



UNIVERSITY OF  
PENNSYLVANIA  
HEALTH SYSTEM

Penn Transplant Institute

ABOUT YOUR

# Lung Transplant



UNIVERSITY OF  
PENNSYLVANIA  
HEALTH SYSTEM

Hospital of the University of Pennsylvania  
Penn Presbyterian Medical Center  
Pennsylvania Hospital

WE ARE MEDICINE.

800.789.PENN pennhealth.com

## C O N T E N T S

Introduction .....	1
About Lung Transplantation .....	2
About Your Evaluation .....	4
The Evaluation Process .....	4
Standard Evaluation Testing .....	8
FAQ.....	12

### Introduction

*As you prepare for your lung transplant evaluation, this booklet will provide you and the people who care about you with the information necessary to understand the evaluation process and the role lung transplant may play in the treatment of your lung disease.*

*During your evaluation, you will meet the members of the transplant team who will get to know you and explain the impact your lung disease has on the rest of your health and lifestyle. After the completion of your evaluation, the entire team will meet and each member will make recommendations to best manage your health — which may or may not include transplantation.*

*It is important for you to know as much as possible about this process so that you can help make the best decision about your health care. Please take time to read through this information and consider any specific*

*questions that you may want to ask during your evaluation.*

## About Lung Transplantation

Lung transplantation is a surgical option for select patients with advanced lung disease. It is considered for patients whose lung disease has advanced to the point that medical treatment alone is no longer successful.

Based on your evaluation results, our lung transplant team decides whether or not a lung transplant is the best option for you. Only you can ultimately make the decision about whether or not a lung transplant may improve the quality of your life.

Lung transplants have the potential to treat many types of lung diseases including, but not limited to:

- Chronic Obstructive Pulmonary Disease (COPD)
- Emphysema
- Alpha - 1 - Antitrypsin Deficiency
- Chronic Bronchitis
- Bronchiectasis
- Pulmonary Fibrosis
- Pulmonary Hypertension
- Cystic Fibrosis
- Sarcoidosis
- Lymphangioleiomyomatosis (LAM)

## Normal Lung Functions

When you breathe in, oxygen travels down your trachea or windpipe. From there, it goes through the many branches of the respiratory tree: the bronchi, and the bronchioles. The oxygen reaches the alveoli, or air sacs, where it is taken up by the bloodstream in exchange for carbon dioxide (CO<sub>2</sub>). From there the oxygen-rich blood is sent through the body where it is used by the heart, brain, kidneys, muscles, and other important organs and tissues. The blood carries CO<sub>2</sub>, the waste product, back to the lungs to be exhaled, and the process starts all over again.

You can see how lung disease may affect your entire body and why it is so important to evaluate your entire health when considering lung transplantation. Replacing a diseased lung with a healthy donor lung can greatly improve your respiratory function, may improve your ability to exercise and work, and should allow you to return to a normal lifestyle and an improved quality of life.

## A Brief History of Lung Transplant

The first successful single lung transplant was performed 1983. That transplant was followed three years later by the first successful double lung transplant.

The Penn Lung Transplant Program was founded in 1991. Since then, Penn Surgeons have performed nearly 600 transplants. We care for patients from all over the country with a variety of advanced lung diseases and congenital abnormalities. Because our survival rates consistently exceed the national averages, we are recognized as a preferred provider by many insurance companies.

## About Your Evaluation

Before you become a lung transplant candidate, your condition and prospect for improvement with a transplant are thoroughly evaluated. At Penn, evaluation for a lung transplant occurs on an outpatient basis and typically takes place over three days.

During your evaluation, you meet the various members of the transplant team. While examining you, we help you become more knowledgeable about the impact a lung transplant has on you and your family.

Transplantation is not always the best option for the treatment of advanced lung disease. During your transplant evaluation, we are trying to accomplish four things:

- 1) To be sure that you have a disease that is treatable with a transplant.
- 2) To better understand the current status of your disease to make sure it is the right time to consider transplantation.
- 3) To confirm that you have no other medical problems that would decrease your chances of doing well with a transplant.
- 4) To provide you with all the information you need to make an informed decision about lung transplantation. Having a transplant is a major undertaking, not only for the patient, but also for family members and significant others who help care for you following the transplant. It is very important for you and your support person(s) to fully understand the dramatic lifestyle changes before making the commitment to have a lung transplant.

