

Medications – What to Know BEFORE Transplant

Kidney and/or pancreas transplant patients will need to take some combination of medications for the life of their transplanted organ. The types and amounts of medications may change over time, but all patients will need an ongoing medication regimen. This section will provide an overview of medications and what transplant patients may expect. You will have an individualized medication plan. If you have any questions about your medications, please discuss them with your transplant team.

Anti-Rejection Medications

Anti-rejection medications are a fact of life for patients following a kidney and/or pancreas transplant. Immunosuppressive drugs reduce the strength of the body's immune system, but they do not eliminate the immune system. Immediately following transplant, you will take many medications in high dosages. Different combinations of medications and smaller dosages are used to develop a balance between providing enough immunosuppression to avoid rejection and as little as necessary to minimize side effects. **While you will always be on some immunosuppressive medications**, the dosages may be changed over time.

Side Effects of Anti-Rejection Drugs

The immunosuppressive medications necessary following a transplant have side effects that you may find troublesome. Over time the Transplant Team will work with you to find the right balance of medications and dosages to prevent rejection and minimize side effects. The most common side effects for the major drug types following transplant are shown here.

Side Effects of Anti-Rejection Drugs

Prednisone	Mycophenolate	Tacrolimus	Cyclosporine
Weight Gain	Decreased Blood Counts	Kidney Toxicity	Kidney Toxicity
High Blood Sugar	Diarrhea	Hypertension (High Blood Pressure)	Hypertension (High Blood Pressure)
Hypertension (High Blood Pressure)	Upset Stomach	High Blood Sugar	Increased Cholesterol Levels
Increased Cholesterol Levels		Tremors, Headaches	Tremors, Headaches
Mood Changes		Diarrhea	Excess Gum Growth
Osteoporosis		Hair Loss	Excess Hair Growth
Poor Wound Healing			

Transplant Research – Clinical Trials

When you come to the hospital for your transplant you may be approached by a transplant professional to inform you of Transplant Clinical Trials and to explore your interest in participating in a clinical trial. A clinical trial (also called a research study) is a study that helps test whether a new treatment or medication is safe and effective, or which older treatments produce the best results. In organ transplants, previous clinical trials have been very important in finding the best way to care for your new organ.

Why are Clinical Research Trials Important?

Clinical trials have been found to be the best way to make sure that new standards of medical care are safe and effective. This is especially true for new drugs, devices or procedures. Successful organ transplantation could not be done today without the lessons learned through clinical trials.

Do I Have to Join a Clinical Research Trial?

You are not required to join. You must volunteer in order to be able to take part in a clinical trial. Making the decision to take part in a clinical trial is important. A decision should be made after you have full knowledge of what is involved. Taking part in a clinical trial may or may not improve your health. You may be one of the first to try a promising new drug or you may receive the standard or regular therapy. The decision not to take part in a clinical trial will have no effect on your medical care. In either case you will be cared for by the Transplant Center team of dedicated health professionals who are interested in your health. One of the most important reasons for joining a clinical trial is to help advance what is known about new treatments.

Team: The entire health care team, including the Clinical Research Team, is committed to providing our patients the best possible health care while protecting their rights and interests.

Clinical Trials: The Transplant Center generally has approximately 20 active clinical trials in progress at any point in time. Many transplant recipients are eligible for a clinical trial at some point during the process of being listed for a transplant, undergoing transplant surgery or during the follow-up period after transplantation.

Free Medications: Many clinical trials provide free medications after transplant for the period of time patients are in the clinical trial.

Clinical Trial Safety: The terms “research study” and “clinical trial” are both labels for a scientific process that measures how things work for patients who are receiving medical treatment. All studies are reviewed and approved by a safety and ethics board before any patients are enrolled. Each patient is monitored very closely while participating in a clinical trial.

Medications – What to Know While In the Hospital for Transplant

What do I need to know about my medications?

