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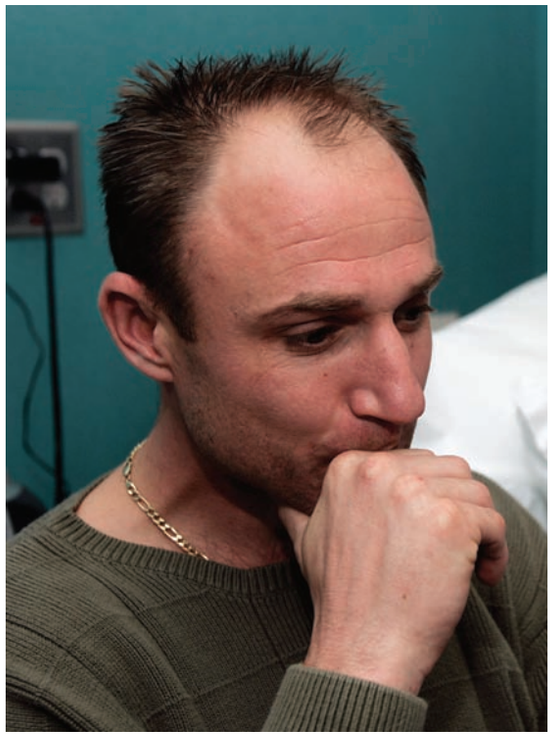
The Pediatric Renal Transplant Process

A Guide for Home

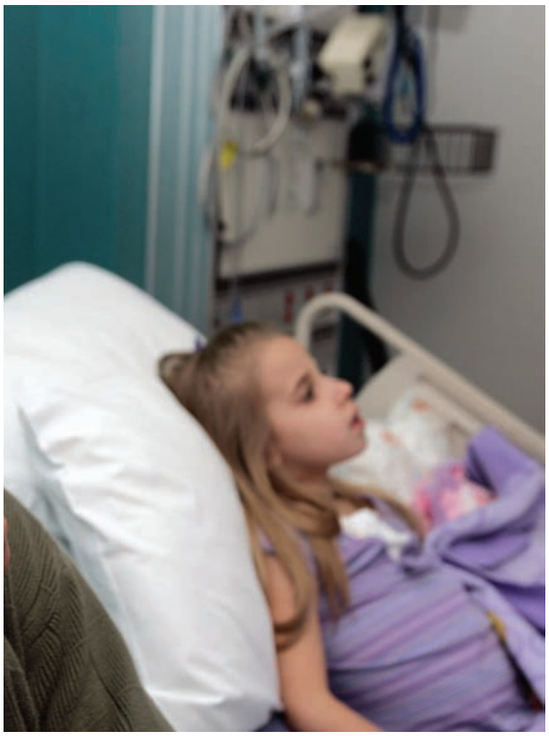


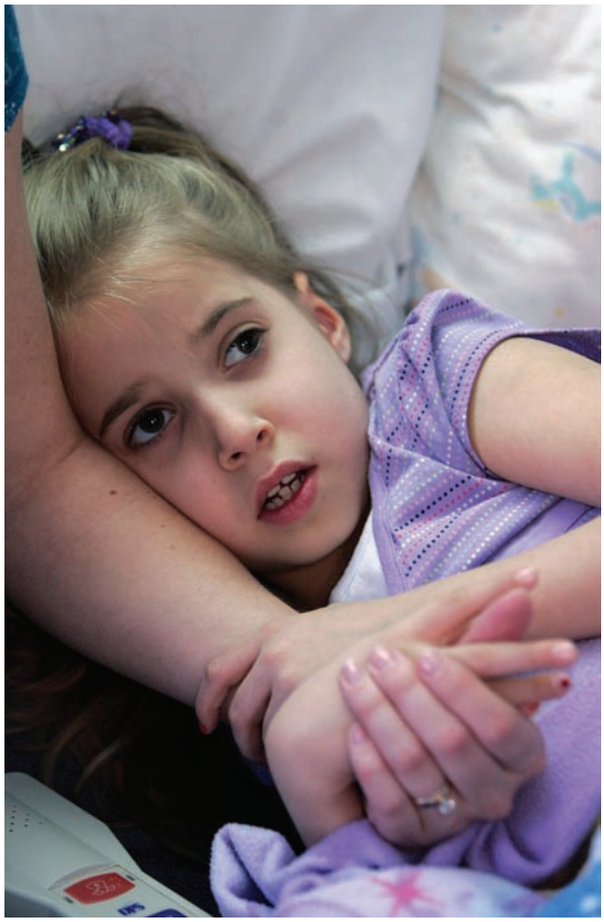
Kidneys are one of the most commonly transplanted solid organs in children. In 2008, 16,067 renal transplants were performed in the United States; of those, 773 were performed on patients under the age of 18 (2009 OPTN/SRTR Annual Report 1999-2008, 2009). The process of renal transplantation can be a long one and children and their families often endure many challenges on the road to the transplant, not to mention the adjustments that lie ahead afterward. For this reason, and because these patients benefit from home health follow-up after their transplant, it is important for home health clinicians to be knowledgeable about the renal transplant process in addition to posttransplant care.