## The Evaluation Process

### Scheduling the Evaluation

Once you have seen a transplant pulmonologist and it is determined you are a candidate for evaluation, a lung transplant scheduler helps book your evaluation. You are given a written copy of the schedule of tests and consultations to be performed.

As mentioned, the typical evaluation consists of three days of outpatient testing and consultation by the transplant team members. If you have had recent exams at another facility, please bring that information to your pulmonologist or nurse practitioner so they can determine if you need to repeat any exam.

It is also important to continue routine health screening tests including, but not limited to: dental exams, PSA and prostate exams for men, Pap smears and mammograms for women and colonoscopy for patients over age 50. We ask that you provide copies of these reports when you arrive for your evaluation.

We make every effort to ensure that your experience is as pleasant and informative as possible, allowing time for your questions to be answered.

### What to Bring to Your Evaluation

- A list of all current medications, including dosages and frequency.
- Any medications you need to take while you are here for evaluation including oxygen and nebulizer equipment, if necessary. If you are spending the night locally, call your oxygen supply company at least one week prior to your stay so it can deliver the equipment to your hotel. If you have a liquid oxygen tank, we are able to refill this for you while you are in the hospital.
- Any questions you have.
- Insurance cards.
- Referral form, if required. This form can be obtained from your primary care physician. Primary care providers require several days notice to prepare a referral form. You may need more than one referral for your evaluation. It may help your primary doctor's office if you share a copy of the written evaluation schedule that you receive when you book your testing dates. If you have questions about your insurance coverage, please call our financial coordinator at (215) 349-8237.
- Comfortable clothes and shoes.
- A friend or family member to assist you in getting to each testing area throughout the hospital
- There is a cafeteria in the hospital, but you may also want to bring snacks or a bagged lunch.

## Meeting the Evaluation Team

Throughout your evaluation process, both you and your support person(s) may have questions about your tests and what to expect after your evaluation is complete. The members of the transplant team are prepared to discuss these concerns with you. These members include:

- **Transplant pulmonologist:** A medical doctor who specializes in diseases of the lungs and has specific training to manage the complex medical issues that may arise following transplantation. If you are listed for transplant, this physician provides your care before, during and after the surgery.
- **Nurse practitioner:** An experienced, specialized nurse who works closely with your transplant pulmonologist to develop your medical plan of care. Because each patient is unique, the nurse practitioner adjusts the program to meet your needs. In order to do this, he/she needs to know how lung disease has affected your lifestyle and what medical plans can be instituted to accommodate your unique situation.
- **Cardiothoracic surgeon:** This physician has trained for several years to perform surgeries of the chest, including both heart and lung. The surgeon performs the lung transplant operation and helps care for you immediately following your surgery.
- **Dietitian:** The lung transplant team dietitian meets with you to discuss your eating habits and nutritional needs. If needed, the dietitian helps create a nutritional plan for you.
- **Pulmonary rehabilitation team:** This team includes respiratory and physical therapists who work together to look at and to improve your exercise tolerance. During your evaluation, they make recommendations for a pulmonary rehabilitation regimen. This is important to assuring you the best quality of life before and after transplant. Achieving your best possible fitness is important to reduce the risk of complications following transplant surgery. After transplantation, all patients must participate in a pulmonary conditioning program at Penn three days a week for 12 weeks. We provide close monitoring at our center in case complications arise immediately following transplant. We have the professional resources and equipment to handle situations immediately. After this period, follow-up exercise programs may be done locally.

- **Social Worker:** Transplantation can be stressful for you and your family. Your social worker provides counseling for emotional support and problem-solving techniques, as well as relaxation therapy for anxiety. He/she addresses any financial or insurance concerns you may have and can assist with other practical problems such as relocation or transportation problems.