You will be responsible for taking the medications prescribed for you. It is important for you to be familiar with them. All the things you need to know cannot be covered in this section. That’s why it is important for you to understand what your doctor, physician assistant, nurse practitioner, transplant pharmacist, or nurse teaches you about your medications. This section will give you information about the medications that you may need. You will have space to record questions and instructions for each one. You will also learn about some important terms used when we talk about transplant medications. While you are in the hospital for your transplant, your caregivers will teach you about your medications and how to take them. You will be expected to pass a quiz on the medications before you are allowed to leave the hospital.

How Anti-Rejection Medications are Used

Induction

At the time of transplantation, induction therapy may be used for patients who are at high risk for rejection. These are African Americans, living unrelated, those with a high PRA, and kidney-pancreas transplants. Induction therapy helps the recipient “tolerate” the new organ. Thymoglobulin® is the most commonly used medication for induction therapy, although there are several others, including Simulect®, that your team may select for you.

Medications Used to Prevent Rejection

A combination of the following medications will be used to prevent rejection of the kidney and/or pancreas transplant. You will be on prednisone, an anti-proliferative agent (mycophenolate) and a calcineurin inhibitor (cyclosporine or tacrolimus).

Since the chance of rejection is highest immediately following the transplant surgery, patients receive the most drugs and in higher dosages shortly following surgery. As you move farther from the date of surgery, it is likely you will take fewer drugs and in smaller doses. If you choose to be part of a clinical trial, your medications will depend on your study protocol.

The following section highlights the common side effects of the medicines that we use. Most patients tolerate the medications well but many patients experience some of the side effects. You must remember to keep the transplant team informed of any side effects you may have.

There is an increased risk of infection and cancer in transplant patients. Infections can be bacterial, viral or fungal. They will be treated with the appropriate medications. Cancers that are more frequent include skin cancers, female genital cancers and lymphoma (cancer of the lymph nodes). Female genital cancers are associated with human papilloma virus (HPV). Lymphomas are associated with Epstein-Barr Virus (EBV). If cancers occur, they are treated. Sometimes, the dose of the anti-rejection medicines will be reduced.

There are four groups of anti-rejection medications that are commonly used. Each group works differently in the body to prevent rejection. A combination of the following medications will be used to prevent rejection of the kidney and/or pancreas.

1. Prednisone (Deltasone® and numerous others)

Dose: Right after transplant – Twice each day
After discharge, follow the prednisone taper supplied in clinic and found at the end of the “Resources” section.

Strength: 1 mg 10 mg
 2.5 mg 20 mg
 5 mg 50 mg

To Taper: Instructions for dose tapering are given in clinic and must be followed carefully. Decreasing the dose should only be done under the care of a physician. Do not stop abruptly.

Possible Side Effects:

- Swelling of face, hands or feet
- Increased appetite and weight gain
- Stomach irritation that may cause nausea, ulcers and/or heart-burn
- Acne
- Mood swings (anger, crying, guilt, irritability, short temper, etc.)
- Sodium and water retention
- Muscle weakness, bone loss and bone pain
- Diabetes mellitus (high blood sugar)
- High blood pressure
- High cholesterol
- Visual changes, cataracts
- Poor wound healing
- Insomnia

Notes about Prednisone:

- Always take this medication with food.

2. Tacrolimus or Cyclosporine

Tacrolimus and cyclosporine work the same way. You will take either tacrolimus or cyclosporine, but will never take both at the same time. Each drug is taken twice a day – **12 hours apart.**

It is important to maintain therapeutic blood levels. Blood concentrations are measured at their lowest level, which is referred to as a “trough level.” For example, if tacrolimus is taken at 9 p.m. on Monday night, you will need to go to your lab on Tuesday at 9 a.m. to have your blood drawn **before taking your morning dose** of tacrolimus or cyclosporine. Measuring trough levels reflects whether adequate blood levels are being maintained.

