

# Pediatric ESKD Kidney Transplant Fact Sheet

## Kidney Transplant – What Is It?

Kidney transplantation is another available treatment option for pediatric patients with end stage kidney disease (ESKD). It improves survival and quality of life compared to dialysis (Chadban et al., 2020).

Kidney transplant is when a patient with ESKD receives a donated healthy kidney from either a living or deceased person. This requires surgery from a trained transplant surgeon, where the donated kidney is connected via anastomosis to the recipient’s vasculature and urinary system. The goal is to prolong the lifespan of the transplanted kidney. Therefore, most kidney transplants that are well taken care of can last 10 to 20 years.

## Requirements to Receive a Kidney Transplant

Each pediatric kidney transplant program should develop criteria and a standardized evaluation process before approving a patient to receive a kidney transplant. If considered a possible candidate, the patient should have an official kidney transplant meeting. Suggested criteria include:

- Meet weight and size requirement.

- Receive all standard childhood vaccinations per the Centers for Disease Control and Prevention (CDC) immunization schedule.
- Blood tests, at a minimum to include hepatitis, cytomegalovirus (CMV), Epstein-Barr virus (EBV), human leukocyte antigen (HLA), panel of reactive antibodies (PRA), type and screen, basic metabolic panel, complete blood count with differential (CBCD), coagulation studies of prothrombin time (PT), INR and partial thromboplastin time (PTT), and urinalysis.
- If the patient has residual urine output, a 24-hour urine collection to assess daily urine output, protein, and creatinine.
- Evaluation by members of the interdisciplinary team: nephrologist, surgeon, psychologist, social worker, Child Life Specialist, pharmacist, kidney transplant nurse, and nutritionist/dietitian.
- Imaging and procedures may include ultrasound (US) of the upper chest vasculature; US of the abdominal aortic, inferior vena cava (IVC), and iliac vasculature; US of native kidneys; echocardiogram; electrocardiogram (EKG); and chest X-ray.
- Based on the underlying kidney disease or other health conditions, the patient may need to see other specialists, such as rheumatology, pulmonology, cardiology, or endocrinology.
- A native nephrectomy may be recommended.

**Table 1.**  
**Advantages and Disadvantages for Deceased and Living Donations**

|                      | Deceased Donor                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Living Donor                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|----------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Advantages</b>    | <ul style="list-style-type: none"> <li>• Open to a wider network of organs.</li> <li>• Possibly receive a kidney transplant faster than trying to find someone for living donation.</li> <li>• Know the overall quality and health of the donor based on the Kidney Donor Profile Index (KDPI) score.</li> </ul>                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• Donor will have a full evaluation and workup by the adult renal transplant program to be approved as a donor.</li> <li>• Ability to determine who is the best donor between two potential donors based on epitope match.</li> <li>• Known time and date of surgery, which allows for provisions of care of other children in the family, time off work, or out of school for the recipient.</li> </ul> |
| <b>Disadvantages</b> | <ul style="list-style-type: none"> <li>• Can spend several months to years on waitlist if patient has a high PRA status.</li> <li>• Unknown kidney anatomy that may not be detected until the organ is retrieval.</li> <li>• Unknown timeframe and date of when a kidney offer will occur. This makes it difficult for the family to plan events or vacations because they will need to have their phone on standby and be close to the hospital in case they receive a call.</li> </ul> | <ul style="list-style-type: none"> <li>• Limited donor pool. Only people who wish to donate their kidney are options.</li> <li>• Coordination of operating room schedules between adult renal transplant program and pediatric renal transplant program can be challenging.</li> </ul>                                                                                                                                                          |



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## Types of Kidney Transplants

There are two types or ways patients receive a kidney transplant. A living donor transplant is when a patient receives a kidney from someone who is living. This is usually a parent, sibling, or other relative, but may also come from a friend or altruistic donor. A deceased donor transplant is when a patient receives a kidney from someone who has died. The patient is on a waiting list based on a point system database through the United Network for Organ Sharing (UNOS) organization. Overall patient outcomes and lifespan for living and deceased donor kidney recipients are now essentially the same (Johansen et al., 2023). See Table 1 for advantages and disadvantages for deceased and living donation.

## Intraoperative Kidney Transplant

Location of kidney transplant will be based on the patient's size. Infants usually have an intraabdominal placement, while younger children and adolescents have a retroperitoneal placement.

