Cedars Sinai

# Adult Lung Transplant

Cedars-Sinai has long been a leader in lung transplant. In 1988, we established the first lung transplant center of its kind in the western U.S.

# A comprehensive and innovative approach to lung transplant

Minimally invasive lung transplant surgery has been shown to not only reduce the chance of infection but also result in faster recovery and fewer post-surgical complications.

## Early referral is key to increasing a transplant patient's chance of success.

We understand that the decision to recommend a patient for transplant is complex. We encourage physicians to refer patients even if they might not fit the exact criteria for transplant. Regardless of diagnosis, early referral can be crucial to treatment outcomes.

Our program has seen continued success transplanting patients of older age. Cedars-Sinai also has the expertise and cutting-edge surgical capabilities to perform heart-lung transplants.

## Our program is dedicated to health equity and increasing access to care.

All patients are welcome to seek a lung transplant consultation at Cedars-Sinai.

## Candidates for adult lung transplant

Lung transplantation may benefit patients with the following diseases:

- Chronic obstructive pulmonary disease (COPD)
- Cystic fibrosis
- Bronchiectasis
- Lymphangioleiomyomatosis (LAM)
- Pulmonary Langerhans cell histiocytosis (PLCH)
- Idiopathic pulmonary fibrosis (IPF)
- Sarcoidosis
- Occupational lung disease
- Interstitial lung disease
- Connective tissue diseases causing interstitial lung disease
- Pulmonary hypertension
- Pulmonary veno-occlusive disease (PVOD)
- Pulmonary capillary hemangiomatosis (PCH)
- Adenocarcinoma in situ and minimally invasive adenocarcinoma

## International Society for Heart and Lung Transplant (ISHLT) disease-specific recommendations for lung transplant referral:

### Chronic Obstructive Pulmonary Disease (COPD)

- BODE score 5–6 with additional factor(s) present suggestive of increased risk of mortality:
  - Frequent acute exacerbations
  - Increase in BODE score >1 over past 24 months
  - Pulmonary artery to aorta diameter >1 on CT scan
  - FEV1 20%–25% predicted
- Clinical deterioration despite maximal treatment, including medication, pulmonary rehabilitation, oxygen therapy and, as appropriate, nocturnal noninvasive positive pressure ventilation.
- Poor quality of life unacceptable to the patient.
- Patient is not a candidate for or does not wish to pursue bronchoscopic or surgical lung volume reduction (LVR). Simultaneous referral of patients with COPD for both lung transplant and LVR evaluation is appropriate.

### Interstitial Lung Disease

- Referral should be made at time of diagnosis, even if a patient is being initiated on therapy, for histopathological usual interstitial pneumonia (UIP) or radiographic evidence of a probable or definite UIP pattern.
- Any form of pulmonary fibrosis with forced vital capacity (FVC) of <80% predicted or diffusion capacity of carbon monoxide (DLCO) <40% predicted.
- Any form of pulmonary fibrosis with one of the following in the past two years:
  - Relative decline in FVC ≥10%
  - Relative decline in DLCO ≥15%
  - Relative decline in FVC ≥5% in combination with worsening of respiratory symptoms or radiographic progression
- Supplemental oxygen requirement, either at rest or on exertion.
- For inflammatory ILDs and progression of disease (either on imaging or pulmonary function) despite treatment.
- For patients with connective tissue disease or familial pulmonary fibrosis, early referral is recommended, as extrapulmonary manifestations may require special consideration.

### Cystic Fibrosis (CF) or Bronchiectasis

- Referral for lung transplantation should occur for an individual with cystic fibrosis meeting any of the following criteria despite optimal medical management, including a trial of elexacaftor/ezacaftor/ivacaftor, if eligible:
  - FEV1 <30% predicted in adults (or <40% predicted in children)
  - FEV1 <40% predicted in adults (or <50% predicted in children) and any of the following:
    - Six-minute walk distance <400 meters
    - PaCO2 >50 mmHg
    - Hypoxemia at rest or with exertion
    - Pulmonary hypertension (PA systolic pressure >50 mmHg on echocardiogram or evidence of right ventricular dysfunction)
    - Worsening nutritional status despite supplementation
    - Two exacerbations per year requiring intravenous antibiotics
    - Massive hemoptysis (>240 mL) requiring bronchial artery embolization
    - Pneumothorax
  - FEV1 <50% predicted and rapidly declining based on pulmonary function testing or progressive symptoms
  - Any exacerbation requiring positive pressure ventilation
  - In individuals with CF, a lower threshold for both lung transplant referral and listing should be considered in females and those with short stature, diabetes or increasing antibiotic resistance, including infection with Burkholderia cepacia complex or nontuberculous mycobacteria.
- For individuals with non-CF bronchiectasis, similar criteria as with CF for referral and listing for lung transplantation is reasonable, though providers should recognize that prognosis is highly variable, with many patients experiencing a more stable course.

## Pulmonary Vascular Disease

- ESC/ERS intermediate or high risk or REVEAL risk score ≥8 despite appropriate PAH therapy
- Significant RV dysfunction despite appropriate PAH therapy
- Need for IV or SC prostacyclin therapy
- Progressive disease despite appropriate therapy or recent hospitalization for worsening of PAH
- Known or suspected high-risk variants such as PVOD/PCH, scleroderma, large and progressive pulmonary artery aneurysms
- Signs of secondary liver or kidney dysfunction due to PAH
- Potentially life-threatening complications such as recurrent hemoptysis

## Lymphangioleiomyomatosis (LAM)

- Referral for lung transplantation evaluation should occur for an individual with LAM who has any of the following despite mTOR inhibitor therapy:
  - Severely abnormal lung function (e.g., FEV1 <30% predicted)
  - Exertional dyspnea (NYHA class III or IV)
  - Hypoxemia at rest
  - Pulmonary hypertension
  - Refractory pneumothorax

## Adenocarcinoma In Situ and Minimally Invasive Adenocarcinoma

- Lung transplant should be limited to very select cases of lung-limited adenocarcinoma in situ, minimally invasive adenocarcinoma or lepidic predominant adenocarcinoma for patients in whom (1) surgical resection is not feasible, either because of multifocal disease or significant underlying pulmonary disease; (2) multifocal disease has resulted in significant lung restriction and respiratory compromise; (3) medical oncology therapies have failed or are contraindicated; and (4) lung transplant is expected to be curative.

## Acute Respiratory Distress Syndrome

- Persistent requirement for mechanical ventilatory support and /or ECLS without expectation of clinical recovery and with evidence of irreversible lung destruction

*For conditions that do not have disease specific guidelines, we recommend a phone consultation with one of our transplant physicians.*

## Lung Transplant Team

**Our transplant surgeons are experts in minimally invasive lung transplantation, extracorporeal membrane oxygenation (ECMO), multi-organ transplantation and ex vivo lung perfusion.**

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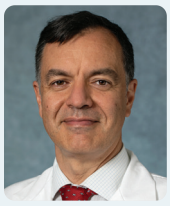
Surgical Director, Lung Transplant

Reinaldo Rampolla-Selles, MD
Medical Director, Lung Transplant



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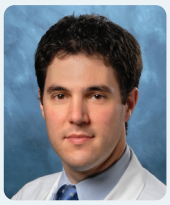

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For more information about the Comprehensive Transplant Center or for physician referrals, **call 310-423-7249 or fax 310-423-5666**.

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