Dosages are changed frequently during the first several months. These adjustments are made taking the following into consideration:

- Actual 12-hour trough level
- Presence of any side effects
- How recently the transplant was done
- Whether the patient is on any other anti-rejection medications, such as prednisone or mycophenolate
- Any previous episodes of rejection
- Presence of active infections

If you miss a dose of tacrolimus or cyclosporine, and it is within four hours of your normally scheduled dose, go ahead and take the dose. If more than four hours has passed since the scheduled dose, call the Transplant Office. **Do NOT double the dose.**

a) Tacrolimus (Prograf®)

Dose: Twice each day, 12 hours apart

Strength: 0.5 mg capsule
1 mg capsule
5 mg capsule

Possible Side Effects:

- Interactions with other medications that can raise or lower tacrolimus levels in the blood
- Kidney toxicity
- High blood pressure
- Neurotoxicity (tremor, headache, tingling, insomnia)
- Diabetes mellitus (high blood sugar)
- Diarrhea and nausea
- Hair loss
- High potassium
- Low magnesium

Notes about Tacrolimus:

- Sometimes used in place of cyclosporine
- Avoid grapefruit, grapefruit juices and pomelo as they increase drug levels. For other fruits, very limited information is available. Some studies suggest that the following fruits may also cause fluctuations in drug levels: papaya, pomegranate and star fruit.
- Do not take any medications, herbal supplements or St. John's Wart without transplant team approval.
- On blood drawing days do not take your tacrolimus until after blood is drawn.

b) Cyclosporine (Neoral[®], Gengraf[®])

Dose: Twice each day, 12 hours apart

Strength: 25 mg capsule
100 mg capsule

Possible Side Effects:

- Interactions with other medications that can raise or lower cyclosporine levels in the blood
- Kidney toxicity
- High blood pressure
- Neurotoxicity (tremor, headache, tingling sensations, bone pain)
- High cholesterol
- Overgrowth of gums in mouth

You Should Know

The purity of generic cyclosporine cannot be guaranteed; therefore we cannot authorize use of the generic versions of cyclosporine. Prescriptions for Neoral and Gengraf will be written as DAW (Dispense as Written).

- Increased hair growth
- High serum uric acid/gout
- High potassium
- Low magnesium

Notes about Cyclosporine:

- Sometimes used in place of tacrolimus
- Avoid grapefruit, grapefruit juices and pomelo as they increase drug levels. For other fruits, very limited information is available. Some studies suggest that the following fruits may also cause fluctuations in drug levels: papaya, pomegranate and star fruit.
- Do not take any medications, herbal supplements or St. John's Wart without transplant team approval.

You Should Know

- On blood drawing days do not take until after your blood is drawn.
- Must take medication within ½ hour of opening and protect from extreme temperature changes.

c) Sirolimus (Rapamune®)

Dose: Once a day

Strength: 1 mg tablet
2 mg tablet

Possible Side Effects:

- High cholesterol and triglyceride levels
- Low white and red blood cell counts, low platelet count
- Delayed wound healing
- Joint pain

Notes about Sirolimus:

- Sirolimus can be given with tacrolimus, cyclosporine or mycophenolate.
- Avoid grapefruit, grapefruit juices and pomelo as they increase drug levels. For other fruits, very limited information is available. Some studies suggest that the following fruits may also cause fluctuations in drug levels: papaya, pomegranate and star fruit.
- Sirolimus levels are to be drawn 24 hours after the previous dose.

3. Mycophenolate (CellCept®, Myfortic®)

Dose: Twice a day, 12 hours apart

Strength: 250 mg capsule and 500 mg tablet for CellCept®
180 mg tablet and 360 mg tablet for Myfortic®

Possible Side Effects:

- Diarrhea, abdominal cramping, loose stools, bloating, gas, nausea, vomiting
- Low white and red blood cell count, low platelet count

Notes about Mycophenolate:

- Used in combination with tacrolimus, cyclosporine or sirolimus.
- **Pregnancy Warning** – Mycophenolate could cause fetal harm. Women of child bearing age should take a pregnancy test within one week of taking this medication to confirm they are not pregnant. Unless abstinence is the chosen method, two forms of contraception is recommended for the period of four weeks before you begin taking this medication, throughout the time you take the medication, and for up to six to twelve weeks after stopping the medication. If you have any questions, please talk to your transplant team.