## After Kidney Transplant

Immediately after transplantation, the patient will go to an intensive care unit for monitoring of vital signs, urine output, respiratory support, and pain management. As the patient improves clinically with adequate urine output, stable electrolytes, no respiratory concerns, pain controlled, and stable vital signs, the patient will transfer to the inpatient floor. While on the inpatient floor, the patient will have continued monitoring of labs and urine output, medication kinetics obtained, and education provided. Once discharged, the patient will have clinical follow-up appointments per program policy.

## Kidney Transplant Medications

The goal of medication management post-transplant is to provide enough immunosuppression to prevent rejection of the allograft, but not in excess that the patient develops infections. Concerning infections include CMV, EBV, and BK virus. As with all children, it is common to develop normal childhood infections, such as common cold, influenza, or gastroenteritis.

Patients who receive a kidney transplant will need to be on chronic immunosuppressive medications. Common immunosuppressive medications include tacrolimus,

mycophenolate mofetil, and prednisone. Other medications patients may take are sirolimus, azathioprine, belatacept, or mycophenolic acid (Myfortic®). Antiviral medications include valacyclovir, valganciclovir, or ganciclovir. If the patient is CMV PCR negative, and the donor is CMV PCR positive, cytomegalovirus immune globulin (Cytogam®) is often given. Dosing and side effects for tacrolimus, mycophenolate mofetil, and prednisone are below.

**Tacrolimus:** Maintenance dosing is (mg/kg/day) with goal trough levels of 5 to 7. Side effects include toxicity within the kidney transplant (seen on biopsy), hyperglycemia leading to diabetes mellitus, hypertension, hyperkalemia, and neurological manifestations, such as fine hand tremors (if dose is too high).

**Mycophenolate mofetil (Cellcept®):** Maintenance dosing is (mg/m<sup>2</sup>/day). Side effects include gastrointestinal upset and/or diarrhea, and neutropenia or pancytopenia.

**Prednisone:** Dosing is (mg/kg/day). There can be several side effects with chronic steroids, including hyperglycemia, hypertension, osteopenia, poor linear growth, stomach ulcers or other gastrointestinal upset, and Cushingoid features. The patient may even have an impaired stress response by suppressing the hypothalamic-pituitary-adrenal (HPA) axis.

Patients who are deemed "rapid metabolizers" of tacrolimus by evidence of low tacrolimus trough levels despite increasing the dose should have testing of the cytochrome (CYP) metabolism. If the patient is a rapid metabolizer, then one should consider changing to extended-release tacrolimus (Envarsus®) and maintain the same goal trough levels.

## Infectious Complications

Infections are inevitable with immunosuppressive medication use. Although children will develop common childhood community-based infections of common cold, influenza, and gastroenteritis, it is vital that the patient also be monitored for CMV, EBV, and BK virus. Pediatric kidney transplant programs should develop a virus monitoring and treatment policy or guideline to prevent the risk of serious complications. At a minimum, the patient and donor status for CMV and EBV should be confirmed before or immediately after transplant.

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**Cytomegalovirus (CMV):** Complications include neutropenia, CMV-related gastroenteritis, or colitis.

**Epstein-Barr virus (EBV):** Complications include neutropenia and post-transplant lymphoproliferative disease (PTLD).

**BK virus (BKV):** First detected in 1971 and was termed “BK” from a Sudanese kidney transplant recipient with ureteric stenosis and had BKV in the urine. BKV in the general population occurs during early childhood, with seroprevalence rates increasing up to greater than 90% by age 4 years (Hirsh & Randhawa, 2019). BK virus remains latent in the uroepithelium and renal tubular cells. In the donor, there is no way to detect for BK virus because the donor’s immune symptoms suppress the virus. BK virus can replicate once immunosuppression begins. Use of potent immunosuppressive combination therapy of mycophenolate and tacrolimus may play a role in the occurrence of this virus. Complications include viruria, viremia, ureteral stenosis, and allograft nephropathy.

## Other Problems Post-Transplant

Common patient struggles post-transplant include medication adherence, meeting daily fluid goals, and mental health conditions. Medication nonadherence can be due to several reasons and may include polypharmacy; medication taste, size, and side effects; not wanting to appear different in front of peers; and multiple medication times. The kidney transplant team should administer a standardized barriers assessment tool if medication non-adherence is suspected. Along with medication adherence, it may be challenging for the patient to meet the required oral fluid intake every day. Patients may have the sensation of feeling full by the amount of fluid volume required; thus, their nutrition can suffer. Evaluation by a renal dietitian is imperative to help patients with fluid intake and nutritional status. Placement of a gastrostomy tube, especially in younger children, can help with the nutritional status.

