Nephrology and Hypertension

Division Details

RESEARCH AND TRAINING DETAILS	
Faculty	**12**
Total Annual Grant Award Dollars	**$3,332,383**
Total Annual Industry Award Dollars	**$557,355**
Total Publications	**64**

CLINICAL ACTIVITIES AND TRAINING	
Clinical Fellows	**10**
Inpatient Encounters	**4,278**
Outpatient Encounters	**4,549**

Row 1: M Schuh, K Drake, V Taylor, E Erkan, E Ciccia, D Claes, P Devarajan

Row 2: OR Bignall, S Goldstein, F Flores, M Mitsnefes, S Benoit, M Bennett, B Dixon

Row 3: O Volovelsky, E Nehus, D Hooper, G Hamdani, C Varnell

Research Highlights

Prasad Devarajan, MD

Dr. Devarajan has continued with a wide spectrum of approaches to kidney health and disease processes; spanning from molecular, genomic and proteomic approaches, to human observational and clinical trials. Dr. Devarajan is the director of the NIH-funded P50 Center of Excellence in Nephrology, a unique multi-disciplinary research program designed to support basic, translational, and clinical research on critical pediatric kidney diseases that have major unmet needs. The proposal includes several research projects in the areas of acute kidney injury, proteinuric kidney disease, and lupus nephritis, with participation from recognized teams of investigators from multiple disciplines. Also included are high-resource Gene Expression, Proteomics and Biomarker Cores with core leaders of international repute. Dr. Devarajan is also the nephrology lead investigator for several NIH-funded prospective clinical studies. He has also established a Kidney Biomarker Laboratory which now performs more than 50 distinct assays for acute and chronic kidney disease biomarkers. Dr. Devarajan is also the director and principal investigator (PI) of the NIH T32-funded Fellowship in Nephrology. Dr. Devarajan's research on biomarkers and new therapeutic targets in kidney diseases has yielded over 25 publications and new patent applications during the last fiscal year. He is currently the PI or Co-PI on 8 NIH grants.

Stuart L. Goldstein, MD

Dr. Goldstein is the director of the Center for Acute Care Nephrology (CACN), and has had a very productive research year, with achievements that spanned the scope of the center's research missions. The nephrotoxic medication acute kidney injury (AKI) reduction project, NINJA, which resulted in a four year sustained reduction in AKI, preventing AKI in more than 400 children, has spread to 13 US pediatric centers. This collaborative has already observed decreases in nephrotoxic medication exposure and associated AKI. The CACN also coordinated and completed the largest prospective pediatric AKI study ever undertaken: "Assessment of Worldwide AKI, Renal angina and Epidemiology in Children (AWARE)". In addition, the CACN coordinated the DIRECT study, which is a genome wide

association study for nephrotoxic medication associated AKI; and the NICHD sponsored Pediatric Opportunistic Pharmacokinetic Study arm of the Pediatric Trials Network. The CACN has pioneered applications of specialized techniques such as aquapheresis and the Molecular Adsorbent Recirculating System for liver support The CACN also launched an LDL-apheresis program to treat patients with refractory FSGS. We are the only single center in the US to offer all of these specialized novel extracorporeal techniques. In addition, the CACN demonstrated unparalleled commitment to education via the CRRT University simulation course, that the center offered to more than 200 RNs and MDs from all over the world during the past two years. In addition, the CACN received a 3rd year of extramural funding this year. Finally, the CACN hosted the 2nd International Symposium on AKI in Children in Cincinnati; with attendees drawn from 20 countries and 26 US states.

Elizabeth C. Jackson, MD

Dr. Jackson is the director of the Healthy Bladder Clinic, and continues her active research program in optimizing the management of nocturnal enuresis. She has completed a randomized prospective trial comparing the effectiveness of the voice recordable alarm with the buzzer alarm for nocturnal enuresis. Dr. Jackson presented the results at the International Children's Continence Society Meetings. She is submitting another alarm study to evaluate different teaching methods. She has also completed an evaluation of the two-day versus the one day metabolic stone profile in children. Preliminary findings suggest that more than half the children with a 48 hour urine collection have a significant abnormality that would have been missed if only 24 hours of urine had been tested. Her results were pooled with a multicenter consortium, and the paper is ready for submission. She is actively supervising Catherine Forster, fellow in hospital medicine, as she researches urinary tract infections in children on clean intermittent catheterization. The *Journal of the Pediatric Infectious Disease Society* accepted her article, "Frequency of Multi-Drug Resistant Organisms Cultured from Urine in Children on Clean Intermittent Catheterization".