Medications Used to Prevent Rejection

When the body notices the transplanted kidney as “foreign,” it may begin the process of rejection. In acute cellular rejection, white blood cells attack the transplanted kidney. Rejection must be treated or the organ will be destroyed. Rejection is diagnosed by performing a kidney biopsy. If rejection is present, it may be treated with high dose corticosteroids, or other anti-rejection medications. These include Thymoglobulin® and ATGAM®. These medications are antibodies that are made in animals. The antibodies react against human white blood cells to neutralize them. This stops the rejection process. The transplanted organ is then able to recover and continue to function. Sometimes, these medicines are not able to stop the rejection and then the organ may be permanently damaged or lost. You will need to be admitted to the hospital to receive the first few doses.

Polyclonal Anti-T Cell Antibodies (Thymoglobulin® or ATGAM®)

Dose: Once daily for five to 14 days by IV
It must be administered under close medical supervision

Possible Side Effects

- Chills, fever, joint or muscle pain
- Serum sickness
- Low white blood cell or platelet counts
- Increased risk of cancer of the lymph nodes (lymphoma)
- Increased incidence of cytomegalovirus (CMV)

Notes about Thymoglobulin® and ATGAM®:

- In some cases it is used for the treatment of rejection or for induction therapy.

Medications Used to Prevent Infection

After transplant, patients are at higher risk for infection. These infections can come from bacteria, fungus, or viruses that are normally found in the environment or the body. Since transplant patients take anti-rejection medications that lower the resistance to infection, they also are given several medications to help prevent infections.

Sulfamethoxazole/Trimethoprim (Bactrim, Septra, Cotrimoxazole)

Purpose: Prevents Pneumocystis infection (a type of pneumonia)
Prevents urinary tract infection

Dose: Single strength (80 mg trimethoprim)
1 tablet daily for one month, taken with food

Possible Side Effects:

- Do not take if you are allergic to sulfa. Instead you will be given pentamidine inhalation.
- Increased sensitivity to sun. Avoid sun exposure.
- May cause rash.

Nystatin (Mycostatin®)

Purpose: Prevents fungal infection in mouth

Dose: Swish and swallow (400,000 units/4 ml) 4 times daily for one month
Do not eat, drink, or brush teeth for 15 minutes after taking

Valganciclovir (Valcyte) - OR – Acyclovir (Zovirax®)

Purpose: Prevents viral infection caused by cytomegalovirus and/or herpes virus. Cytomegalovirus (CMV) is a common herpes virus most people have had as a child. Patients have often been exposed to CMV and have developed antibodies to it. Prior to transplant, patients have a blood test to identify the presence of this antibody. The result of this test and a similar test given to the organ donor determine which anti-viral medications are used.

Dose: Valganciclovir 450 mg once a day for three or six months (depending on the CMV status of the donor and the recipient) OR – Acyclovir 400 mg twice a day for one month (for new transplant patients of CMV negative donor/negative recipient, not getting Thymoglobulin® induction). Doses may be reduced depending on your kidney function.

Possible Side Effects:

- Nausea or vomiting
- Diarrhea
- Decrease in white blood cell counts

What You Need to Know About Your Medications Before Discharge

The success of the transplanted organ is dependent on the proper use of anti-rejection medications. For this reason you cannot be discharged from the hospital until you and your caregiver can demonstrate a basic understanding about medications. Below are some of the things you will need to know about your medications. You will be given a quiz about your medications prior to discharge to ensure you have accurate knowledge about your medications.

- Name of each medication
- When to take each medication
- How to take each medication
- How long to take each medication
- Why each medication is needed
- What are the major side effects of each medication
- What to avoid when taking each medication
- What actions to take if a dose is missed
- How and when to refill medications

You will not be discharged from the hospital until you can show that you know these things about your medications.