## Special Consultations

Special consultations are performed as needed and include, but are not limited to, the following:

- **Infectious Disease Specialist:** This physician has extensive training in diagnosing and treating infections and is often asked to evaluate patients with any possible infection that may be identified during transplant evaluation. In the case of a patient with cystic fibrosis or infectious lung disease, the infectious disease physician may recommend an appropriate antibiotic regimen.
- **Cardiologist:** A cardiologist is consulted when there are concerns identified on the heart studies. Heart disease that may be treatable prior to lung transplantation is often identified during the evaluation.
- **Psychiatrist:** Many patients with advanced lung disease experience some component of anxiety and/or depression. We provide support services for you and your loved ones to help you discuss and manage how you feel. A psychiatrist can help with your concerns about transplantation and the implications of having a chronic illness.

## Standard Evaluation Testing

### Lab work

Blood tests are an important part of your evaluation and can help determine how your kidneys, liver, pancreas and other parts of your body are working. We can also identify your exposure to infections.

Matching compatible blood types of organ donors to recipients is so important that we check your blood type twice before you are listed for a lung transplant.

You also need to give your consent for another important laboratory test included in every evaluation: an HIV test.

The analysis of your blood and tissue typing is a crucial part of the evaluation. Usually, about 18 vials of blood (drawn by one needle) are needed for all of the required testing. Drawing all of this blood at one time is a safe process.

All of your lab work results are kept confidential and you may have a copy of any results for your own records.

### Ventilation/Perfusion Scan

This test, also known as the “V/Q Scan,” looks at the blood supply to your lungs (perfusion) and the movement of air both in and out of the lungs (ventilation). The results of this test provide important information on the function of each lung and help the surgeons decide which lung to transplant, or in the case of both lungs being transplanted, which lung should be transplanted first.

The ventilation portion of the test is done first and requires you to wear a tight-fitting mask through which you breathe a tasteless, odorless gas. This allows us to monitor the movement of air into your lungs.

The second portion of the test, the perfusion scan, looks at the blood flow to your lungs. A small amount of radioactive protein is given to you through an intravenous line (IV). You are positioned near a camera that is much like an X-ray machine that detects how the blood is brought to your lungs. The pictures need to be taken in several positions, so you are asked to move side-to-side and to lie flat.

## Pulmonary Function Tests

A series of breathing tests, also known as PFTs, show us your ability to move air into and out of your lungs. We ask you to try not to use your inhalers for about six hours prior to the test. This allows us to see how your breathing is affected by the use of inhalers targeted at opening your airways. During the procedure, you breathe through a mouthpiece that is attached to a computer. Remember, it is important to do your best with each breath. This is just one of the many tiring tests you must undergo.

### Six-Minute Walk Test

Used to determine your exercise tolerance, a physical therapist and respiratory therapist walk alongside you and evaluate your muscle strength and endurance throughout this procedure. Since it is important for lung transplant patients to remain in the best health, we often repeat this test to monitor your physical status while you are on the waiting list. Typically the walk and pulmonary rehabilitation team consultation are done at the same time.

### Arterial Blood Gas

Better known as “an ABG,” this test involves taking a sample of blood from an artery in order to determine the amounts of oxygen and carbon dioxide present in the blood being delivered to your body. The sample is typically drawn during the pulmonary function test (PFTs). Because the blood must be from an artery (rather than a vein where most blood tests are drawn) it may be uncomfortable. The area from where the sample is taken will be numbed before the test.

### Echocardiogram

Commonly referred to as “an echo,” this test looks at the function of the heart muscle and the heart valves. Gel is applied to the skin on your chest and an instrument that transmits high-frequency sound waves is placed on your ribs near the breast bone and directed toward the heart. The transducer picks up the echoes of the sound waves and transmits them as electrical impulses that are converted to moving pictures of the heart. A cardiologist interprets these pictures to determine how your heart is working.

## Electrocardiogram

An ECG/EKG shows the electrical activity in your heart. Stickers covered with gel are placed on your chest, arms and legs and then attached to electrical sensors. The test only takes a few minutes and is usually done at the same time as the echocardiogram.

## Cardiac Catheterization

Cardiac catheterization is typically done on the last day of testing. The catheterization shows any narrowed or clogged arteries around the heart (coronary arteries). You are not allowed to eat or drink after midnight the night before the test. Please make sure the nurse practitioner or pulmonologist is aware of any allergies that you may have to shellfish or iodine before the test begins. You may need to have a special preparation of steroids started a few days before the test or have another test scheduled if you have these allergies. It is important to tell your pulmonologist or nurse practitioner if you are taking a blood thinner such as Coumadin®, Lovenox® or aspirin. They can determine when you should stop taking these medications prior to the procedure.

