

Subject: Lung and Lobar Transplantation
Document #: TRANS.00009
Status: Reviewed

Publish Date: 01/03/2024
Last Review Date: 11/09/2023

Description/Scope

This document addresses lung transplantation (lobar, single-lung or double-lung replacement). In a lobar transplantation, a lobe of the donor's lung is excised, sized appropriately for the recipient's thoracic dimensions, and is transplanted into the recipient. Donors for lobar lung transplantation have primarily been living related, but lobes of deceased donors have also been transplanted. In single-lung transplantation, only one lung from a deceased donor is provided to the recipient. In double-lung transplantation, the recipient's lungs are removed and replaced by both deceased donor's lungs.

Note: Please see the following related document for additional information:

- [TRANS.00026 Heart/Lung Transplantation](#)

Position Statement

Medically Necessary:

Lung or lobar transplantation is considered **medically necessary** for individuals who meet the general individual selection criteria^a and have irreversible, progressively disabling, end-stage pulmonary disease including, but not limited to, one or more of the conditions listed below.

- A. Restrictive lung disease, examples of which include, but are not limited to:
 1. Idiopathic pulmonary fibrosis (IPF);
 2. Interstitial pulmonary fibrosis;
 3. Scleroderma;
 4. Sarcoidosis;
 5. Extrinsic allergic alveolitis;
 6. Post-chemotherapy disease;
 7. Asbestosis.
- B. Chronic lung disease, examples of which include, but are not limited to:
 1. Alpha-1 antitrypsin deficiency;
 2. Eosinophilic granuloma (Langerhans cell histiocytosis or histiocytosis X);
 3. Chronic Obstructive Pulmonary Disease (COPD) (emphysema, chronic bronchitis);
 4. Bronchiolitis obliterans;
 5. Bronchopulmonary dysplasia;
 6. Recurrent pulmonary embolus;
 7. Lymphangiomyomatosis (LAM).
- C. Pulmonary hypertension, examples of which include, but are not limited to:
 1. Primary pulmonary hypertension;
 2. Pulmonary hypertension due to cardiac diseases and interstitial pulmonary fibrosis;
 3. Eisenmenger's syndrome;
 4. Fibrosing mediastinitis.
- D. Septic lung disease, examples of which include, but are not limited to:
 1. Cystic fibrosis;
 2. Bronchiectasis.

Lung or Lobar Retransplantation

Retransplantation in individuals with graft failure of an initial lung or lobar transplant, due to either technical reasons or hyperacute rejection is considered **medically necessary**.

Retransplantation in individuals with chronic rejection or recurrent disease is considered **medically necessary** when the individual meets general selection criteria as defined below.

Investigational and Not Medically Necessary:

Lobar or lung transplantation in individuals for all other diagnoses is considered **investigational and not medically necessary**.

Note: For multi-organ transplant requests, criteria must be met for each organ requested. In those situations, an individual may present with a concurrent medical condition which would be considered an exclusion or a comorbidity that would preclude a successful outcome, but would be treated with the other organ transplant. Such cases will be reviewed on an individual basis for coverage determination to assess the member's candidacy for transplantation.

General Individual Selection Criteria

In addition to having end stage pulmonary disease, the individual must not have a contraindication, as defined by the American Society of Transplantation in Guidelines for the Referral and Management of Patients Eligible for Solid Organ Transplantation (2001)* listed below.

