitations (global, cannot provide split renal function, laborious)

3. Review imaging methods other than MR and their drawbacks
   - Nuclear Medicine/Renal Diuretic Scintigraphy (poor spatial resolution, radiation)
   - Ultrasonography (poor spatial resolution)
   - Computerized Tomography (CT) (poor functional info or high radiation dose in 4DCT)

4. Relevant pediatric pathology- hydronephrosis (compensated and uncompensated), obstruction, congenital malformations, renal scarring

3. Role MR in renal function
   - MR’s uniqueness in providing anatomic and functional information at high spatial and temporal resolution- overview of current literature.
   - Role of T2 and T1 weighted imaging, typical imaging protocol for pediatric renal function

4. Main elements of MR renal function imaging- acquisition, post processing, parametric extraction (semi-quantitative and quantitative)
   - Spatial and temporal resolution requirements
   - Elements of post processing- motion correction, segmentation
   - Extraction of parameters- renal and calyceal transit times, differential renal function (volume and Patlak): Rutland-Patlak (two compartment) model for GFR, more sophisticated multi-compartment pharmacokinetic models

5. Challenges and problem areas
   - Coil design, pulse sequence aspects
   - Online image reconstruction speeds and throughput, post-processing software
   - Respiratory compensation, inadequate spatial resolution and hence suboptimal segmentation
   - Automation of segmentation, motion correction
   - Issues specific to pediatric subjects