Pathophysiology: A Snapshot

Kidneys are primarily responsible for excreting waste and maintaining fluid and electrolyte balances in the body. Renal failure results when the kidneys are no longer able to function in these capacities and can be acute or chronic in nature. Acute renal failure usually resolves with treatment, although in some cases and when left untreated, acute renal failure will progress to chronic renal failure. Chronic renal failure will worsen over time until the body requires outside intervention to function in the capacity

Health Clinicians





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(AP Photos/John Bazemore)

of the kidneys. The final stage of chronic renal failure is end-stage renal disease (ESRD). At this stage, there are only two treatment options—dialysis or renal transplant. While dialysis is an effective treatment for patients with ESRD, it prevents these patients and families from having a normal lifestyle and presents risks as a treatment option. Renal transplant is a very complex process and can be very emotionally taxing for a child and family, but provides the best chance for a normal lifestyle (Hockenberry & Wilson, 2007).

Preparing for a Renal Transplant

A child, or adult, may become a candidate for renal transplant when they have been diagnosed with ESRD or if they have chronic renal failure that is rapidly progressing to ESRD. Donor kidneys can come from living donors, often family members or close friends, or from deceased donors. For living donor renal transplant, the donor must be in good health and tests must be completed to ensure compatibility (Henry & Dharnidharka, 2008). To receive a kidney from a deceased donor, the child and family must undergo a detailed screening process prior to becoming eligible to receive a donor organ.

United Network of Organ Sharing (UNOS) maintains a database of all patients who are eligible to receive an organ (Organ Donation, Tissue Donation, Organ Transplants—The Gift of a Lifetime, 2004). In order to be included in this database, patients must be evaluated by a physician at a transplant center. This screening process includes a thorough medical history for the child and their parents, as well as a comprehensive physical assessment to determine if the child is healthy enough to undergo renal transplant (UNC Healthcare Pediatric Health Library, 2009). There is also a psychosocial assessment of the parents and child, if he or she is old enough to participate, that evaluates components such as educational level, employment status, activity level, and compliance with previous treatment plans (UNC Healthcare Pediatric Health Library, 2009). These indicators are intended to determine how likely the patient and family are to successfully manage a transplant at home. Any type of organ transplantation requires strict adherence to a lifelong care plan and it is important to ensure that the family is capable of managing that care plan until the child is old enough to be taught the importance of self-management and assume responsibility. The screening process also includes histocompatibility testing, whereby the patient's ABO blood type and human leukocyte antigen type are documented. Both are necessary in determining the immunological compatibility between the patient's body and any donor kidney that becomes available (UNC Healthcare Pediatric Health Library, 2009). Once this information has been collected, a patient can be placed in the UNOS database.