Absolute Contraindications- for Transplant Recipients include, but are not limited to, the following:

- A. Metastatic cancer;
- B. Ongoing or recurring infections that are not effectively treated;
- C. Serious cardiac or other ongoing insufficiencies that create an inability to tolerate transplant surgery;
- D. Serious conditions that are unlikely to be improved by transplantation as life expectancy can be finitely measured;

- E. Demonstrated patient noncompliance, which places the organ at risk by not adhering to medical recommendations;
- F. Potential complications from immunosuppressive medications are unacceptable to the patient;
- G. Acquired immune deficiency syndrome (AIDS) (diagnosis based on Centers for Disease Control and Prevention [CDC]

definition of CD4 count, 200 cells/mm³) unless the following are noted:

1. CD4 count greater than 200 cells/mm³ for greater than 6 months;
2. HIV-1 RNA undetectable;
3. On stable anti-retroviral therapy greater than 3 months;
4. No other complications from AIDS (for example, opportunistic infection, including aspergillus, tuberculosis, coccidioidomycosis, resistant fungal infections, Kaposi's sarcoma or other neoplasm);
5. Meeting all other criteria for lung transplantation.

* Steinman, Theodore, et al. Guidelines for the Referral and Management of Patients Eligible for Solid Organ Transplantation. Transplantation. 2002; 71(9):1189-1204.

Rationale

For individuals with end-stage lung disease not amenable to or refractory to available medical and surgical approaches, lung transplantation may be the only accepted therapeutic option available. Lung transplantation techniques and immunosuppressive therapies have evolved over time, with the bulk of experience accumulated since 1990. Refinement of surgical techniques, individual selection criteria, and postoperative management has resulted in improved outcomes for lung transplantation. Although there are no randomized controlled trials available demonstrating the safety and efficacy of the procedure, current published literature does include retrospective studies, guidelines and reviews which indicate that lung transplantation may improve overall survival in select individuals with a variety of end-stage lung diseases.

Kreider and Kotloff (2009), in a report on the selection of lung transplantation candidates, stated that "Lung transplantation is a therapeutic option for a broad spectrum of chronic debilitating pulmonary disorders of the airways, parenchyma and vasculature." The authors also noted, "The selection of candidates requires an appreciation of the natural history of advanced lung disease as well as the impact of pretransplant patient characteristics on post-transplantation outcomes."

Orens (2009), in a review of the current status of lung transplantation, reported that, "Lung transplantation is an established treatment option for those with a wide variety of end-stage lung diseases and can prolong survival." In addition, the author noted that survival statistics for lung transplantation are not as favorable as for other solid organ transplants; lung transplants having a half-life of around 5 years versus 10 years for heart, kidney, and liver transplants. Yusem (2009) indicated that the literature provides conflicting data on survival and quality of life outcomes. This author encouraged development and reporting of valid measures of outcomes such as symptom control and function, as well as survival, which will assist individuals in weighing the potential costs and benefits of lung transplantation.

Todd and colleagues (2013), in a lung transplant update, reported that the number of potential candidates who could benefit from this procedure far exceeded the number of lung transplants performed annually, especially in the pediatric population. The authors also indicated that recently the epidemiology of those undergoing transplantation has changed considerably with a large increase in the proportion of older recipients and those with interstitial lung disease.

The Pulmonary Transplantation Council of the International Society for Heart and Lung Transplantation (ISHLT) issued a 2021 updated consensus document for the selection of lung transplant candidates. The authors (Leard and colleagues, 2021) include the following information:

General Considerations

Lung transplantation should be considered for adults with chronic, end-stage lung disease who meet all the following general criteria:

- High (>50%) risk of death from lung disease within 2 years if lung transplantation is not performed.
- High (>80%) likelihood of 5-year post-transplant survival from a general medical perspective provided that there is adequate graft function.

Pediatric Candidate Selection

Timing of Listing

In addition to general recommendations for adults, considerations for listing children for lung transplant include the following:

- Patients with CF < 18 years of age should be listed when FEV₁ < 30% predicted
- Patients with PAH < 18 years of age should be listed when they are in the EPPVDN high risk category and on optimal therapy without improvement

Transition from pediatric to adult care while on the transplant waiting list needs careful planning, timing, and ongoing communication

In pediatric candidates, growth and nutritional status should be carefully monitored.

Extracorporeal life support may be an acceptable bridge to transplant in appropriately selected pediatric candidates at centers with expertise.

