Trends in Urologic Indications for Pediatric Renal Transplantation Over a 27-Year-period United Network for Organ Sharing (UNOS) Database

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OBJECTIVE To elucidate the trends in urologic causes for renal transplant in the pediatric population using a national database. Little is known about the specific pediatric urologic conditions and resultant trends that precede renal transplantation.

MATERIAL AND METHODS We reviewed the United Network for Organ Sharing (UNOS) database for pediatric patients (<18 years old) who underwent renal transplantation from January 1988 to September 2015. We included those patients who received a renal transplant because of a urologic condition.

RESULTS Over 27 years, 7291 of 20,213 children (36%) underwent renal transplant secondary to a urologic condition. The 2 most common indications were hypoplasia/dysplasia/dysgenesis/agenesis (HDDA, 35.1%) and congenital obstructive uropathy (COU, 25.7%). The incidence of COU has increased from 18% to 30%, and the incidence of Wilms tumor has remained relatively consistent at 1.8% per year.

In addition, 68% of all urologic renal transplants were performed in men compared with women. However, a higher percentage of women required transplantation because of Wilms tumor (3.1% vs 1.2%) and chronic pyelonephritis (17.6% vs 7.9%).

Overall, the majority of patients (61.5%) who underwent renal transplantation were white, 18.8% Hispanic, and 15.3% black.

CONCLUSION HDDA and COU consistently have been the most common urologic indications for renal transplantation. Both are the leading causes in men, whereas HDDA and chronic pyelonephritis are predominant in women. Higher rate of renal transplant during the ages of 11-17 years is suggestive of increased burden on poorly functioning kidneys during times of adolescent growth. UROLOGY ■■: ■■–■■, 2017. © 2017 Elsevier Inc.

Pediatric urologic indications are some of the leading causes of end-stage renal disease (ESRD) leading to renal transplantation.[1,2] Per the United States Renal Data System (USRDS), the incidence of ESRD in children has been decreasing since 2008, whereas the prevalence has plateaued between 2008 and 2012.[3] To date, renal transplant in pediatric patients with ESRD remains to be the most common treatment modality.

With recent changes in the Organ Procurement and Transplantation Network Organ allocation policy (OPTN), there has been a major shift from living-related to deceased donors. According to the Scientific Registry of Transplant Recipients and OPTN, the number of deceased kidney donors decreased from 19% to 12.3% between 1997 and 2006, whereas the number of patients requiring transplant has been relatively constant.[1]

Based on the National American Renal Trials and Collaborative Studies (NAPRTCS), approximately 15%-28% of patients <6 years of age undergo renal transplantation.[2] Little is known, however, about the specific pediatric urologic conditions and resultant trends that precede renal transplantation. The aim of this study was to elucidate trends in urologic causes for renal transplant in the pediatric population using a national database.

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MATERIALS AND METHODS

Data Source

We reviewed the United Network for Organ Sharing (UNOS) database for pediatric patients (<18 years old) who underwent renal transplantation from January 1988 to September 2015.

UNOS was incorporated as a nonprofit organization in 1984 and was offered a contract to operate as OPTN in 1986 by the United States Department of Health and Human Services.

Study population. All patients receiving a renal transplant secondary to urologic indications were included. Such diagnoses included hypoplasia/dysplasia/dysgenesis/agenesis (HDDA), congenital obstructive uropathy (COU), chronic pyelonephritis or reflux nephropathy, polycystic kidney disease, acquired obstructive nephropathy, prune-belly syndrome, Wilms tumor, dysplasia, nephrolithiasis, renal cell carcinoma, and urolithiasis. Patients with a diagnosis of "unknown and others" were excluded from analysis. We performed summary statistics of patients undergoing renal transplantation based on specific diagnosis and characterized them based on year of transplant, age, gender, and race as represented in the UNOS database. In the UNOS database, the ages were subdivided into <1, 1-5, 6-10, and 11-17 years. The analysis was limited to those under 18 years of age as the next group categorized was 18-34 years. Race was categorized as white, black, Hispanics, Asian, unknown, American Indian or Alaska Native, Pacific Islander, and unknown. For summary purposes, individual race categories with fewer numbers (American Indian or Alaska Native, Pacific Islander, and unknown) were grouped together and analyzed as "others."