During this time, in addition to meeting with the transplant surgeon and nephrologist, the patient and family are heavily involved with the transplant nurse coordinator and the social worker for the transplant team. The nurse coordinator and social worker are key resources for the patient and family—they organize the care and schedule the tests and procedures that a patient will undergo prior to the transplant and serve as point persons for the family for any questions, concerns, or frustrations that may arise. These resources are involved with the initiation of education for the patient and family early in the transplant process (UNC Healthcare Pediatric Health Library, 2009). This education sets the foundation for the patient and family and is critically important. It begins the process of reinforcement regarding the lifestyle changes and commitment to the treatment regimen that will be required posttransplantation (McPake & Burnapp, 2009).

This database, often referred to as a transplant "waiting list," quickly cross-references screening data from eligible potential organ recipients when an organ becomes available and ranks the potential recipients according to likely compatibility (Organ Procurement and Transplantation Network, 2010). For deceased donors under the age of 35, preference is given to pediatric patients (2009 OPTN/SRTR Annual Report 1999-2008, 2009*). After harvest from a deceased donor, kidneys are cooled for transport and transplant. With respect to the kidneys, the potential for acute rejection following transplantation is lowest if this period of cold is less than 24 hours (Mikhalski et al., 2008). Given this short window of time for the highest likelihood of success, when kidneys do become available, things move very quickly. Transplant surgeons evaluate the patient's current state of health and other factors to determine if the organ is a good match. If a patient is sick at the time an organ becomes available or if the surgeon determines that the organ is not a good match, the next potential recipient in the UNOS database is notified and the process continues until a good match is determined (Organ Procurement and Transplantation Network, 2010).

Renal Transplant

Renal transplant surgery involves the transfer of a kidney, ureters, and potentially several blood vessels (Friedman, 2005). The donor kidney is placed in the lower abdomen of the recipient and

children as young as 2 years of age have enough space in their abdomens to accommodate an adult-sized kidney (Henry & Dharnidharka, 2008).

Postoperative Care Considerations

After the renal transplant surgery, patients are initially admitted to an intensive care unit, where they can be closely monitored for bleeding, infection, or signs that the kidney may not be functioning properly, including elevated blood pressure.

Frequent laboratory blood tests are necessary both postoperatively and after discharge to monitor for complications. Complete blood cell (CBC) counts are obtained to monitor for internal bleeding and infection. Blood chemistries including potassium, blood urea nitrogen, creatinine, and sodium, among others, are verified to help ensure that the new kidney is functioning properly. Also, blood levels of some immunosuppression drugs, for example tacrolimus (Prograf), are monitored to ensure that the dose is therapeutic; this will be done prior to the patient's discharge and will need to be monitored frequently after discharge to ensure that the level remains within the therapeutic range. See Table 1 for normal and critical laboratory values for these blood tests.

During discharge planning, clinical care managers actively work with the family to determine their specific home health needs. Clinical care managers also work with home health providers during this time to establish and coordinate the care after discharge. Staff also educate families on the medications their child will be discharged with, when to call their doctor, and the scheduling of follow-up appointments.

Medications After Renal Transplant

Successful medication management after a renal transplant can be a very challenging area for patients and families to master. One of the key points for any clinician involved with a postrenal transplant patient or family to emphasize is that the medications must be taken every day, and as directed, in order for the transplanted kidney to

Table 1. Common Pediatric Laboratory Values Following Renal Transplant

Lab		Normal Range	Critical Value(s)
Potassium (K)	1 month-1 year	4.1-5.3	<2.7
	1-17 years	3.4-4.7	>6.0
BUN		5-17	>25% increase from baseline
Creatinine (Cr)		0.30-0.80	>25% increase from baseline
Sodium (Na)		135-145	<115 >155
WBC		4.5-13.5	<0.5 >50
Hemoglobin (HgB)		11.5-15.5	<5 >20
Hematocrit (Hct)		35-45	<15 >60
Tacrolimus (Prograf)	Postoperative	10-12	>15
	Maintenance (after discharge)	6-10	

Source: Data from Georganne Sebastian, RPh, MS, and McLendon Clinical Laboratories database (2011).

survive. Families should be aware that if their child misses one dose of their scheduled medications, they should contact their transplant physician to determine how to make up the dose. They should also be mindful to not run out of medications by keeping a close eye on their home supply and knowing when they will need to have their medications refilled. As home health clinicians, it is important to continue to reinforce teaching with families about the medications that their child is taking and what the medications do for the child; this will help ensure adherence to their child's treatment regimen as the family establishes new routines at home (Aradhye et al., 2006).

