

Pulmonary Exercise Training before and after Lung Transplantation

Lung Transplantation Mini-Series #6

Your body relies on your lungs to bring oxygen into your body and to remove carbon dioxide. The different tissues in your body, such as your brain, heart and your muscles take up this oxygen from your blood in order to stay healthy. Your lungs also normally have a reserve that can be relied upon to provide more oxygen when you exert yourself. However, when your lungs are failing from lung disease, you may not be able to use all this reserve. This can limit your ability to exercise.



Pulmonary exercise training or pulmonary rehabilitation (PR) is a method by which you can exercise despite the limited reserve of your lungs. Exercising despite this limitation ensures your body stays fit and can make the most out of your existing lung function. Exercise is also necessary to ensure you are strong enough to recover from surgery and to make the most out of your new lungs when you have a lung transplant.

What is your body's normal response to exercise?

At the start of exercise, your rate and depth of breathing gradually increases to bring more air into your body. This extra air (because of the extra oxygen in it) helps your muscles and your heart because they are working much harder. Your lung function controls how much air you can take in with each breath. If your lung function is normal, the balance between supply and demand of oxygen is maintained and exercise can continue.

In addition to getting more oxygen into your lungs, breathing more frequently and deeply helps remove carbon dioxide. Getting rid of carbon dioxide is important because that is the main way that the body gets rid of lactic acid produced during exercise.

Why do people with lung disease have trouble with exercise?

People with lung disease can have different reasons for being limited in exercise.

1. Your disease may affect the structure and function of your lungs leading to shortness of breath with exercise.
2. You may become uncomfortable and anxious when you feel short of breath, and you worry that it will happen with any exertion. This fear and worry can lead to inactivity.
3. The muscles in your arms and legs, as well as those that affect your breathing can become "deconditioned". This happens because when one does not use these muscles regularly, they do not work as well and get stiff and weak.

These three reasons can create a vicious cycle of inactivity. You then limit your activity even more making it even harder to exercise as your fitness reduces. Simple, everyday tasks such as climbing steps, cleaning the house, lifting objects and even showering become scary and avoided. Being limited in activity can reduce your quality of life and may lead to feelings of hopelessness and depression.

How can I improve my exercise capacity if I have lung disease?

You can improve your exercise capacity by exercising on your own or as a part of a rehabilitation program. How much you improve will depend in part on your lungs, your motivation and other health problems. Your healthcare provider can advise on the best starting point for you. If you already have other medical problems including lung or heart disease, speak with your healthcare provider before exercising. A referral from your healthcare provider will also be necessary for you to be enrolled in a formal rehabilitation program.

What are pulmonary rehabilitation programs?

Over the past three decades, research has shown that rehabilitation programs for people with lung disease can greatly improve exercise capacity and quality of life. Pulmonary rehabilitation (PR) programs are formal exercise plans that you can do in a facility, either as an inpatient or an outpatient (See ATS Patient Information Series on "Pulmonary Rehabilitation"). These programs provide education and exercise that help you manage your breathing problems. They also increase your ability to exercise and can help reduce your shortness of breath.

PR consists of a program that is personalized for you that includes multiple sessions supervised by trained staff. The exercises start at a level that you can handle and help you to increase the amount of time you can exercise. They also help

you improve your strength. Rehabilitation has many benefits for people both before and after lung transplant surgery. Many transplant programs require that a person undergo PR before and after their lung transplant. This is because most people who participate in PR will usually have more muscle strength, endurance and a better quality of life after transplantation.

Why do I need to do pulmonary rehabilitation prior to lung transplant surgery?

Many people are weak and deconditioned when they are evaluated for transplant surgery. Improving your ability to exercise through PR trains your muscles, can greatly improve your breathing, and your ability to tolerate the surgery. In some cases, the movement of your rib cage and the rhythm and pacing of your breathing can be improved. With training, your arm and leg muscles can adapt. You can learn how to move in ways that are more coordinated and efficient, helping you conserve your energy. Thus, PR can help your body “tune up” to be as reliable and faithful a machine as it can be. All this can also help you feel better.

Are there any goals I need to achieve during pulmonary rehabilitation to be eligible for transplant surgery?

It is in your best interest to be as fit as you can be both before and after the transplant surgery. You should build yourself up to walk a total of 20 to 30 minutes on most days of the week. You may take short breaks during your walking if needed. As your body develops more stamina, you may not need to stop at all. Strengthening your arm and leg muscles during PR also helps to reduce fatigue and soreness with activity.

What kind of exercises do people do in pulmonary rehabilitation?

Pulmonary rehabilitation exercises include different types of training such as “endurance training” and “interval training”. Either walking and/or biking on a stationary bicycle is suggested. “Endurance training” involves continuous, high-intensity exercise under supervision. Usually it lasts from 20 to 60 minutes and is recommended three to five times a week. You will likely be uncomfortable at the end of each session, but you will always be supervised. If you are unable to tolerate endurance training or cannot reach the target work rate, your therapist may recommend “interval training”. In interval training, high-intensity exercise is mixed with periods of rest or lower intensity exercises.

“Resistance training” exercises include training specific muscle groups by lifting relatively heavy loads. It is usually done along with endurance or interval training. In addition to this, training your arms is also an important part of PR. During all these exercises, your healthcare team ensures you are safe and supervises how your body handles exercise. They will also advise you how you can continue to exercise at home and keep up your improved muscle strength. For additional information, please see the ATS Patient Information Series on “Pulmonary Rehabilitation”.

Why do I need to do pulmonary rehabilitation after lung transplant surgery?

Lung transplantation is a major surgery. You are in bed for at least a few days after your surgery, and your body tends to become weak. Having new lungs gives you a new reserve that should allow you to do more and be more active. Post-operative rehabilitation offers very similar plans to those that were done before surgery. Developing your endurance during exercise is stressed upon, so your body can make the most out of your new lungs.

If your transplant team believes you are ready, they will recommend that you start doing PR prior to you leaving the hospital after your surgery. You will likely be asked to come to a facility to do PR for weeks to months after your surgery, until your team thinks you are ready to do this on your own. Taking part in a formal PR program also ensures that there are other healthcare providers who check in with you in between your visits with your transplant providers.

It is important that your rehabilitation therapists and transplant team work together with you to accomplish the goals necessary for a successful lung transplant. Rehabilitation is hard work, but the rewards are significant when you are able to return to many of the activities that you may have thought were only dreams of the past.

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Rx Action Steps

- ✓ Ask your health care provider if a pulmonary rehabilitation exercise program is right for you.
- ✓ Exercise regularly with guidance from your health care provider and physical therapist.
- ✓ Let your health care provider know if you are having more problems than usual with physical activity.

Healthcare Provider's Contact Number:

References:

American Thoracic Society Patient Information Series—Pulmonary Rehabilitation

<http://www.thoracic.org/patients/patient-resources/resources/pulmonary-rehab.pdf>

National Heart, Lung and Blood Institute—What to Expect After a Lung Transplant

<http://www.nhlbi.nih.gov/health/health-topics/topics/lungtxp/after>

Pulmonary Rehab Patient Resources

<https://www.aacvpr.org/Resources/Resources-for-Patients/Pulmonary-Rehab-Patient-Resources>

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