

Practice Variation in the Immediate Postoperative Care of Pediatric Kidney Transplantation: A National Survey

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ABSTRACT

Introduction. Advances in organ allocation, surgical technique, immunosuppression, and long-term follow-up have led to a significant improvement in kidney transplant outcomes. Although there are clear recommendations for several aspects of kidney transplant management, there are no pediatric-specific guidelines for immediate postoperative care. The aim of this survey is to examine practice variations in the immediate postoperative care of pediatric kidney transplant patients.

Methods. We surveyed medical directors of Pediatric Acute Lung Injury and Sepsis Investigators (PALISI)-affiliated pediatric intensive care units regarding center-specific immediate postoperative management of pediatric kidney transplantation.

Results. The majority of PALISI centers admit patients to the pediatric intensive care unit postoperatively, and 97% of the centers involve a pediatric nephrologist in immediate postoperative care. Most patients undergo invasive hemodynamic monitoring; 97% of centers monitor invasive arterial blood pressure and 88% monitor central venous pressure. Most centers monitor serum electrolytes every 4 to 6 hours. Wide variation exists regarding blood pressure goal, fluid replacement type, frequency of obtaining kidney ultrasound, and use of prophylactic anticoagulation.

Conclusion. There is consistent practice across PALISI centers in regards to many aspects of immediate postoperative management of pediatric kidney transplantation. However, variation still exists in some management aspects that warrant further discussions to reach a national consensus.

END-STAGE renal disease affects 5 to 10 children per million per year and is associated with an increased mortality risk by 30-fold compared with the general pediatric population [1].

Although the first kidney transplant was performed successfully in 1954, the field of pediatric transplantation lagged behind by 20 years. Major improvements in surgical approach and postsurgical care led to great strides in short-term and long-term outcomes. The drivers behind these improvements are related to advances in organ allocation, surgical technique, immunosuppression, and long-term follow-up [2–4]. The development of pediatric trial groups served as an important milestone that enhanced progress in all these areas and resulted in dramatic improvements. Remarkably, young children now have the best

long-term graft survival among all age groups. As outcomes have improved, the patient population has become increasingly complex, including more children who have multiple congenital anomalies. In the United States, approximately 800 kidney transplants are performed per year in children under the age of 18 years, representing about 5% of all kidney transplants performed nationally (Fig 1) [5].

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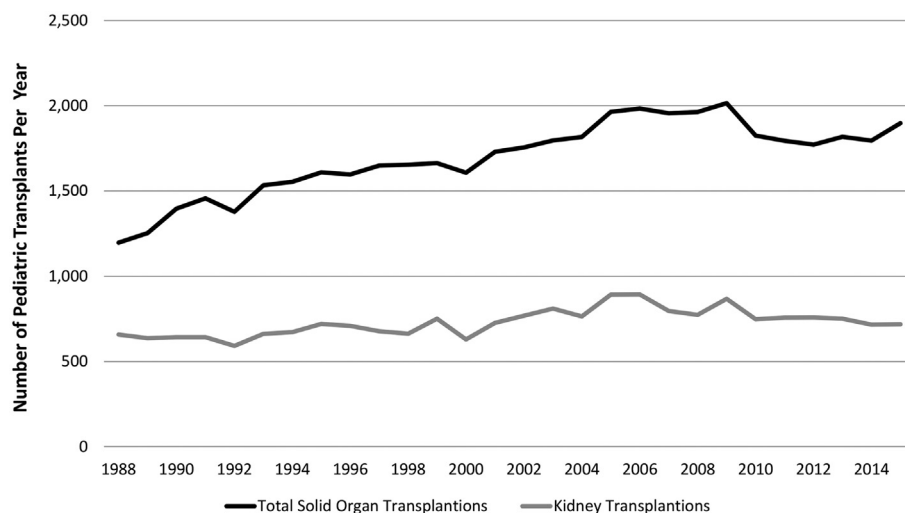


Fig 1. Trends of yearly pediatric solid organ and kidney transplantation in the United States from 1988 to 2014. Data retrieved from United Network for Organ Sharing (UNOS) website in August 2016.