During the test, a cardiologist inserts a small catheter into blood vessels in your groin. The area is numbed before the procedure begins. The catheter passes through your blood vessels up to your heart, and once it is in the proper place, a dye is injected. As the dye is injected you may experience a warm sensation. The dye helps create a picture of the vessels surrounding the heart and provides a map of the arteries. You remain awake during the test, but may be given medication to help you to relax.

After the procedure, you are required to remain in bed from four to six hours to prevent any bleeding. The staff makes every attempt to make you as comfortable as possible during this time. You need to drink plenty of fluid in order to flush the dye through your kidneys. The staff can assist you in using a bedpan, if necessary. You are discharged after the procedure, but should not drive until the following day.

## Chest X-Ray

A chest X-ray provides the transplant team a picture of your lungs and heart. You will be asked to stand upright in front of the x-ray machine and hold a deep breath for a couple of seconds while the picture is being taken.

## CT Scan

A computed tomography or CT scan is required for all patients with significant smoking history and for those with certain types of lung disease. During the procedure, you lie flat on a table that moves in and out of a round machine, the scanner, that takes cross-sectional pictures of your body.

## DEXA Scan

Another radiology study, called a DEXA Scan, is important in determining the health of your bones. The majority of advanced lung disease patients have been on steroids at some point, and which can cause your bones to weaken, leading to osteoporosis. Following transplantation, large doses of steroids are needed to prevent rejection. It is important to identify the degree of osteoporosis you may have so that treatment can begin before transplantation.

## PPD and Anergy Panel

Through a series of skin pricks placed on your forearm, we test your prior exposure to tuberculosis and how well your immune system is working. Since most patients being evaluated have been on steroids, your immune system may be weaker than normal.

## FAQs

### How will I know if I am listed for lung transplantation?

The results of your evaluation are presented at a team conference within two weeks following your evaluation. The team members who evaluated you as well as the surgeons and medical consultants are present at the conference. It is determined whether or not transplantation is a safe and possible option for you during the meeting and a plan of care is designed for you.

When your evaluation testing is arranged, you are also scheduled for a follow-up appointment to meet with the transplant pulmonologist and nurse practitioner. At the follow-up they discuss the results of your evaluation and if you are listed for transplant. Additionally, the team may make recommendations to help you better manage your health while you prepare for transplant.

### What if I am not a candidate for lung transplant?

Lung transplantation is not an option for everyone. Sometimes the risk associated with transplant outweighs the benefit. At the Penn Lung Transplant Program, we are experienced in caring for a range of patients with end-stage lung disease, and we may be able to offer you other treatment options to help improve your quality of life. If transplantation is not the best option for you, you have the option of continuing your relationship with the advanced lung disease program at Penn, where other treatments may be appropriate for you. These treatments may include:

- New medical therapies
- Improved methods of delivering oxygen
- Vasodilator therapy for pulmonary hypertension
- Lung volume reduction surgery
- Pulmonary rehabilitation
- Noninvasive mechanical ventilation (Bi-Pap, CPAP)

### Can I be listed for lung transplant at more than one center?

Yes. You have the right to be listed for transplant at different centers provided that the centers are in different regions. If you are interested in pursuing this option, please tell your lung transplant coordinator. Our office can facilitate your referral by sending pertinent records from your evaluation to the center of your choice.

### What do I do if I have concerns about the lung allocation process or about the Lung Transplant Program at Penn?

To express concerns about the lung allocation system, ask questions about national transplant-related data, or if you feel the need to file a grievance, you may contact the UNOS/Organ Transplant Procurement Network (OPTN) patient hotline at 888-TX-INFO-1. If you have a concern related to the care you have received from our program, we hope you will feel comfortable discussing it with your doctor or nurse practitioner. If not, we invite your call to the Administrator of the Penn Transplant Institute at (215) 662-6798.

**For more information, please call the Lung Transplant Program at the University of Pennsylvania Health System at 800-789-PENN (7366) or visit [pennhealth.com](http://pennhealth.com).**

*This booklet was supported by a generous grant from the Board of Women Visitors of the Hospital of the University of Pennsylvania.*