Bradley Dixon, MD

Dr. Dixon is the director of the Nephrology Clinical Laboratory, which focuses on the clinical diagnostic laboratory evaluation of patients with complement-mediated renal diseases such as atypical hemolytic uremic syndrome, C3 glomerulopathy and membranoproliferative glomerulonephritis. The Nephrology Clinical Laboratory serves as a reference laboratory for these diseases for clinicians across the United States and around the world, highlighting Cincinnati Children's role as a leader in highly complex clinical testing. Dr. Dixon's clinical and translational research interests focus on complement-mediated kidney diseases, directing both patient registries and pharmaceutical trials in these diseases at Cincinnati Children's. Dr. Dixon also has a basic research laboratory studying the effect of high concentrations of salt and urea on the ability of cells in the kidneys and urinary tract to protect themselves from these hostile conditions. He, and his collaborators at Cincinnati Children's and the UC College of Medicine, are currently investigating how primary cilia act as sensors of hyperosmolality in kidney cells, and the impact that this process may have on cystic kidney diseases.

Mark Mitsnefes, MD

Dr. Mitsnefes' research interest has been to define biologic targets for interventions to prevent progression of cardiovascular disease in children with chronic kidney disease, through epidemiological and translational studies. Dr. Mitsnefes is a co-investigator and co-chair of the Cardiovascular Subcommittee in the multicenter NIH funded study of chronic kidney disease in children, the CKiD study. In one published study, CKiD investigators examined if masked ambulatory hypertension is predictable from casual blood pressure. Masked hypertension, even during sleep, was especially uncommon in subjects with low normal casual blood pressure (BP) (≤25th percentile). These data suggest that at least in clinical settings with limited access to ambulatory blood pressure monitoring (ABPM), an estimation of BP outside the medical office could be made based on a BP obtained during a clinic visit; if the casual BP is in the low normal range, ABPM could be omitted from the patient's evaluation. In another published study, he showed that in young kidney transplant recipients, elevated ambulatory blood pressure is frequently unrecognized, undertreated, and associated with left ventricular hypertrophy (LVH). The high prevalence of abnormal ABP, including masked hypertension, and its association with LVH supports the case for routine ABPM and cardiac structure evaluation as the standard of care in these patients

Edward Nehus, MD

Dr. Nehus has ongoing research efforts in comparative effectiveness research in kidney transplantation, novel biomarkers of early kidney injury and chronic kidney disease in children with obesity. Dr. Nehus is currently collaborating with the Teen-Longitudinal Assessment of Bariatric Surgery (Teen-LABS) consortium to evaluate early kidney injury in children undergoing bariatric surgery. In a recent publication,

Teen-LABS investigators examined kidney outcomes in severely obese adolescents up to three years following bariatric surgery. This study indicated that early kidney injury improved following bariatric surgery in adolescents with evidence of preoperative kidney disease. Dr. Nehus is also a co-investigator of a Patient-Centered Outcomes Research Institute (PCORI) award that will investigate novel applications of propensity score-based methods to improve research validity in studies using secondary data. Dr. Nehus is applying this research methodology to national registry data of pediatric kidney transplant recipients to evaluate the long-term outcomes of steroid-avoidance immunosuppression protocols in this patient population.

Michael Bennett, PhD

Dr. Bennett is the director of the Biomarker Laboratory and do-director of the Center of Excellence in Pediatric Nephrology Proteomics Core. His primary research interests include biomarkers and mechanisms of nephrotic syndrome and lupus nephritis. This year, Dr. Bennett discovered and validated an investigational panel of biomarkers that can distinguish steroid sensitive from steroid resistant nephrotic syndrome. This panel has the potential to assist physicians in the early diagnosis of steroid resistance and help them to tailor more appropriate treatment plans for patients with this serious and progressive disease. Dr. Bennett also worked this year, in collaboration with Hermine Brunner, MD, to develop an adult and pediatric Renal Activity Index for Lupus Nephritis (RAIL) biomarker panel. The RAIL is a robust and highly accurate noninvasive measure of lupus nephritis activity. Dr. Bennett's work has resulted in 10 peer reviewed publications this year, and one patent application.