Pediatric kidney transplantation is generally performed in specialized centers due to complex technical, metabolic, immunologic, and physiologic factors. The transplant team usually is a multidisciplinary team comprising transplant surgeons, pediatric intensivists, pediatric nephrologists, and pediatric urologists alongside psychologists, renal transplant and dialysis nurses, social workers, pharmacists, and nutritionists.

There are clear recommendations for several management aspects of pediatric kidney transplantation, including induction and maintenance immunosuppressive medication, monitoring for allograft kidney function, recurrence of kidney disease, and infectious complications [6,7]. Because there are no specific guidelines for the immediate postoperative care of pediatric kidney transplant recipients, we hypothesized that there is tremendous practice variation in the immediate postoperative care of those patients in the United States.

METHODS

The study was approved by the institutional review board of Indiana University. A Redcap online survey regarding center-specific immediate postoperative management of pediatric kidney transplant recipients was sent to 78 medical directors of the Pediatric Acute Lung Injury and Sepsis Investigators (PALISI)-affiliated pediatric intensive care units. The survey included 21 questions. The first part aimed to collect data regarding the size and clinical team composition of each pediatric intensive care unit (PICU) followed by questions regarding various aspects of immediate postoperative management of pediatric kidney transplantation including disposition of patients postoperatively, invasive monitoring practice, laboratory and imaging protocols, fluid replacement type, and anticoagulation practice. The survey was initially sent in May 2014 and a follow-up reminder was sent in June 2014. The responses were summarized using descriptive statistics; median and interquartile ranges or number and percentages were used as appropriate. Centers were divided based on their annual transplant volume into low (<6), medium (6–12), and high volume (>12) centers [8]. The survey responses were further analyzed based on the center volume using χ^2 or Fisher exact test and Kruskal-Wallis test.

RESULTS

Thirty-five (45%) of PALISI centers responded to the survey. Thirty-three centers (94% of responding centers) have a pediatric kidney transplant program with median of 10 (interquartile range 6–15) cases per year. Center characteristics are summarized in Table 1. Of the 33 centers that have a kidney transplant program, 8 were low volume, 11 medium volume, and 14 high volume.

Only 61% of centers have written protocols or guidelines to manage those patients, and 73% have printed or electronic order sets for immediate postoperative care. The vast majority of centers (94%) routinely admit patients to the PICU postoperatively and involve a pediatric nephrologist and a pediatric intensivist in the immediate postoperative care (Fig 2). Most patients receive invasive monitoring; 97% of centers monitor invasive arterial blood pressure and 88% monitor central venous pressure (CVP). In regards to arterial blood pressure goals, a large variation exists regarding blood pressure target: 15% of centers use preoperative recipient’s baseline blood pressure, 3% use 50th percentile for recipient’s age, 24% use 90th to 95th percentile for recipient’s age, 21% use normal blood pressure range for the donor, and 37% have no set blood pressure goal.

Most centers monitor intake and output hourly and serum electrolytes every 4 to 6 hours, but there is a wide variation in the type of fluid used to replace urine output: 46% of centers

Table 1. Demographics of Responding Pediatric Acute Lung Injury and Sepsis Investigators Centers (n = 35)*

Number of PICU beds	24 (20, 35.5)
Number of intensivists in the group	10 (9, 15)
Have transplant intensive care unit	2 (5.7%)
Have 24-h in-house PICU attending coverage	22 (62.9%)
Have kidney transplant program	33 (94.3%)
Number of kidney transplant per year	10 (6, 15)

Abbreviations: IQR, interquartile range; PICU, pediatric intensive care unit. *Data presented as median (25th, 75th interquartile range) or as n (%).

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