

Biographical Sketch Format and Instructions

OMB No. 0925-0001 and 0925-0002 (Rev. 03/2020 Approved Through 02/28/2023)

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Rupesh Raina MD

eRA COMMONS USER NAME (credential, e.g., agency login): Rraina

POSITION TITLE:

Associate Professor of Internal Medicine, Specialty: Nephrology, Northeastern Ohio Medical University (NEOMED).
Director of Medical Research, Internal medicine, Cleveland Clinic Akron General.

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE <i>(if applicable)</i>	Completion Date MM/YYYY	FIELD OF STUDY
King George's Medical College UK affiliated, Chowk, Lucknow, Uttar Pradesh, INDIA - 226003	MBBS/MD	1992-1998	Medicine
King George's Medical College UK affiliated, Chowk, Lucknow, Uttar Pradesh, INDIA – 226003	Internship	1998-1999	Medicine
All India Institute of Medical Science, Ansari Nagar, New Delhi, India - 110029	House Officer in Internal medicine	1999-2001	Medicine
Glickman Urological Institute, Cleveland Clinic 12000 McCracken Rd, Cleveland, OH 44125	Clinical Research Fellow	2001-2003	Urology and Nephrology
Internal Medicine & Pediatrics, Metro Health Medical Center, 2500 Metro Health Dr. Cleveland, OH 44109	Residency	2003-2007	Internal Medicine and Pediatrics
Internal Medicine & Pediatrics, Metro Health Medical Center, 2500 Metro Health Dr. Cleveland, OH 44109	Chief Residency	2007-2008	Internal Medicine and Pediatrics
Department of Nephrology and Hypertension, Cleveland Clinic, 2049 E 100th St, Cleveland, OH 44195	Nephrology Fellowship	2009-2011	Nephrology and Hypertension

Division of Pediatric Nephrology, Rainbow Babies and Children's Hospital/University Hospitals Case Medical Center, 11100 Euclid Ave, Cleveland, OH 44106	Pediatric Nephrology Fellowship	2011-2013	Pediatric Nephrology
Case Western Reserve University 10900 Euclid Ave, Cleveland, OH 44106	Clinical Research in the Clinical Research Scholars Program	2014	Clinical Research
Northeastern Ohio Medical University (NEOMED) 4209 OH-44, Rootstown, OH 44272	Fellowship in Academic Medicine (FAME)	2015-2016	Academic Medicine
Northeastern Ohio Medical University (NEOMED) 4209 OH-44, Rootstown, OH 44272	Fellowship in Academic Medicine (FAME)-Leadership	2016-2017	Academic Medicine

A. Personal Statement

I am currently a combined adult and pediatric nephrologist with substantial training, prowess, and leadership qualities to carry out clinical research. I have trained many basic scientists and clinical researchers from the United States and abroad, and the recipient of twelve research grants. My current research interest includes the pathophysiology and preventive methods of progression of renal cystic disease, transition of nephrology care from pediatrics to adults, pathophysiology of acute kidney injury, renal replacement therapy, and high flow ultrafiltration for management of inborn error of metabolism. I have written more than 90 original peer reviewed articles along with numerous additional articles, editorial and book chapters relating to biomedical research and clinical activities.