David Hooper, MD

Dr. Hooper's research interests lie in improving clinical outcomes for children with a kidney transplant through the design of reliable healthcare systems both locally and nationally. The multidisciplinary kidney transplant innovation team he leads has established a true learning health system to provide comprehensive chronic disease management for children with a kidney transplant and to continuously measure care and improve outcomes of these patients at Cincinnati Children's. Their data system has automated tracking of more than 30 outcome and process metrics enabling the identification of gaps in care, and the ability to use structured quality improvement methods together with clinical outcomes research to systematically improve health. This year, his team has developed and implemented a comprehensive system to identify barriers to patients taking their immunosuppressive medications, coupled with patient-centered shared decision making tools to help patients overcome those barriers. As a result, the rate of acute rejection episodes has improved, sparing patients from kidney injury and costly therapies. Nationally, his team launched the Improving Renal Outcomes Collaborative, a network based learning health system focused on improving health, longevity, and quality of life for children with a kidney transplant. Dr. Hooper is leading over 120 physicians, researchers, nurses, other staff and patients and caregivers from 16 centers nationally to specifically improve blood pressure control, decrease acute rejection and improve quality of life for nearly 2,000 children with a kidney transplant nationwide.

Donna Claes, MD, MS

By creating a highly reliable, clinical care delivery system, Dr. Claes' academic interest is to significantly slow the rate of decline in kidney function over time in pediatric chronic kidney disease (CKD) patients at Cincinnati Children's by focusing on the improved treatment of common associated comorbidities – such as hypertension and proteinuria. Dr. Claes has lead a team to first define the overall quality of care we wish to achieve in this patient population, and then build the necessary framework and decision support tools to process and assimilate relevant outcome data over time. As there are no national benchmarks to compare the rate of pediatric CKD progression across the US by center, especially in regards to the management of these common comorbidities associated with CKD progression, Dr. Claes' vision is for Cincinnati Children's to become the leader in pediatric CKD care delivery. Dr. Claes is also the site PI for multi-center clinical and pharmacologic studies, such as the NIH funded Chronic Kidney Disease in Children (CKiD) and Cure Glomerulonephritis (CureGN) studies.

Elif Erkan, MD, MS

Dr. Erkan's research focus is to understand the detrimental effects of proteinuria in glomerular diseases and to examine the protein-protein interactions involved in albumin endocytosis in the proximal tubule epithelial cells. Dr. Erkan is particularly interested in investigating the multiple facets of molecular pathways that lead to progression in focal segmental glomerulosclerosis (FSGS). Dr. Erkan investigates the mechanism of albumin endocytosis in proximal tubule epithelial cells, and determines how albumin overload may contribute to tubular apoptosis/autophagy in glomerular diseases. The goal of this project is to dissect the molecular pathways, and cell

signaling events, involved in the cross-talk between apoptosis and autophagy in glomerular disease particularly in FSGS. She recently showed that children with FSGS display derangement of urinary lipid metabolites. This novel finding led to approval of an ancillary study enrolling patients with nephrotic syndrome from a national cohort, NEPTUNE. The goal of this study is to understand how lipid metabolites contribute to progression in FSGS.

Brian Siroky, PhD

The focus on Dr. Siroky's laboratory is on the mechanisms of renal cyst and tumor formation that occur in the inherited disease Tuberous Sclerosis Complex (TSC), and the identification of targeted therapies for these lesions. He is also interested in the structural and functional relationship between renal epithelial primary cilia, specialized cellular organelles whose dysfunction linked to cystogenesis, and mTOR signaling, the pathway dysregulated in TSC. He is currently developing a patient urine-derived epithelial cell culture system coupled with cutting edge 3-dimensional culture methodology to both characterize structure/function and evaluate response to potential therapies in a patient-specific fashion. In collaboration with clinicians in the Cincinnati Children's TSC Clinic, Dr. Siroky is the PI of a retrospective clinical study aimed at determining the clinical benefit of early mTOR inhibitor treatment on renal cystic disease in patients with TSC. Dr. Siroky also collaborates with researchers at Cincinnati Children's and the UC College of Medicine on a funded project studying the mechanisms by which renal epithelial cells sense and adapt to a hyperosmolal microenvironment, specifically the role of the primary cilium and transient receptor potential channels in this process. In collaboration with researchers at the University of Alabama at Birmingham, Dr. Siroky contributed to a published study that found hyperglycemia, in the absence of cilia, results in renal structural and functional damage and accelerates renal cystogenesis, suggesting that diabetes is a risk factor in the progression of polycystic kidney disease.