The Medications – What to Know After Transplant

When You Get Home

When you get home, you will continue to take most of the medications you took in the hospital. Your immune system sees your kidney as foreign and will try to reject it. Your medications will suppress your immune system. You will always have a risk of rejection and loss of your kidney. Your medications help you avoid rejection. **Never stop taking any medications, change the way you take them, or change the dosage without the approval or direction of the transplant team. Always call the transplant team to get approval to take a medication given to you by another doctor.**

How should I store my medications?

- Store them in the original container.
- Keep them tightly capped. If you use a special container to store them, keep it tightly closed.
- Store them in a cool, dry place away from direct sunlight.
- Keep them away from children.
- Do not store them in the bathroom. The bathroom is too damp for your medications. Moisture can make them lose strength.
- Don't let liquid medications freeze.
- Do not store them in the refrigerator, unless you are told by the doctor or pharmacist to do so.
- Do not open the foil cyclosporine packets before you are ready to use them.

When should I call the team about my medications?

- If you cannot take your medicines by mouth because you are sick.
- If you have an illness, especially if you have a fever, vomiting, nausea or diarrhea.
- When you think the directions on the label are different from what you were taught.
- If you have trouble removing childproof caps.
- When you think you need to take pain relievers, cold medicines or over-the-counter medications call to get approval for any new medication you are thinking of taking – whether prescription or over the counter. Do not take aspirin or non-steroidal anti-inflammatory drugs (Advil®, Motrin®, Aleve, etc.) unless directed to do so by a transplant team member.

- If you think you are having a reaction to your medication.
- If your health or eating habits change.
- If a doctor (other than your transplant kidney doctor) prescribes or changes any medications.
- If you have any unusual symptoms, since they might be a side effect.
- If the medication that you get from the pharmacy looks different than the medication that you had before.
- If at any time you cannot afford your medications, please call the Transplant Center and a social worker will contact you.
- If you have any doubts, questions or concerns.

What other things do I need to know about medications?

- Your nurse, doctor, physician assistant, nurse practitioner or pharmacist will help you decide the best times to take your medications.
- Take your medications at the same time every day.
- Use a written schedule. This will make it easier for you to remember when to take your medications.
- **Do NOT crush or cut tablets, capsules or caplets** unless the pharmacist or a health care provider tells you to do so.

Other Medications

Most pre-existing medical conditions will continue after transplantation. Medications for pre-existing conditions, such as diabetes and high blood pressure, will be prescribed at the time of discharge. The medications prescribed may be different than those taken previously by the patient. Patients are instructed to return to their local physician who will evaluate the patient's response to the new medications and to have them continued or changed. Patients are asked to return to their local primary care physicians as soon as possible following discharge for medical care for all conditions other than transplant related issues.

Frequently patients find they are taking medications that are new to them. Anti-rejection medications and the surgery itself can cause a patient to have high blood pressure, high blood sugars and stomach problems. These conditions can be temporary or permanent. The following are examples of medications that may become necessary.

Gastric acid reducing medications protect the digestive system and they will be prescribed as long as the patient needs them. Examples of these medications include Zantac®, Protonix®, Prevacid® and Nexium®.

Anti-hypertensive medications manage blood pressure. High blood pressure may be a result of the surgery and the anti-rejection medications. This may be a short-term or a long-term medical concern. Long-term hypertension will be managed by your local physician and/or your nephrologist.

Diuretics (known as water pills), such as Lasix®, may be prescribed to resolve swelling following surgery. This medication may be decreased as swelling decreases over weeks or months.

Insulin may be prescribed to control blood sugars. Tacrolimus and prednisone can cause blood sugars to increase. Elevated blood sugars can sometimes be managed using oral medication. If oral medications do not manage the elevated blood sugars, insulin may be necessary. Elevated blood sugars may be a short-term or a long-term medical concern. Long-term management of diabetes is handled through your local physician or an endocrinologist.

As prednisone and tacrolimus are decreased, your blood sugars should come down. Therefore it is important for you to closely monitor your blood glucose levels. Monitoring your blood sugar levels at home requires a machine called a glucometer. You will be instructed on the proper use of the glucometer and how to record your glucose levels and vital signs, such as temperature, weight and blood pressure.