The Pulmonary Transplantation Council of the ISHLT committee consensus update (2021) addressed use of lung transplantation in individuals with acute respiratory distress syndrome (ARDS) and COVID-19. The committee concluded:

Case reports describing bilateral lung transplant for COVID-19 associated ARDS have started to emerge since January 2020. Experts in the field recommend waiting at least 4-6 weeks after the onset of respiratory failure due to COVID-19 prior to considering lung transplant. While it seems likely that these cases should be evaluated like other patients with post-viral ARDS, it is too early to make conclusive recommendations at this time.

Valapour and colleagues, (2021) reported in the Organ Procurement Transplant Network (OPTN)/ Scientific Registry of Transplant Recipients that lung transplants declined in 2020, this coincided with the COVID-19 pandemic. The number of candidates added to the waiting list increased after a decline in 2020, the waitlist mortality increased with a decreased number of transplants, time to transplant improved with 38.0% of candidates waiting fewer than 90 days for a transplant, post-transplant 85.3% of recipients are surviving to 1 year; 67%, to 3 years; and 54.3%, to 5 years.

Lobar Transplantation

Several authors (Date, 2012; Inci, 2012) indicate that living donor lobar lung transplantation (LDLLT) is a reasonable treatment option for carefully selected individuals with end-stage lung disease who are unlikely to survive or who may deteriorate clinically to the point of transplant ineligibility during the wait for a compatible deceased donor, but who are otherwise eligible candidates for unilateral or bilateral lung transplantation. LDLLT provides health benefits by improving respiratory and cardiac function and quality of life and by prolonging survival in those who otherwise are likely to die. While a number of recipients experience complications or die, the likelihood of survival without transplant is extremely low. There is some evidence that LDLLT may be more efficacious than deceased donor lung transplant for certain individuals, for example, it leads to greater improvement in respiratory function, and that the incidence of chronic rejection is lower than that for cadaveric transplantation. In a retrospective review, Toyooka and colleagues (2009) analyzed the outcome of bronchial healing after LDLLT and reported that bronchial healing after this procedure was acceptable.

Donors for lobar transplantation have been primarily living-related donors, with one lobe obtained from each of two donors (generally mother and father) to a child when bilateral lung transplantation is required. Based upon evidence from several studies (Barr, 2005; Bowdish, 2005), lobar lung transplantation may also be beneficial in adults with primary pulmonary hypertension, idiopathic pulmonary fibrosis, cystic fibrosis, or those who require retransplantation. Bowdish and colleagues (2005) reported that when compared with bilateral cadaveric lung transplantation, LDLLT provided comparable intermediate and long term pulmonary function and exercise capacity.

A 2015 retrospective review by Date and colleagues reported that LDLLT provides similar survival to cadaveric lung transplantation. The authors compared the preoperative status and outcome of LDLLT recipients with those of cadaveric lung transplantation (CLT) recipients. A total of 79 lung transplants (42 LDLLTs and 37 CLTs) were performed at a single Japanese center between June 2008 and January 2014. Prior to transplantation, LDLLT recipients were reported to be more debilitated than CLT recipients due to a lower body mass index, less ability to ambulate and greater ventilator dependence. Postoperatively, LDLLT recipients required longer mechanical ventilation. Survival rates at 1 and 3 years were similar between the LDLLT and CLT groups (89.7% and 86.1% vs 88.3% and 83.1%, $p=0.55$). Additionally, all living donors returned to their previous activities without restriction. The authors concluded that LDLLT is a viable option for those too ill to survive a long waiting period for cadaveric donors.