Significant Publications

Sutherland SM, Byrnes JJ, Kothari M, Longhurst CA, Dutta S, Garcia P, **Goldstein SL. AKI in hospitalized children: comparing the pRIFLE, AKIN and KDIGO criteria**. *Clin J Am Soc Nephrol*. 2015 Apr 7;10(4):554-61.

This is the first large study to examine all three standardized definitions and staging criteria for acute kidney injury in children. The study demonstrated that acute kidney injury is clearly associated with morbidity, and mortality in critically ill children along with an increased hospital length of stay in non-critically ill children.

Nehus E, Liu C, **Hooper DK**, Macaluso M, Kim MO. **Clinical practice of steroid avoidance in pediatric kidney transplantation**. *Am J Transplant*. 2015 Aug;15(8):2203-10.

This nationwide study demonstrated significant variability among transplant centers, but with increasing use of steroid avoidance. Different practice patterns of steroid avoidance were not explained by patient characteristics, emphasizing the need for a more personalized approach in pediatric kidney transplantation.

Schuh MP, **Nehus E**, Ma Q, Haffner C, **Bennett M, Devarajan P**. **Long-term Stability of Urinary Biomarkers of Acute Kidney Injury in Children**. *Am J Kidney Dis*. 2016 Jan:67(1):56-61.

This is the first study to demonstrate that novel urinary biomarkers are stable in short and long term storage. This provides reassurance for the deployment of these assays as biomarkers in clinical practice, as well as in prospective clinical studies requiring long term urine storage.

Division Publications

1. Abulaban KM, Fall N, Nunna R, Ying J, Devarajan P, Grom A, Bennett M, Ardoin SP, Brunner HI. **Relationship of Cell-Free Urine Microrna with Lupus Nephritis in Children.** *Pediatr Rheumatol Online J*. 2016; 14:4.
2. Alsaied T, Goldstein SL, Kaddourah A, Poynter SE. **Thrombocytopenia-Associated Multi-Organ Failure Caused by Diabetic Ketoacidosis.** *Pediatr Int*. 2016; 58:232-4.

3. Askenazi DJ, Morgan C, Goldstein SL, Selewski DT, Moxey-Mims MM, Kimmel PL, Star RA, Higgins R, Laughon M. **Strategies to Improve the Understanding of Long-Term Renal Consequences after Neonatal Acute Kidney Injury.** *Pediatr Res*. 2016; 79:502-8.

4. Bagshaw SM, Goldstein SL, Ronco C, Kellum JA, ADQI Consensus Group. **Acute Kidney Injury in the Era of Big Data: The 15(Th) Consensus Conference of the Acute Dialysis Quality Initiative (Adqi).** *Can J Kidney Health Dis*. 2016; 3:5.

5. Bennett MR, Pordal A, Haffner C, Pleasant L, Ma Q, Devarajan P. **Urinary Vitamin D-Binding Protein as a Biomarker of Steroid-Resistant Nephrotic Syndrome.** *Biomarker Insights*. 2016; 11:1-6.

6. Bertram JF, Goldstein SL, Pape L, Schaefer F, Shroff RC, Warady BA. **Kidney Disease in Children: Latest Advances and Remaining Challenges.** *Nat Rev Nephrol*. 2016; 12:182-91.

7. Chawla LS, Fink M, Goldstein SL, Opal S, Gomez A, Murray P, Gomez H, Kellum JA, ADQI XIV Workgrp. **The Epithelium as a Target in Sepsis.** *Shock*. 2016; 45:249-58.

8. Coffey S, Costacou T, Orchard T, Erkan E. **Akt Links Insulin Signaling to Albumin Endocytosis in Proximal Tubule Epithelial Cells.** *PLoS One*. 2015; 10:e0140417.

9. Cooper DS, Basu RK, Price JF, Goldstein SL, Krawczeski CD. **The Kidney in Critical Cardiac Disease: Proceedings from the 10th International Conference of the Pediatric Cardiac Intensive Care Society.** *World J Pediatr Congenit Heart Surg*. 2016; 7:152-63.