1. **Raina R**, Chakraborty R, Tibrewal A, Sethi SK, Bunchman T. Advances in pediatric acute kidney injury. *Pediatr Res*. 2021 Mar 17. doi: 10.1038/s41390-021-01452-3. Epub ahead of print. PMID: 33731820.
2. **Raina R**, Joshi H, Chakraborty R. Changing the Terminology from Kidney Replacement Therapy to Kidney Support Therapy. *Ther Apher Dial*. 2020 Sep 18. doi: 10.1111/1744-9987.13584. Epub ahead of print. PMID: 32945598.
3. **Raina R**, Bedoyan JK, Lichter-Konecki U, Jouvett P, Picca S, Mew NA, Machado MC, Chakraborty R, Vemuganti M, Grewal MK, Bunchman T, Sethi SK, Krishnappa V, McCulloch M, Alhasan K, Bagga A, Basu RK, Schaefer F, Filler G, Warady BA. Consensus guidelines for management of hyperammonaemia in paediatric patients receiving continuous kidney replacement therapy. *Nat Rev Nephrol*. 2020 Aug;16(8):471-482. doi: 10.1038/s41581-020-0267-8. Epub 2020 Apr 8. PMID: 32269302; PMCID: PMC7366888.
4. Sethi SK, Mittal A, Nair N, Bagga A, Iyenger A, Ali U, Sinha R, Agarwal I, de Sousa Tavares M, Abeyagunawardena A, Hanif M, Shreshtha D, Moorani K, Asim S, Kher V, Alhasan K, Mourani C, Al Riyami M, Bunchman TE, McCulloch M, **Raina R**. Pediatric Continuous Renal Replacement Therapy (PCRRT) expert committee recommendation on prescribing prolonged intermittent renal replacement therapy (PIRRT) in critically ill children. *Hemodial Int*. 2020 Apr;24(2):237-251. doi: 10.1111/hdi.12821. Epub 2020 Feb 18. PMID: 32072767.
5. **Raina R**, Chauvin A, Chakraborty R, Nair N, Shah H, Krishnappa V, Kusumi K. The Role of Endothelin and Endothelin Antagonists in Chronic Kidney Disease. *Kidney Dis (Basel)*. 2020 Jan;6(1):22-34. doi: 10.1159/000504623. Epub 2019 Dec 18. PMID: 32021871; PMCID: PMC6995952.

B. Positions and Honors

Positions and Employment

2020-Present Biomedical Researcher, Case Western Reserve University at MetroHealth Medical Center, Cleveland, Ohio

2015-Present	Director of Research, Akron Nephrology Associates, Cleveland Clinic Akron General
2015-Present	Associate Program Director, Department of Medicine, Cleveland Clinic Akron General
2012-Present	Nephrologist/Staff, Americare Kidney Institute and Akron Nephrology Associates Inc. Nephrologist/Staff, Cleveland Clinic Akron General
2012-Present	Staff Nephrologist, Medina Hospital at Cleveland Clinic Foundation
2014-Present	Pediatric Nephrologist, Nephrology & Pediatric Hypertension Center, Akron Children's Hospital
2014-Present	Chief of Resident and Staff in Internal Medicine and Pediatrics, Metro Health Medical Center
2007-2008	Resident in Internal Medicine and Pediatrics, Metro Health Medical Center
2003-2007	Clinical Research Fellow/Scientist, Center for Advanced Research in Human
2001-2003	Reproduction Infertility and Sexual Function, Glickman Urological Institute, Cleveland Clinic Foundation

Academic Appointments

2013-Present	Associate Professor, Northeastern Ohio Medical University (NEOMED)
2013-Present	Associate Professor, Case Western Reserve University School of Medicine

Certification and Licensure

2008	American Board of Internal Medicine, Ohio, #169777-recertified 2019
2009	American Board of Pediatrics, Ohio, #095774
2011	Nephrology and Hypertension (ABIM), Ohio, #169777
2014	Diplomat of Hypertension- American Society of Hypertension Board, Ohio
2016	Pediatric Nephrology, Ohio

C. Contributions to Science: Original Research Articles

Renal Cystic Disease:

My long-term goal is to identify pathogenic mechanisms of progression of Adult Polycystic Kidney Disease (ADPKD). Affected patients develop progressively enlarged kidneys due to the growth of multiple renal epithelial cysts. No treatment has been proven to prevent or reduce progression of ADPKD. In 1989, six months after the discovery of endothelin-1 (ET-1), Dr. Simonson's laboratory reported that ET-1 stimulates mitogenesis and collagen deposition in mesangial cells, the first demonstration of a non-vasoconstrictor function for ET-1. In animal studies transgenic over expression of ET-1 in mice causes extensive cyst formation in the kidney with glomerular and peritubular fibrosis and monocyte infiltration without increasing blood pressure. Second, renal expression of ET-1 is robustly elevated in murine and rat models of ADPKD and is associated with cyst formation and the development of hypertension. I want to establish a research program in the molecular and cellular biology of ET-1 signaling as a potential determinant of renal cyst formation in ADPKD in humans under guidance and tutelage of Dr. Simonson. I want to expand our understanding of non-invasive biomarkers (urine ET-1 and others) to identify ADPKD patients at high risk for progression before significant renal insufficiency occurs. Those patients, at an early stage of disease, could then be targeted for therapies as new ones emerge. I want my research to focus on translational studies to determine the extent to which urine levels of the autocrine mediators and biomarker candidates are associated with reduced renal function and cyst proliferation in patients with ADPKD.

- 1) **Raina R**, Chakraborty R, Sethi SK, Kumar D, Gibson K, Bergmann C. Genetic and Sporadic Renal Cystic Diseases During the Perinatal and Neonatal Period: Core Curriculum 2021. Am J Kidney Dis. 2021 Jan 6:S0272-6386(20)31194-X. doi: 10.1053/j.ajkd.2020.10.021. Epub ahead of print. PMID: 33418012.

- 2) Nair N, Chakraborty R, Mahajan Z, Sharma A, Sethi SK, **Raina R**. Renal Manifestations of Tuberous Sclerosis Complex. *J Kidney Cancer VHL*. 2020;7(3):5-19. Published 2020 Aug 27. doi:10.15586/jkcvhl.2020.131
- 3) Raina R, Chakraborty R, DeCoy ME, Kline T. Autosomal-dominant polycystic kidney disease: tolvaptan use in adolescents and young adults with rapid progression. *Pediatr Res*. 2020 May 11. doi: 10.1038/s41390-020-0942-2. Epub ahead of print. PMID: 32392574.
- 4) Raina R, Polaconda S, Nair N, Chakraborty R, Sethi S, Krishnappa V, Kapur G, Mhanna M, Kusumi K. Association of pulse pressure, pulse pressure index, and ambulatory arterial stiffness index with kidney function in a cross-sectional pediatric chronic kidney disease cohort from the CKiD study. *J Clin Hypertens (Greenwich)*. 2020 Jun;22(6):1059-1069. doi: 10.1111/jch.13905. Epub 2020 May 30. PMID: 32472978.

Acute Kidney Injury

My research interest includes pathophysiology of acute kidney injury (AKI), renal replacement therapy (RRT) and high flow ultrafiltration for management of inborn error of metabolism. Epidemiology and outcomes of acute kidney injury, acute renal replacement therapy provision of interdisciplinary and inter-institutional collaboration, establishment of AKI evidence-based guideline for Prospective Pediatric Continuous Renal Replacement Therapy (ppCRRT) and collaboration with critical care physicians, cardiologists, and emergency medicine physicians to study AKI in their populations. Special interest in neonatal AKI and devices, ongoing updated research in AKI and RRT, as well as focus on hepatic support systems and transition care from pediatric to adult providers.