## Mental Health Issues

Even after receiving a kidney transplant, a patient can suffer from post-transplant anxiety from transition to the new norm or depression from a variety of reasons. Patients with few friends or social support miss the caring and supportive atmosphere the dialysis staff provide. Adolescent patients may struggle with balancing daily transplant care with work, school, and extracurricular activities. Patients should continue to follow up with a counselor, child psychologist, or psychiatrist to help with the transition from dialysis to transplant.

## Food and Medications to Avoid after Transplant

Any food or drink that contains grapefruit should be avoided because it interacts with the metabolism of tacrolimus or other medications metabolized through the CYP system within the liver. If the patient requires calcium carbonate supplementation, the dose should be spaced out 1 to 2 hours from immunosuppression medications to prevent binding and inadequate medication absorption. Proton pump inhibitors (omeprazole) should also be used cautiously when a patient is taking mycophenolate mofetil (Cellcept®) because proton pump inhibitors can lower blood levels of mycophenolate.

## Activity Restrictions after Transplant

The patient should have limited physical activity for several weeks after transplant to allow for healing of the allograft anastomosis and surgical incision sites (typically 4 to 6 weeks). The patient should avoid crowded areas, if possible. If not possible to avoid crowds, the patient should wear a mask in public until at maintenance dosing. Contact sports, such as football, rugby, martial arts, and wrestling, should be avoided to prevent a direct blow and injury to the kidney transplant. Other sports or activities, such as soccer, baseball, basketball, tennis, and band, require discussion with the transplant team before participation. Sports where there is some contact (soccer, basketball, baseball) may require the patient to have a protective shield, called a *kidney guard*, over the kidney transplant.

## Overall Goal after Kidney Transplant

The overall goal of kidney transplant is to restore normal kidney function and provide optimal health status with preservation of the allograft for as long as possible. This allows the child to have better growth and improved taste, and corrects the comorbidities of anemia and bone-mineral disorders. For those who were hypertensive due to hypervolemia, a kidney transplant may even improve blood pressures by allowing the patient to remain euvolemic. Patients may struggle with medication adherence or daily fluid intake goals. Medication barrier assessment tools are helpful in determining reasons for medication nonadherence.

At every clinic visit, a patient who has received a kidney transplant should continue to have their glomerular filtration rate monitored, along with continued monitoring for known kidney disease-related comorbidities. The frequency of those visits vary from center to center. It is also important for the child to be prepared for transition to adult-based

kidney transplant care once they are in the age range of 18 to 21 years (age of transition varies by center).

## References

- Chadban, S.J., Ahn, C., Alexman, D.A., Foster, B.J., Kasiske, B.L., Kher, V., Kumar, D., Oberbauer, R., Pascual, J., Pilmore, H.L., Rodrigue, J.R., Segev, D.L., Sheerin, N.S., Tinckam, K.J., Wong, G., & Knoll, G.A. (2020). KDIGO clinical practice guideline on the evaluation and management of candidates for kidney transplantation. *Transplantation*, 104(4S1), S11-S103. <https://doi.org/10.1097/TP.00000000000003136>
- Hirsch, H.H., & Randhawa, P.S. (2019). BK polyomavirus in solid organ transplantation – Guidelines from the American Society of Transplantation Infectious Diseases Community of Practice. *Clinical Transplantation*, 33(9), e13528. <https://doi.org/10.1111/ctr.13528>

Johansen, K.L., Gilbertson, D.T., Li, S., Li, S., Liu, J., Roetker, N., Ku, E., Schulman, I.H., Greer, R.C., Chan, K., Abbott, K.C., Butler, C.R., O'Hare, A.M., Powe, N.R., Reddy, Y.N.V., Snyder J., St. Peter, W., Taylor, J.S., Weinhandl, E.D., & Wetmore, J.B. (2023). 2023 USRDS annual data report: Epidemiology of kidney disease in the United States. *American Journal of Kidney Diseases*, 83(4). [https://www.ajkd.org/article/S0272-6386\(24\)00048-9/fulltext](https://www.ajkd.org/article/S0272-6386(24)00048-9/fulltext)

## Additional Readings

- Cameron, A., Coe, C.D., Cometti, B., Kanute, V., Richards, C., Salazar, M.A., Schmidt, D., Stephens, S., & Taylor, C. (2020). Kidney disease in patient populations across the life span. In C.S. Counts (Ed.), *Core Curriculum for nephrology nursing* (7th ed.). American Nephrology Nurses Association.
- Warady, B.A., Alexander, S.A., & Schaefer, F. (Eds.). (2021). *Pediatric dialysis* (3rd ed.). Springer.

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### Additional Information:

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