10. Cooper DS, Claes D, Goldstein SL, Bennett MR, Ma Q, Devarajan P, Krawczeski CD. **Follow-up Renal Assessment of Injury Long-Term after Acute Kidney Injury (Frail-Aki).** *Clin J Am Soc Nephrol*. 2016; 11:21-9.

11. DeFoor WR, Asplin JR, Kollar L, Jackson E, Jenkins T, Schulte M, Inge T. **Prospective Evaluation of Urinary Metabolic Indices in Severely Obese Adolescents after Weight Loss Surgery.** *Surg Obes Relat Dis*. 2016; 12:363-7.

12. Devarajan P. **Genomic and Proteomic Characterization of Acute Kidney Injury.** *Nephron*. 2015; 131:85-91.

13. Devarajan P, Jefferies JL. **Progression of Chronic Kidney Disease after Acute Kidney Injury.** *Prog Pediatr Cardiol*. 2016; 41:33-40.

14. Downes K, Goldstein S, Vinks A. **Increased Vancomycin Exposure and Nephrotoxicity in Children: Therapeutic Does Not Mean Safe.** *J Pediatric Infect Dis Soc*. 2016; 5:67-65.

15. Downes KJ, Patil NR, Rao MB, Koralkar R, Harris WT, Clancy JP, Goldstein SL, Askenazi DJ. **Risk Factors for Acute Kidney Injury During Aminoglycoside Therapy in Patients with Cystic Fibrosis.** *Pediatr Nephrol*. 2015; 30:1879-88.

16. Drake K, Nehus E, Goebel J. **Hyponatremia, Hypo-Osmolality, and Seizures in Children Early Post-Kidney Transplant.** *Pediatr Transplant*. 2015; 19:698-703.

17. Erkan E, Zhao X, Setchell K, Devarajan P. **Distinct Urinary Lipid Profile in Children with Focal Segmental Glomerulosclerosis.** *Pediatr Nephrol*. 2016; 31:581-8.

18. Foster BJ, Khoury PR, Kimball TR, Mackie AS, Mitsnefes M. **New Reference Centiles for Left Ventricular Mass Relative to Lean Body Mass in Children.** *J Am Soc Echocardiogr*. 2016; 29:441-47 e2.

19. Garimella PS, Biggs ML, Katz R, Ix JH, Bennett MR, Devarajan P, Kestenbaum BR, Siscovick DS, Jensen MK, Shlipak MG, Chaves PH, Sarnak MJ. **Urinary Uromodulin, Kidney Function, and Cardiovascular Disease in Elderly Adults.** *Kidney Int*. 2015; 88:1126-34.

20. Gist KM, Goldstein SL, Joy MS, Vinks AA. **Milrinone Dosing Issues in Critically Ill Children with Kidney Injury: A Review.** *J Cardiovasc Pharmacol*. 2016; 67:175-81.

21. Gist KM, Mizuno T, Goldstein SL, Vinks A. **Retrospective Evaluation of Milrinone Pharmacokinetics in Children with Kidney Injury.** *Ther Drug Monit*. 2015; 37:792-6.

22. Goldstein S, Zappitelli M. **Evaluation and Management of Acute Kidney Injury in Children**. In: A ED, H WE, N Pet al, eds. *Pediatric Nephrology*. New York: Springer; 2015:2167-39.

23. Goldstein SL. **Automated/Integrated Real-Time Clinical Decision Support in Acute Kidney Injury.** *Curr Opin Crit Care*. 2015; 21:485-9.

24. Goldstein SL. **Urinary Ngal to Define Aki in Asphyxiated Infants.** *Pediatr Nephrol*. 2015; 30:1047-9.

25. Greenberg JH, Whitlock R, Zhang WR, Thiessen-Philbrook HR, Zappitelli M, Devarajan P, Eikelboom J, Kavsak PA, Devereaux PJ, Shortt C, Garg AX, Parikh CR, TRIBE-AKI Consortium. **Interleukin-6 and Interleukin-10 as Acute Kidney Injury Biomarkers in Pediatric Cardiac Surgery.** *Pediatric Nephrology*. 2015; 30:1519-27.

26. Hamdani G, Nehus EJ, Hanevold CD, Sebestyen Van Sickle J, Woroniecki R, Wenderfer SE, Hooper DK, Blowey D, Wilson A, Warady BA, Mitsnefes MM. **Ambulatory Blood Pressure, Left Ventricular Hypertrophy, and Allograft Function in Children and Young Adults after Kidney Transplantation.** *Transplantation*. 2016.