- 1) **Raina R**, Wang J, Sharma A, Chakraborty R. Extracorporeal Therapies in the Treatment of Focal Segmental Glomerulosclerosis. *Blood Purif*. 2020;49(5):513-523. doi: 10.1159/000506277. Epub 2020 Feb 19. PMID: 32074606.
- 2) Sethi SK, Mittal A, Nair N, Bagga A, Iyenger A, Ali U, Sinha R, Agarwal I, de Sousa Tavares M, Abeyagunawardena A, Hanif M, Shreshtha D, Moorani K, Asim S, Kher V, Alhasan K, Mourani C, Al Riyami M, Bunchman TE, McCulloch M, **Raina R**. Pediatric Continuous Renal Replacement Therapy (PCRRT) expert committee recommendation on prescribing prolonged intermittent renal replacement therapy (PIRRT) in critically ill children. *Hemodial Int*. 2020 Apr;24(2):237-251. doi: 10.1111/hdi.12821. Epub 2020 Feb 18. PMID: 32072767.
- 3) **Raina R**, Lam S, Raheja H, Krishnappa V, Hothi D, Davenport A, Chand D, Kapur G, Schaefer F, Sethi SK, McCulloch M, Bagga A, Bunchman T, Warady BA. [Pediatric intradialytic hypotension: recommendations from the Pediatric Continuous Renal Replacement Therapy \(PCRRT\) Workgroup](#). *Pediatr Nephrol*. 2019 Feb 8. doi: 10.1007/s00467-018-4190-1.

Patient Transition from Pediatric to Adult Care Providers

Adolescents with chronic renal disease face a unique challenge in their medical care when they transition from the pediatric to adult world. During this transition, adolescent patients are expected to begin self-management of their disease. Adolescent patients are expected to learn how to navigate insurance, medication adherence, appointment adherence, and other responsibilities that were previously managed primarily by parents or providers. These skills are expected to be picked up during a period of increased high-risk behavior as well as psychosocial development. As such, this is a very tenuous time in the patient's renal disease timeline. Failure to have a proper transition can result in poor long-term health consequences, most notably, loss of transplant or the need to return or initiate dialysis. The goal of transition care is to help prevent poor consequences and smooth the transition into adulthood. Currently, there is no standardized transition protocol in place to help guide this process. As a result, the transition of adolescents is not optimized. It is not optimized from a physician standpoint nor a patient standpoint. There are validated questionnaires to assess readiness, however, their use is not regularly implemented. My area of research is (i) To establish transition process guidelines and to develop transition protocol (ii) To make transition process smooth and easily accessible (iii) To educate adult providers as they may lack knowledge and skills to care for young adults with childhood-onset chronic conditions and (iv) To address health insurance and transition services funding negatively impact patient outcome (v) To establish transition clinic set up by an inter-disciplinary team of pediatric and adult care providers.

- 1) **Raina R**, Wang J, Krishnappa V, Ferris M. Pediatric Renal Transplantation: Focus on Current Transition Care and Proposal of the "RISE to Transition" Protocol. *Ann Transplant*. 2018 Jan 16; 23:45-60. PubMed PMID: 29335397.

- 2) **Raina R**, Wang J, Krishnappa V. Structured Transition Protocol for Children with Cystinosis. *Front Pediatr.* 2017 Aug 31; 5:191. doi: 10.3389/fped.2017.00191. eCollection 2017. PubMed PMID: 28913329; PubMed Central PMCID: PMC5583154.
- 3) Díaz-González de Ferris ME, Del Villar-Vilchis M, Guerrero R, Barajas-Valencia VM, Vander-Schaaf EB, de Pomposo A, Medeiros M, Rak E, Cantu-Quintanilla G, **Raina R**, Alvarez-Elias AC. Self-Management and Health Care Transition Among Adolescents and Young Adults with Chronic Kidney Disease: Medical and Psychosocial Considerations. *Adv Chronic Kidney Dis.* 2017 Nov;24(6):405-409. doi: 10.1053/j.ackd.2017.09.010. Review. PubMed PMID: 29229172.
- 4) **Raina R**, Wang J, Sethi SK, Ferris M. Survey on health care transition services in pediatric nephrology. *Clin Exp Nephrol.* 2017. Epub 2017/06/07. doi: 10.1007/s10157-017-1426-5. PubMed PMID: 28585110.

Complete List of Published Work in My Bibliography:

<https://www.ncbi.nlm.nih.gov/pubmed/?term=rupesh+raina>