Table 1. Demographic characteristics

Total number of renal transplant 1988-2015	7248
Total number of male patients (%)	4952 (68%)
Total Number of female patients (%)	2296 (32%)
Age distribution (y)	
<1	61 (0.8%)
1-5	2084 (29%)
6-10	1573 (22%)
11-17	3530 (49%)
Race	
White	4462 (62%)
Black	1110 (15%)
Hispanics	1352 (19%)
Asian	165 (2%)
Others (unknown, American Indian/ Alaska Native, Pacific Islander)	159 (2%)

Statistical Methods

Here, we present frequencies of various urologic indications for renal transplantation and chi-square analyses to assess significant differences in clinical diagnosis for renal transplantation with gender, ethnicity, and age.

RESULTS

From January 1988 to September 2015, a total of 20,213 pediatric patients underwent renal transplantation because of various medical and surgical conditions. Of these, 7291 (36%) underwent renal transplant secondary to a urologic etiology (Table 1). Of these patients, 61.5% were white, 68.3% were male, and 48.8% were between the ages of 11 and 17. Overall, 51% of all urologic renal transplants were ≤10 years of age.

Ten major urologic indications were listed in the UNOS database and are depicted in Table 2. The 2 most common diagnoses were HDDA (35%) and COU (25.7%). The incidence of acquired obstructive nephropathy has decreased from 23% to 4% of all yearly transplants over the past 27 years, whereas COU has increased from 18% to 30%. The incidence of Wilms tumor has remained relatively consistent at 1.8% per year. The incidence of polycystic kidney disease, chronic pyelonephritis or reflux nephropathy, and prune-belly syndrome leading to renal transplant has remained relatively the same since 1988.

Men were more likely to be diagnosed with COU (31.2% vs 13.3%, P <.001) and prune-belly syndrome (8.6% vs 0.5%, P <.001) compared with women. Chronic pyelonephritis, polycystic kidney disease, and Wilms tumor as an indication for renal transplant is significantly more common in female patients compared with men (P <.001).

The overall majority of patients (61.5%) who underwent renal transplantation were white with 18.8% Hispanic and 15.3% blacks (Table 2). Among all races, HDDA and COU were the most common etiology leading to renal transplant. Wilms tumor was more commonly seen in white and Hispanic (Table 3).

The majority of patients (49%) undergoing renal transplantation for urologic indications were between ages 11 and 17 years, followed by patients between ages 1 and 5

Table 2. Urologic indications for renal transplantation by gender

	Total Number of Patients (% Within Each Indication)	Number of Male Patients (% Within Each Indication)	Number of Female Patients (% Within Each Indication)	*P*-Value*
Hypoplasia/Dysplasia/Dysgenesis/Agenesis	2603 (36)	1598 (32)	1005 (44)	<.001
Congenital obstructive uropathy	1842 (25)	1538 (31)	304 (13)	<.001
Chronic pyelonephritis/Reflux nephropathy	795 (11)	391 (8)	404 (18)	<.001
Polycystic kidneys	736 (10)	370 (7)	366 (16)	<.001
Acquired obstructive nephropathy	660 (9)	544 (11)	116 (5)	<.001
Prune-belly syndrome	438 (6)	426 (9)	12 (0.5)	<.001
Wilms tumor	133 (2)	62 (1)	71 (3)	<.001
Nephrolithiasis	32 (0.4)	16 (0.3)	16 (0.7)	.03
Renal cell carcinoma	5 (0.1)	4 (0.1)	1 (0)	.58
Urolithiasis	4 (0.1)	3 (0.1)	1 (0)	.77
Total	**7248**	**4952**	**2296**	

* Compared with all other indications combined.