27. Hamdani G, Nehus EJ, Hooper DK, Mitsnefes MM. **Masked Hypertension and Allograft Function in Pediatric and Young Adults Kidney Transplant Recipients.** *Pediatr Transplant*. 2016.

28. Hooper DK, Mitsnefes M. **A Systems-Based Approach to Managing Blood Pressure in Children Following Kidney Transplantation.** *Pediatr Nephrol*. 2016; 31:1593-604.

29. Hoste EA, Kashani K, Gibney N, Wilson FP, Ronco C, Goldstein SL, Kellum JA, Bagshaw SM, ADQI Consensus Group. **Impact of Electronic-Alerting of Acute Kidney Injury: Workgroup Statements from the 15(Th) Adqi Consensus Conference.** *Can J Kidney Health Dis*. 2016; 3:10.

30. James M, Hobson C, Darmon M, Mohan S, Hudson D, Goldstein S, Ronco C, Kellum J, Bagshaw S. **Applications for Detection of Acute Kidney Injury Using Electronic Medical Records and Clinical Information Systems: Workgroup Statements from the 15(Th) Adqi Consensus Conference.** pmc/PMC4768328. *Can J Kidney Health Dis* 2016; 3.

31. Jodele S, Fukuda T, Mizuno K, Vinks AA, Laskin BL, Goebel J, Dixon BP, Chima RS, Hirsch R, Teusink A, Lazear D, Lane A, Myers KC, Dandoy CE, Davies SM. **Variable Eculizumab Clearance Requires Pharmacodynamic Monitoring to Optimize Therapy for Thrombotic Microangiopathy after Hematopoietic Stem Cell Transplantation.** *Biol Blood Marrow Transplant*. 2016; 22:307-15.

32. Jotwani V, Scherzer R, Estrella M, Jacobson L, Witt M, Palella F, Macatangay B, Bennett M, Parikh C, Ix J. **Cumulative Tenofovir Disoproxil Fumarate Exposure Is Associated with Biomarkers of Tubular Injury and Fibrosis in Hiv-Infected Men.** *J Acquir Immune Defic Syndr* 2016; 73:177-81.

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34. Kaddourah A, Goldstein SL, Basu R, Nehus EJ, Terrell TC, Brunner L, Bennett MR, Haffner C, Jefferies JL. **Novel Urinary Tubular Injury Markers Reveal an Evidence of Underlying Kidney Injury in Children with Reduced Left Ventricular Systolic Function: A Pilot Study.** *Pediatr Nephrol*. 2016; 31:1637-45.

35. Kaddourah A, Goldstein SL, Lipshultz SE, Wilkinson JD, Sleeper LA, Lu M, Colan SD, Towbin JA, Aydin SI, Rossano J, Everitt MD, Gossett JG, Rusconi P, Kantor PF, Singh RK, Jefferies JL. **Prevalence, Predictors, and Outcomes of Cardiorenal Syndrome in Children with Dilated Cardiomyopathy: A Report from the Pediatric Cardiomyopathy Registry.** *Pediatr Nephrol*. 2015; 30:2177-88.

36. Kamal FA, Travers JG, Schafer AE, Ma Q, Devarajan P, Blaxall BC. **G Protein-Coupled Receptor-G-Protein Betagamma-Subunit Signaling Mediates Renal Dysfunction and Fibrosis in Heart Failure.** *J Am Soc Nephrol*. 2016.

37. Kane-Gill SL, Goldstein SL. **Drug-Induced Acute Kidney Injury: A Focus on Risk Assessment for Prevention.** *Crit Care Clin*. 2015; 31:675-84.

38. Khan MK, VanderBrink BA, DeFoor WR, Minevich E, Jackson E, Noh P, Reddy PP. **Botulinum Toxin Injection in the Pediatric Population with Medically Refractory Neuropathic Bladder.** *J Pediatr Urol*. 2016; 12:104 e1-6.

39. Klein M, Hershey GK, Devarajan P, Muglia LJ, Wikenheiser-Brokamp KA, Loch J, Hostetter MK, Strauss AW, DeWitt TG. **Enhancing Pediatric Fellows' Research Training: Development of an Office of Pediatric Clinical Fellowships.** *J Pediatr*. 2015; 167:506-7 e1.

