## MATERIALS AND METHODS

### Study Design

We retrospectively reviewed allograft biopsies from the Department of Pathology at Columbia University Irving Medical Center (CUIMC) from 2011 to 2019 (n=4,127). We searched for the terms “immune complex” or “glomerulonephritis” in the final diagnostic report in order to build our cohort. Patients were labeled as having *de novo* GN if the cause of kidney failure in patients with a native kidney biopsy was not a GN. In patients without a native kidney biopsy available at CUIMC, we used the clinical history and the absence of hematuria and/or proteinuria to exclude a diagnosis of native kidney GN. Exclusion criteria included patients in whom GN was suspected to be donor-derived or patients in whom native kidney disease was unknown because we did not have reliable proteinuria or hematuria data to make assumptions about the presence or absence of GN. Using the same search criteria, recurrent GN was also selected based on reported native kidney biopsy results. Recurrent GN of autoimmune etiology, specifically lupus nephritis, was excluded since the majority of recurrent lupus nephritis in our material were associated with weak immune deposits without proliferative features. The first post-transplant allograft biopsy where *de novo* GN or recurrent GN were discovered was labeled as the “index biopsy”. Demographic, clinical, and laboratory data were extracted from the medical record. Death-censored allograft failure was defined as the need for chronic dialysis or re-transplantation. Circulating DSA were recorded when available at the time of transplantation and/or at the time the index biopsy was performed. DSA were assessed by Luminex single antigen beads (One Lambda,

Canoga Park, CA) and considered positive when the mean fluorescence intensity (MFI) was greater than 1000.

### Pathologic Evaluation

Kidney allograft biopsies were stained with hematoxylin and eosin, periodic acid Schiff, Jones methenamine silver, and trichrome. For immunofluorescence, frozen tissue was stained with antibodies against IgG, IgA, IgM, C4d, C3, C1q, fibrin, kappa light chain, lambda light chain, and albumin. T-cell mediated-rejection (TCMR) and AMR were defined according to the 2017 Banff classification[17]. This study was approved by the institutional review board of CUIMC and adheres to the Declaration of Helsinki.

### Statistical Analyses

Demographics and clinical characteristics were compared using Fisher's exact test. Log-rank test was used to compare Kaplan-Meier survival curves. For survival analyses, follow-up was defined from the time from transplantation or index biopsy to the time of graft loss or was censored at the date of last serum creatinine if the graft was still functional at the end of follow up period. Data were analyzed using Graphpad Prism 8 (San Diego, CA). *P* value $\leq$ 0.05 with two-sided hypothesis testing was considered statistically significant.

### SUPPLEMENTAL REFERENCES


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