Two of the most severe complications at any given time after transplant are rejection of the transplanted organ and infection; patients are prescribed medications to minimize the risk of these complications and provide the kidney with the best chance for survival. A combination of several different medications may be prescribed for a child after renal transplant; most of these medications fit into one of the two main types—immunosuppression medications and infection prevention medications. See Table 2 for commonly prescribed medications and their possible side effects.

Immunosuppression Medications

Immunosuppression medications work by suppressing the posttransplant patient's own immune system to keep their body from attacking the newly transplanted kidney. These medications can suppress the immune system in several different ways, including inhibiting the signaling of an immune response, decreasing the production of white blood cells (WBCs) required to effectively fight infection, and weakening the white blood cells that are produced (Aradhye et al., 2006; McPake & Burnapp, 2009). Examples of immunosuppression medications include tacrolimus (Prograf), mycophenolate (CellCept), steroids (prednisone, prednisolone, methylprednisolone), azathioprine (Imuran), or cyclosporine (Gengraf, Neoral, Sandimmune). The medication regimen for each renal transplant patient is different and often changes frequently, and a combination of different immunosuppressive medications may be prescribed; regardless of the medications, however, current trends in pediatrics involve lifetime immunosuppression.

While patients are in the hospital, the blood levels of some of their immunosuppression medications, tacrolimus for example, will be closely monitored to ensure that the dose is within a therapeutic range for the child. Because this dose may need to be adjusted at times, patients will need to have blood levels monitored frequently following transplant (McPake & Burnapp, 2009). If a patient will be having a blood level drawn, it is very important for them to wait until after the blood is drawn to take their medication on the day of the blood draw only.

There are a wide range of potentially unpleasant side effects from immunosuppression medications, including nausea, vomiting, diarrhea, high blood glucose, hair loss or gain, or tremors. Steroids, which are taken to minimize inflammation and the body's immune response, may cause weight gain and appetite changes, acne, mood swings, depression, and may slow the child's physical growth (Aradhye et al., 2006; Candelaria, 2005; McPake & Burnapp, 2009). It is important to monitor the side effects that patients display because it may be possible for their physician to order medications to help prevent the side effects or change the dose of the immunosuppression drug to minimize the side effects. Working with the transplant team to make side effects more manageable increases the likelihood that the child and family will adhere to the medication regimen, thereby improving the chances of a successful transplant (Candelaria, 2005).

Infection Prevention Medications

One of the dangerous side effects from immunosuppression medications is the risk of infection; posttransplant patients are much more vulnerable to infections because of the suppression of their immune system caused by medications taken to protect the donor kidney. To combat this effect, infection prevention medications are prescribed in the immediate posttransplant stages as prophylaxis against a variety of bacterial, viral, and fungal infections for which posttransplant patients are at risk. Patients may not need lifelong infection prevention; these medications may be stopped according to the patient's response to immunosuppression and medication management strategies specific to different doctors.

One of the more common antibacterial medications prescribed is sulfamethoxazole/trimethoprim (Bactrim). There are several different medications that may be prescribed as antivirals, including valganciclovir (Valcyte), acyclovir (Zovirax), or ganciclovir (Cytovene). Nystatin (Mycostatin)