40. Kogon AJ, Matheson MB, Flynn JT, Gerson AC, Warady BA, Furth SL, Hooper SR, Chronic Kidney Disease in Children Study G, Chronic Kidney Disease in Children CSG. **Depressive Symptoms in Children with Chronic Kidney Disease.** *J Pediatr*. 2016; 168:164-70 e1.

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42. Koyner JL, Davison DL, Brasha-Mitchell E, Chalikonda DM, Arthur JM, Shaw AD, Tumlin JA, Trevino SA, Bennett MR, Kimmel PL, Seneff MG, Chawla LS. **Furosemide Stress Test and Biomarkers for the Prediction of Aki Severity.** *J Am Soc Nephrol*. 2015; 26:2023-31.

43. Lorenzin A, Garzotto F, Alghisi A, Neri M, Galeano D, Aresu S, Pani A, Vidal E, Ricci Z, Murer L. **Cvvhd Treatment with Carpediem: Small Solute Clearance at Different Blood and Dialysate Flows with Three Different Surface Area Filter Configurations.** *Pediatr Nephrol* 2016; 31:1659-65.

44. Mehta R, Bihorac A, Selby N, Quan H, Goldstein S, Kellum J, Ronco C, Bagshaw S. **Establishing a Continuum of Acute Kidney Injury - Tracing Aki Using Data Source Linkage and Long-Term Follow-Up: Workgroup Statements from the 15th Adqi Consensus Conference.** pmc/PMC4768419. *Can J Kidney Health Dis* 2016; 3:13.

45. Mehta RL, Awdishu L, Davenport A, Murray PT, Macedo E, Cerda J, Chakaravarthi R, Holden AL, Goldstein SL. **Phenotype Standardization for Drug-Induced Kidney Disease.** *Kidney Int*. 2015; 88:226-34.

46. Menon S, Goldstein SL, Mottes T, Fei L, Kaddourah A, Terrell T, Arnold P, Bennett MR, Basu RK. **Urinary Biomarker Incorporation into the Renal Angina Index Early in Intensive Care Unit Admission Optimizes Acute Kidney Injury Prediction in Critically Ill Children: A Prospective Cohort Study.** *Nephrol Dial Transplant*. 2016; 31:586-94.

47. Mitsnefes M, Pierce C, Flynn J, Samuels J, Dionne J, Furth S, Warady B. **Can Office Blood Pressure Readings Predict Masked Hypertension?** *Pediatr Nephrol* 2016; 31:163-6.

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50. Nehus EJ, Mizuno T, Cox S, Goldstein SL, Vinks AA. **Pharmacokinetics of Meropenem in Children Receiving Continuous Renal Replacement Therapy: Validation of Clinical Trial Simulations.** *J Clin Pharmacol*. 2016; 56:291-7.

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52. Riar SK, Mitsnefes MM, Nehus EJ, Patel HP, Steinke JM, Crumb T, Abraham EC, Kamel MW, Greenbaum LA. **Kidney Transplantation in Children with Decreased Left Ventricular Systolic Function: A Midwest Pediatric Nephrology Consortium Study.** *Pediatr Nephrol*. 2015; 30:1343-8.

53. Ricci Z, Goldstein S. **Pediatric Continuous Renal Replacement Therapy.** *Contrib Nephrol* 2016; 187:130-21.

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55. Ronco C, Ricci Z, Goldstein SL. **(R)Evolution in the Management of Acute Kidney Injury in Newborns.** *Am J Kidney Dis*. 2015; 66:206-11.

56. Sanchez-Pinto LN, Goldstein SL, Schneider JB, Khemani RG. **Association between Progression and Improvement of Acute Kidney Injury and Mortality in Critically Ill Children.** *Pediatr Crit Care Med*. 2015; 16:703-10.

57. Sas KM, Yin H, Fitzgibbon WR, Baicu CF, Zile MR, Steele SL, Amria M, Saigusa T, Funk J, Bunni MA, Siegal GP, Siroky BJ, Bissler JJ, Bell PD. **Hyperglycemia in the Absence of Cilia Accelerates Cystogenesis and Induces Renal Damage.** *Am J Physiol Renal Physiol*. 2015; 309:F79-87.