In 2018, Roy and colleagues reported findings from a retrospective, single-center analysis of 419 participants who underwent lung transplantation. Of those, 29 participants (6.9%) were retransplantations due to chronic lung allograft dysfunction (CLAD). Time from primary lung transplant to retransplantation ranged from 304 days to 3971 days (median time = 1163 days). The authors concluded that lung retransplantation was a viable treatment option for appropriately selected individuals with CLAD after primary lung transplant (LTx). "Lung retransplant recipients with CLAD are younger with higher LAS and challenging preoperative management, but they have outcomes comparable with those of primary LTx recipients."

Pediatric Lung Transplantation

Benden and colleagues (2012) reviewed pediatric lung transplantations (recipients aged 18 and younger) reported to the International Society for Heart and Lung Transplantation Registry. The authors noted that an increased number of pediatric lung transplants had occurred in recent years. There were 73 pediatric lung transplants in 2000 as compared to 126 transplants in 2010. The most common indication for pediatric lung transplant was cystic fibrosis (CF), accounting for 54% of lung transplants in 6-11 year-olds and 72% of lung transplants in 12-17 year-olds that occurred between 1990 and June 2011. Survival at 5 years was not significantly different from adult recipients. The half-life, estimated time at which 50% of recipients have died, was 4.7 years for children and 5.3 years for adults. For children receiving allografts between 2002 and June 2010, the 5-year survival rate was 54% and 7-year survival was 44%. Children aged 1 to 11 years had a significantly better survival rate than those between the ages of 12 and 17 years (half-life of 6.2 years and 4.3 years, respectively). In the first year after lung transplantation, non-cytomegalovirus infection and graft failure were the leading causes of death. Bronchiolitis obliterans syndrome was the major cause of death beyond 3 years after transplantation.

The CF Foundation lung transplant referral guidelines recommend annual conversations with people with CF once their forced expiratory volume in one second (FEV1) is <50% predicted. Considering lung transplant as a treatment option before it is medically needed will allow more time to address any barriers to lung transplant that may exist. A clinical trial (NCT06030206) with a projected completion date of July 2027, main objective is to test whether a research website improves individual preparedness for discussions about lung transplant, and to understand whether there are unique factors that affect people with CF from communities with decreased access to transplant ("communities of concern").

Lung Allocation Score

In 2021, the OPTN Lung Transplant Committee updated how lung transplants are allocated in the United States. Since 2005, potential lung transplant recipients have been ranked according to the Lung Allocation Score (LAS). UNOS made changes to the updated cohort for calculation of the LAS approved by the OPTN Board of Directors, the update improves the predication of candidates' expected survival on the waitlist and post-transplant to improve equity in lung allocation.

McCue and colleagues (2007) studied the impact of the LAS on early complications, 90-day survival, and incidence of primary graft dysfunction (PGD) post-transplant. A total of 78 recipients receiving transplants after the initiation of the LAS were compared with 78 recipients transplanted prior to the start of the new system. The authors reported that the LAS system did not result in greater mortality, major complications or increased incidence of severe PGD.

Kozower and colleagues (2008) performed a retrospective cohort study using data from five academic medical centers to evaluate the impact of LAS on short-term outcomes after lung transplantation. This score changed lung allocation from a system based on waiting time to an algorithm based on the probability of survival for 1 year on the transplant list and survival 1 year post-transplantation. Results were compared for 170 lung transplant recipients on the basis of the new lung allocation scores (May 4, 2005 to May 3, 2006) with those obtained from 171 lung transplant recipients who underwent transplants the preceding year before implementation of the scoring system. Waiting time decreased from 681 to 445.6 days ($p<0.001$). Recipient diagnoses changed with an increase (15% to 25%) in idiopathic pulmonary fibrosis cases and decreases in emphysema (46% to 34%) and cystic fibrosis (23% to 13%). Hospital mortality and 1-year survival were the same between groups (5.3% vs. 5.3% and 90% vs. 89%, respectively). Presumably due to increased severity of illness, the incidence of primary graft dysfunction and postoperative intensive care unit length of stay increased in the year after implementation of the scoring system; graft dysfunction grew from 14.8% (24/170) to 22.9% (39/171) ($p=0.04$); and length of stay rose from 5.7 to 7.8 days.