Table 2. Common Medications Following Renal Transplant

	Medications	Action	Common Side Effects
Immunosuppression Medications	Tacrolimus (Prograf)	Inhibits T-cell activation	• GI upset (nausea, vomiting, diarrhea) • Hair loss • High blood glucose • Infection
	Mycophenolate (CellCept)	Inhibits T-cell and B-cell proliferation	• GI upset • Infection • Leukopenia
	Steroids (Prednisone, Prednisolone, Methylprednisolone)	Suppresses migration of WBCs	• Depression • Mood swings • Slowed growth • Changes in appetite • Weight gain • Acne
	Cyclosporines (Gengraf, Neoral, Sandimmune)	Inhibits T-cell signaling and T-cell activation	• GI upset • Headaches • Elevated blood pressure • Hair growth • Hyperkalemia • Infection
	Azathioprine (Imuran)	Inhibits WBC production	• GI upset • Infection
Infection Prevention Medications	Sulfamethoxazole/Trimethoprim (Bactrim, Septra) Valganciclovir (Valcyte), Acyclovir (Zovirax), Ganciclovir (Cytovene)	Antibacterial Antiviral	• Nausea • Vomiting • Diarrhea • Cramping • Headache or fatigue (with some antivirals)
	Nystatin (Mycostatin)	Anti-yeast	
	Fluconazole (Diflucan)	Antifungal	

Sources: Data from Aradhye et al. (2009), Candelaria (2005), McPake and Burnapp (2009).

After a child has been discharged from the hospital, two of the most common and most serious complications continue to be rejection and infection. Transplant patients are at an increased risk for infection because the immunosuppression medications necessary to protect the donor kidney leave their bodies vulnerable to infection.

is commonly used to treat yeast infections and fluconazole (Diflucan) is a commonly used antifungal medication. Cytomegalovirus (CMV) is the most common infection in patients following renal transplant and the most effective treatment for CMV is prophylaxis (Ding, 2010).

The side effects from infection prevention medications can include a range of gastrointestinal (GI) symptoms such as nausea, vomiting, cramping, or diarrhea (Candelaria, 2005). It is reported that some of the antiviral medications can cause headache or fatigue (Aradhye et al., 2006). The dosing schedule for these medications can vary as well, with some prescribed for every other day while others are prescribed for four times daily. With a potentially complicated medication regimen, it is very important for healthcare workers and families to pay very close attention to which medications are due to be administered at a given time. As with immunosuppression medications, families should discuss side effects with their transplant physicians, as there may be alternative medications that can be prescribed that the child tolerates better, or there may be a medication that can be prescribed to help mitigate the side effects.

Possible Complications at Home

After a child has been discharged from the hospital, two of the most common and most serious complications continue to be rejection and infection. Transplant patients are at an increased risk for infection because the immunosuppression medications necessary to protect the donor kidney leave their bodies vulnerable to infection.

Rejection is a normal response by the body to the foreign tissue of the donor kidney, whereby the body's immune system attacks the foreign new kidney (UNC Healthcare Pediatric Health Library, 2009). It is a serious complication requiring immediate intervention. There are several signs that could indicate that a patient is going into rejection, including tenderness over the donated kidney, increase in blood pressure, or a decrease in urine production (Friedman, 2005; UNC Healthcare Pediatric Health Library, 2009). A fever can be an indication of either rejection or infection and would need to be evaluated immediately by the physician. Regardless, infection and rejection are dangerous for patients after transplant and home health clinicians should assess for signs and symptoms of either complication at each visit with the patient and reinforce to the family that, should a patient display any symptoms of either of these complications, the family will need to contact their transplant physician or report to a nearby emergency room. Also, it is important to stress to families that these complications can threaten the viability of the kidney at any point in the process, whether it is immediately after transplant or many years later; if a patient or family notices symptoms of rejection or infection, they will need to seek medical attention very quickly to help prevent the loss of the kidney (Ding, 2010).

Goals

The ultimate goal for a child after a renal transplant is a "normal" life. There are many lifelong implications to transplant, but in general, these patients are able to do most things that other children their age are able to do. Transplanted kidneys have a life expectancy of approximately 10 to 14 years (Henry and Dharnidharka, 2008); by increasing awareness among care providers and monitoring family and patient compliance with the treatment regimen, nurses can help to ensure that the donated organ has the best chance for maximal viability.