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Grants, Contracts, and Industry Agreements

Annual Grant Award Dollars

Investigator	Title	Sponsor	ID	Dates	Amount
Michael Bennett;Hermine Brunner, MD	Innovative Efficacy Measures of Lupus Nephritis Therapies	National Institutes of Health	U01 AR065098	7/26/2013 - 6/30/2017	$148,023
Donna Claes, MD	Integrative Proteomics & Metabolomics for Pediatric	National Institutes of Health (Nationwide Children's	UM1 DK100866	6/1/2014 - 5/31/2016	$10,420

	Glomerula Disease	Hospital)			
Prasad Devarajan, MD	2013 Medical Student Summer Research Program	National Institutes of Health	P50 DK096418	9/21/2012 - 8/31/2017	$43,680
Prasad Devarajan, MD	Critical Translational Studies in Pediatric Nephrology	National Institutes of Health (Ntl Inst of Diab & Digest & Kidney Dis)	P50 DK096418	9/21/2012 - 8/31/2017	$741,986
Prasad Devarajan, MD	Novel Serum and Urinary Biomarkers of Diabetic Kidney Disease	National Institutes of Health (Mount Sinai Hospital)	R01 DK096549	10/1/2014 - 6/30/2017	$14,927
Prasad Devarajan, MD	Novel Biomarkers in Cardiac Surgery to Detect Acute Kidney Injury	National Institutes of Health (Yale University School of Medicine)	R01 HL085757	4/12/2012 - 3/31/2017	$44,819
Prasad Devarajan, MD	Research Training in Pediatric Nephrology	National Institutes of Health	T32 DK007695	7/1/2014 - 6/30/2019	$65,842
Prasad Devarajan, MD	Progression of Acute Kidney Injury to Chronic Kidney Disease	National Institutes of Health (Yale University School of Medicine)	U01 DK082185	9/19/2013 - 6/30/2018	$30,600
Bradley Patton Dixon, MD	A Novel Mechanism for Regulation of Renal Urea Transport	University of Cincinnati	UC_Dixon-Siroky	4/1/2015 - 5/1/2017	$8,465
Stuart Goldstein, MD	Pharmacokinetics of Understudied Drugs Administered to Children per Standard of Care	National Institutes of Health (Duke University)	HHSN-2752010000031	4/1/2013 - 2/24/2017	$1,035,000
Stuart Goldstein, MD	Recombinant Erythropoietin Protects Against Kidney Disease (REPAKD)	National Institutes of Health (Children's Hosp & Reg Med Ct-Seattle)	R01 DK103608	9/17/2014 - 8/31/2019	$17,901
Stuart Goldstein, MD	Phase-II IDE G090189-11/6/13: Pediatric ICU Patients wit	Food and Drug Administration (Innovative BioTherapies, Inc.)	R01 FD005092	9/10/2015 - 8/31/2019	$265,790
Stuart Goldstein, MD	Reduction of Nephrotoxic Medication-Associated Acute Kidney Injury in Children	Agcy for Healthcare Research and Quality	R18 HS023763	4/1/2015 - 3/31/2018	$498,321
Gilad Hamdani, MD	Donor specific Antibody IgG Subclasses and Antibody-Mediated Rejection Risk in Children Post Kidney Transplantation	Casey Lee Ball Foundation	Casey Lee Ball - Ham	8/19/2015 - 8/18/2016	$10,000
Mark M Mitsnefes, MD	Cardiovascular Disease in Children with Chronic Kidney D	National Institutes of Health	K24 DK090070	7/1/2011 - 6/30/2017	$160,391

Mark M Mitsnefes, MD	Chronic Kidney Disease in Children (CKiD III)	National Institutes of Health (Children's Mercy Hospital)	U01 DK066143	8/1/2013 - 7/31/2018	$236,218
Total Annual Grant Award Dollars					**$3,332,383**

Annual Industry Award Dollars

Investigator	Industry Sponsor	Amount
Donna Claes, MD	Emory University	$90,101
Bradley Patton Dixon, MD	Otsuka America Pharmaceutical, Inc.	$157,311
Bradley Patton Dixon, MD	Rockwell Medical Technologies, Inc.	$24,525
Keri A. Drake, MD	Mallinckrodt Pharmaceuticals	$80,000
Stuart Goldstein, MD	Astrazeneca	$62,273
Stuart Goldstein, MD	Gambro Renal Products, Inc.	$75,407
Rene G VanDeVoorde III, MD	Amgen, Inc.	$67,738
Total Annual Industry Award Dollars		**$557,355**