Prior to LAS implementation, data indicated that survival was better in double-lung than single-lung transplant recipients (median survival, 6.7 vs 4.6 years; $p<0.001$). However, this association was confounded by large differences between the recipient populations, particularly due to an individual's underlying condition. Schaffer and colleagues (2015) retrospectively assessed and compared recipient outcomes of single and double lung transplants performed since the LAS was implemented in 2005. An exploratory analysis was performed on adults with idiopathic pulmonary fibrosis (IPF) or chronic obstructive pulmonary disease

(COPD) and documented LAS who underwent lung transplantation in the United States between May 4, 2005 and December 31, 2012. Subjects were identified in the United Network for Organ Sharing thoracic registry. Individuals with IPF (n=4134, of whom 2010 received a single-lung and 2124 received double-lung transplantation) or COPD (n=3174, of whom 1299 received a single-lung and 1875 received double-lung transplantation) were identified as having undergone lung transplantation since May 2005. Median follow-up was 23.5 months. Of the subjects with IPF, 1380 (33.4%) died and 115 (2.8%) underwent retransplantation. Of those with COPD, 1138 (34.0%) died and 59 (1.9%) underwent retransplantation. The interaction between diagnosis type (COPD or IPF) and graft failure was substantial (p=0.049). Double-lung transplants were associated with better graft survival in IPF recipients but not in those with COPD. The authors concluded that since the implementation of a medical need-based lung allocation system, double lung transplantation was associated with better survival than single-lung transplantation in those with IPF. In individuals with COPD, there was no survival difference noted between single and double lung transplantation at 5 years.

In 2023, the OPTN published a new policy for matching lung transplant candidates with organs from deceased donors. The new "continuous distribution" methodology states that all of the factors in the organ match are included in a single, weighted score, calculated for each lung transplant candidate, and each potential lung from a donor.

Statistical modeling suggests this will reduce the number of lung candidates who die awaiting a lung transplant, but it will increase transplant access for a number of candidates. This includes candidates who are:

- The most medically urgent
- Younger than age 18
- A prior living organ donor
- More likely to have immune system rejection of many organs
- Short in stature
- Expected to live longer after a transplant

All lung transplant candidates aged 12 and older will receive a lung Composite Allocation Score (lung CAS) that replaces the LAS. For candidates younger than age 12, the two existing priority rankings will still be utilized. With the CAS, candidates receive varying numbers of points based on a set of different attributes. The attributes are weighted. The categories of attributes include the following:

- Candidate medical urgency (maximum 25 points)
- Likelihood of recipient survival over five years post-transplant (maximum 25 points)
- Potential biological challenges in matching, such as the candidate's blood type, height or immune sensitivity (maximum 15 points)
- Whether the candidate was younger than age 18 when listed for a transplant (20 points)
- Whether the candidate was a prior living organ donor (five points)
- A final category of attributes, worth as many as 10 points, is determined by each lung offer from a donor who is a potential match for the candidate. More points will be assigned to matches where the donor hospital and the candidates' transplant hospital are closer to one another, and where the logistics of preserving and transporting the lungs between the two hospitals are more likely to result in a successful transplant. Because this portion of the lung CAS may be different for every organ offer, the total score will not remain the same for all patients and all matches.

Background/Overview

Lung transplantation refers to a lobar, single-lung or double-lung replacement. In a lobar transplant, a lobe of the donor's lung is excised, sized appropriately for the recipient's thoracic dimensions and is transplanted. Donors for lobar transplantation have primarily been living related, but there are also cases of deceased donor lobar transplants. In a single-lung transplant, only one lung is removed from the recipient and replaced with a deceased donor lung. In a double-lung transplant, both lungs of the recipient are removed and replaced by the deceased donor's lungs.