The Importance of Nutrition and Diet After Renal Transplant

Children, after renal transplant, should eat a healthy, well-balanced diet. Many transplant teams have dietitians who assist families in meal planning and diet modification for the child. After discharge from the hospital, home health clinicians play a

key role in reinforcing this education with patients and families. As described previously, the medications that patients are prescribed after transplant can lead to many unpleasant side effects. Prednisone, a commonly prescribed steroid, may lead to an increased risk of weight gain; maintaining a well-balanced diet will help minimize this risk (Ross et al., 2004). Further, obesity has been linked with an increased risk of donor organ complications and failure (Hanevold et al., 2005).

Families and patients should be very mindful of food safety because of the risk of infection due to the immunosuppression medications. Ways for families to minimize the risk of infection in their child from food sources include avoiding undercooked food by testing the temperature of meat with a thermometer, washing fresh fruits and vegetables prior to eating, and encouraging frequent handwashing (Al-Uzri et al., 2005).

Activity and Play for Children After Renal Transplant

Children who have undergone a renal transplant are encouraged to participate in many of the same activities as other children their age. In general, sports are okay as long as there is not a significant risk of blunt force trauma to the kidney. Team sports like basketball, volleyball, soccer, and tennis are generally okay for patients to participate in after transplantation, whereas sports like football, rugby, and wrestling should be avoided due to the risk of trauma to the transplanted kidney. If families are unsure if a sport is okay, they should follow-up with their transplant team (Al-Uzri et al., 2005).

Health and Well-Being

Teach parents of children who have undergone renal transplant to notify all of their child's healthcare providers about the renal transplant and the medications that the child is taking. There are many areas of health maintenance that will be impacted by these transplant medications. For example, because of the increased risk of infection from the immunosuppression medications, transplant patients are generally advised against getting certain live-virus immunizations due to the risk of contracting the disease from the vaccine (Luthy et al., 2006). Common childhood live-virus immunizations include smallpox, measles, mumps, rubella, polio, and varicella and should the family travel internationally, they should speak with their transplant physician prior to getting any immunizations required for travel abroad (Al-Uzri et al., 2005). It may be possible for these children to receive live-virus immunizations after their transplant provided that the transplanted organ is stable, but decisions about immunizations should be made in conjunction with the transplant team (Luthy et al., 2006).

Because the patient is immunosuppressed, the physician may ask that they stay out of school for a period of time to minimize exposure to germs at school. Remind patients to wear masks when they will be in crowded public places and to avoid sick and recently sick people as much as possible (Henry & Dharnidharka, 2008).

One often overlooked, potential source of infection for children who have undergone a renal transplant is the child's own mouth. Prior to discharge, the transplant team reviews the importance of oral hygiene and regular dental visits. It is very important that home health clinicians continue to reinforce this teaching and healthy oral hygiene behaviors. Before going to the dentist, for something as routine as a cleaning, it may be necessary for these patients to have an antibiotic to prevent against infection from oral bacteria (Al-Uzri et al., 2005). The family will need to discuss the child's medical history with their dentist, provide a list of the medications the child is taking, and will need to discuss dental work with their transplant physician to determine if antibiotics are needed as prophylaxis prior to dental work.

Adolescents: Transitioning to Self-Management

One of the goals for patients following renal transplant, unique to pediatrics, is the idea that the patient will assume responsibility for maintaining their own care when they are old enough. In the case of an adult renal transplant, the patient typically assumes responsibility from the initial screening process; in pediatrics, depending on the age of the child at transplant, the parents often manage this responsibility initially. The transition of responsibility can be very challenging for patients and families alike, as noncompliance and poor lifestyle choices can increase the risk of kidney failure in the donated organ, and are contributing factors for the reason that this group is at the greatest risk for rejection (Ross et al., 2004).