Prescription Refills

The long-term success of your transplant requires you to maintain appropriate and constant levels of your medications in your system. For this reason, it is crucial you plan ahead and do not run out of your medications. The following guidelines will help you be prepared and stay healthy.

- Call your pharmacy to request refills when you still have at least a one week supply on hand.
- Allow more time if you use a mail order pharmacy.
- Allow more time when reordering medications near a holiday.
- Call **(800) 333-9013**, option 2 to request our office process a refill. These recorded requests are recovered daily. Be sure to advise us if you are out of a medication so we can prioritize your request.
- Allow five business days when contacting our office for a refill. Mail order prescription refills can take longer, especially around holidays.
- If you are using UMHS outpatient pharmacy, call **(734) 936-8260** and follow the prompts the day before your planned pick up day.

You Should Know

UMHS Transplant Specialty Pharmacy provides comprehensive services to ensure our patients have ongoing and timely access to medications. Call (866) 946-7695 for information.

- Several mail order pharmacies are willing to bill Medicare and offer a three month supply in one order. Many local pharmacies do not bill Medicare. Medicare will likely be your primary insurance provider for medications the first three years after transplant. If you are interested, please ask us for telephone numbers.

Cost of Medications

For information about the financial and insurance aspects of medications, please refer to the Finance and Insurance section of this manual.

If you have trouble affording the cost of medications or lose your prescription coverage contact the Transplant Center and speak with the financial coordinator or the social worker for assistance.

Medications are a Lifetime Commitment

Medications to suppress the immune system will be required for the life of the transplant. The types of medication and the dosages may change over time, but some level of medication will always be needed. Generally, the number of medications and the dosages are highest immediately following the transplant.

Over-the-Counter (OTC) Medications

There are many medications that do not require a prescription and can be purchased over the counter. These drugs are used to treat minor ailments and are generally safe to use. However, there are some OTC medications that may cause problems in a post-transplant patient, such as:

- Non-steroidal anti-inflammatory drugs (NSAIDs). It is important to avoid any medication that contains ibuprofen or naproxen because they can interact with anti-rejection medications and cause kidney failure. Examples that contain ibuprofen or naproxen and should be avoided include Advil®, Motrin®, Naprosyn® or Aleve.
- Aspirin-based drugs which contain salicylic acid, should also be avoided unless prescribed by a physician. Many times baby aspirin is prescribed to prevent heart attacks and is usually safe.
- Acetaminophen (Tylenol®) can be taken safely if the daily dose does not exceed four grams (4,000 mg) in a 24 hour period. It is important to read the labels on medications to know the content and dosage prior to taking the medication.

Generic Medications

Several anti-rejection medications are available in generic products. A generic medication is identical to a brand name medication in dosage form, strength, route of administration, intended use and blood levels in healthy individuals. They may look different in color, size, and shape, so you need to check your medication bottle to assure correct name and strength of the medication. Generic medications are approved by the U.S. Food and Drug Administration and considered to have similar performance characteristics to that of brand name medications; however, their effectiveness and safety have not been studied extensively in transplant patients. Generic medications are often available at a much lower cost than brand name medications.

The decision to change from a brand name medication to a generic medication should always be made by the transplant physician on a patient by patient basis. In order to continue to provide consistent and safe blood levels, it will be necessary that you stay on one type of the medication brand and not switch between the brands, especially if you are combining two different strengths. If your pharmacy fills your prescription with a generic medication, please call your transplant team right away so that we can closely monitor your blood levels as a safety measure.

Herbal Supplements

We recommend that you **do not use herbal supplements**. There are many herbal supplements available to the public – often promoted as cures for many illnesses. Herbal supplements are not regulated by the Federal Drug Administration (FDA) which means there are no standards for the ingredients used in each bottle. There can be a wide variation in the contents from one bottle to another – even with the same brand. Some supplements are harmless, but other can be a serious health risk. This is especially true of St. John's Wort. **ALL TRANSPLANT PATIENTS SHOULD AVOID ST. JOHN'S WORT.**