In a study of 56 patients, Zelikovsky et al. (2008) found that up to 75% of adolescent renal transplant candidates missed at least one dose of one of their

Education remains critical among this population, as they need to know what medications are prescribed, why those medications have been prescribed, and when to take their prescribed medications.

prescribed medications each week. In their study, reasons for missing the doses included forgetting to take the medications, lack of adult supervision when taking medications, lack of understanding about their medication regimen, and complaints that the medications interfere with activity or taste badly. Soliday et al. (2001) found other factors that decrease the likelihood that these patients will adhere to their medication regimen are the unpleasant side effects from medications described previously, including weight gain, acne, and hair loss or gain. Issues with body image and self-esteem are common in teenagers outside of organ transplant and these side effects can exacerbate these issues (Ross et al., 2004).

There are several interventions that can facilitate the transition to self-management for these patients while still ensuring that they adhere to their treatment regimen. Adolescent renal transplant patients, whether they received their transplant as a teenager or at an earlier point in their life and will be assuming responsibility for their care from their parents, benefit from having some level of parental supervision (Zelikovsky et al., 2008). Maintaining involvement with the transplant team is important because there may be changes to the medication regimen in terms of dosage and frequency of dosing that can increase the likelihood that the patient will be able to adhere to their regimen, for example, when parental supervision is available. Some adolescents may not want to talk with their parents, but will open up to a healthcare worker; use this opportunity to assess their understanding of their medications and their understanding of the renal transplant process. Education remains critical among this population, as they need to know what medications are prescribed, why those medications have been prescribed, and when to take their prescribed medications. The adolescent should also be able to recognize the signs of rejection and know when to seek medical help. Patients face many challenges socially, physically, and emotionally during adolescence and it is important for healthcare clinicians to recognize this and work with the patient and their family to help ensure compliance and ease the transition into self-management.

Summary

Renal transplantation in pediatrics can be a stressful event for the child and their families, but by understanding the basic process of kidney transplantation, home healthcare clinicians are better able to understand what families have experienced to get to the point of being discharged with a child with a transplanted kidney. Home health clinicians offer a key link between what is discussed in the hospital with renal transplant patients and families and what actually happens in the home after discharge. Being educated on the plan of care, types of medications, and signs of complications makes home healthcare an excellent resource for these families and increases the likelihood for a successful renal transplant and can improve the quality of life of patients and families after transplant.

Resources for Home Health Clinicians, Patients, and Families

Some transplant centers have support groups that meet at scheduled times for patients who have undergone a kidney transplant, so patients and families should be encouraged to attend. The National Kidney Foundation and American Association of Kidney Patients have resources for patients, families, and healthcare clinicians, as well as a list of local support groups. Also, there are camps and activities for children with chronic medical conditions, such as renal transplant, that children find very rewarding. Specific resources include

- http://www.kidney.org—National Kidney Foundation
- http://www.aakp.org—American Association of Kidney Patients
- http://www.victoryjunction.org—Victory Junction Camp
- Local transplant centers

Case Study

James Smith is a 12-year-old boy who was diagnosed with ESRD secondary to bilateral renal

hypoplasia secondary to prematurity. He has been on dialysis for 3 years, most recently peritoneal dialysis due to hemodialysis catheter infection; preoperatively, his (blood urea nitrogen) BUN was 42 and creatinine was 8.9.

James was transplanted with a cadaveric kidney from a 33-year-old deceased donor and started on immunosuppressive therapy. After being admitted to the pediatric intensive care unit for stabilization after surgery, he was transferred to an acute care floor on postoperative day 3. He was ready for discharge on day 8. On the day of discharge, his BUN was 23 and creatinine was 0.61.

Discharge medications were as follows:

- Mycophenolate 500 mg twice daily
- Nystatin 500,000 units every 6 hours daily
- Prednisolone 30 mg once daily
- Prevacid 30 mg once daily
- Sulfamethoxazole/Trimethoprim (Bactrim) 80 mg once daily on Monday, Wednesday, and Friday
- Tacrolimus 5 mg twice daily
- Valganciclovir 450 mg once daily

Discharge instructions to the patient and his family included the following:

- Twice daily blood pressure monitoring
- Daily weights
- Low salt diet
- Activity as tolerated but no contact sports
- Child should remain out of school until cleared by physician
- Wear a mask when in public places and when around sick or recently sick persons
- Weekly follow-ups with nephrologist until 3 months posttransplant
- Take medications as prescribed
  - Contact Transplant Coordinator or Physician for missed dose instructions

Home health follow-up was ordered for the patient for Monday, Wednesday, and Friday for 1 month after discharge with findings sent to nephrology team. Home health plan of care included the following:

- Laboratory blood draws before morning dose of tacrolimus:
  - CBC
  - Blood chemistries (sodium, potassium, chloride, bicarbonate, bun, creatinine, glucose, calcium, phosphorus, and magnesium)
  - Tacrolimus level
- Blood pressure monitoring
- Weight check
- Observe and assess patient and family adjustment to post-transplant lifestyle
- Teaching and training of patient and family related to the complex medication regimen and compliance with the treatment regimen to promote maximal viability in the donated kidney and maximal quality of life for the patient and family

Due to the complexity of the medication schedule, the home health nurse worked with James's mother to develop a chart for medication administration (Box 1).

James did well at home; his incision healed well and without any signs of infection. A home health nurse drew his blood three times a week. His tacrolimus level was stable in the 8 to 10 range. His blood pressures were 110 to 120 systolic and 50 to 60 diastolic. Over the first 4 weeks after transplant, his weight increased from 30.1 to 32.6 kg. The nurse reinforced with the family the importance of nutrition and the family followed up with the dietitian during weekly follow-up appointments.

At his 4-week postoperative follow-up, his tacrolimus level was 8.6, BUN was 15, and creatinine was 0.49. His nephrologist began to wean the high-dose steroids toward a lower maintenance level and his prednisolone dose was decreased from 30 mg once daily to 22.5 mg once daily. The physician also reduced the frequency of laboratory blood tests to twice weekly because values were stable and there were no signs of symptoms of complication.

After his 6-week follow-up, James was allowed to return to school.

During his 3-month follow-up, James's physician decided to modify his dose of mycophenolate because of leukopenia. Also, his tacrolimus dose was adjusted because the blood levels were elevated at 11. His medication regimen was changed at this time to the following:

- Bactrim 80 mg once daily on Monday, Wednesday, and Friday

Box 1. Chart of Medication Administration

	Sunday, Tuesday, Thursday, Saturday	Monday, Wednesday, Friday
8:00 a.m.	• Nystatin • Tacrolimus	• Nystatin • Tacrolimus
9:00 a.m.	• Mycophenolate • Prednisolone • Prevacid • Valganciclovir	• Bactrim • Mycophenolate • Prednisolone • Prevacid • Valganciclovir
10:00 a.m.		
11:00 a.m.		
12:00 p.m.	• Nystatin	• Nystatin
1:00 p.m.		
2:00 p.m.		
3:00 p.m.		
4:00 p.m.	• Nystatin	• Nystatin
5:00 p.m.		
6:00 p.m.		
7:00 p.m.		
8:00 p.m.	• Mycophenolate • Nystatin • Tacrolimus	• Mycophenolate • Nystatin • Tacrolimus

- Mycophenolate 300 mg twice daily
- Nystatin 500,000 units three times daily
- Prednisolone 6 mg once daily
- Prevacid 30 mg once daily
- Tacrolimus 5 mg once daily in the morning
- Tacrolimus 4 mg once daily at night
- Valganciclovir 450 mg once daily

At 6 months following transplant, Bactrim, valganciclovir, and nystatin were stopped according to the nephrologist's medication protocol and because the patient was infection-free for 6 months following transplant. James's medications at that time were as follows:

- Mycophenolate 400 mg twice daily
- Prednisolone 4.5 mg once daily
- Tacrolimus 5 mg once daily in the morning
- Tacrolimus 4 mg once daily at night

James continues to do well at home. One year after transplant, he remains on a low dose of steroid, prednisolone, and tacrolimus for immunosuppression; mycophenolate was stopped due to leukopenia and he is being monitored on azathioprine, a different immunosuppression medication, at present. ☗

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