The most common indication for lung transplantation in adults is chronic obstructive pulmonary disease (COPD). COPD is a progressive lung disease that makes it more difficult to breathe over time. It is a leading cause of death and illness worldwide. Most COPD is caused by long-term cigarette smoking but other lung irritants such as air pollution may also be contributing factors. Other primary diagnoses for those receiving lung transplants include CF, idiopathic pulmonary fibrosis (IPF), primary pulmonary hypertension (PPH), and retransplantation after graft failure. CF is a genetic disorder that affects the respiratory, digestive and reproductive systems. IPF is scarring or thickening of the lungs without a known cause. It is a debilitating disorder with no proven treatment and a median survival from the time of diagnosis in the range of 3 to 4 years (Kreider, 2009). PPH is also currently termed idiopathic pulmonary arterial hypertension (IPAH). PPH or IPAH is a rare lung disorder in which the blood pressure in the pulmonary artery rises far above normal levels, usually with no apparent reason. Secondary pulmonary hypertension (SPH) means the cause is known. Common causes of SPH are the breathing disorders emphysema and bronchitis.

The limiting factor for lung transplantation is the short supply of donor organs. The procurement and distribution of lung organs for transplantation in the United States is under the direction of the United Network for Organ Sharing (UNOS). A national database of transplant candidates, donors, recipients, and donor-recipient matching and histocompatibility is maintained by UNOS. According to UNOS, the LAS can be used to estimate each transplant candidate's severity of illness and expected post-transplant survival. Clinical information including a candidate's diagnosis and test results are used to calculate an LAS that ranges from 0-100. A lung transplant candidate with a higher LAS will receive higher priority for a compatible lung offer in the same geographic zone. Modifications to the LAS system were last implemented in September 2021 (UNOS, 2022). The updated LAS calculation is data from a more recent cohort of lung candidates and recipients. Several variables have been removed from the waiting list urgency measure and the post-transplant survival measure.

Coding

The following codes for treatments and procedures applicable to this document are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement policy. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

When services may be Medically Necessary when criteria are met:

CPT

32850	Donor pneumonectomy(s) (including cold preservation), from cadaver donor
32851	Lung transplant, single; without cardiopulmonary bypass
32852	Lung transplant, single; with cardiopulmonary bypass
32853	Lung transplant, double (bilateral sequential or en bloc); without cardiopulmonary bypass

32854	Lung transplant, double (bilateral sequential or en bloc); with cardiopulmonary bypass
32855	Backbench standard preparation of cadaver donor lung allograft prior to transplantation, including dissection of allograft from surrounding soft tissues to prepare pulmonary venous/atrial cuff, pulmonary artery, and bronchus; unilateral
32856	Backbench standard preparation of cadaver donor lung allograft prior to transplantation, including dissection of allograft from surrounding soft tissues to prepare pulmonary venous/atrial cuff, pulmonary artery, and bronchus; bilateral

HCPCS

S2060	Lobar lung transplantation
S2061	Donor lobectomy (lung) for transplantation, living donor

ICD-10 Procedure

0BYC0Z0-0BYC0Z1	Transplantation of right upper lung lobe, open approach [allogeneic, syngeneic]
0BYD0Z0-0BYD0Z1	Transplantation of right middle lung lobe, open approach [allogeneic, syngeneic]
0BYF0Z0-0BYF0Z1	Transplantation of right lower lung lobe, open approach [allogeneic, syngeneic]
0BYG0Z0-0BYG0Z1	Transplantation of left upper lung lobe, open approach [allogeneic, syngeneic]
0BYH0Z0-0BYH0Z1	Transplantation of lung lingula, open approach [allogeneic, syngeneic]
0BYJ0Z0-0BYJ0Z1	Transplantation of left lower lung lobe, open approach [allogeneic, syngeneic]
0BYK0Z0-0BYK0Z1	Transplantation of right lung, open approach [allogeneic, syngeneic]
0BYL0Z0-0BYL0Z1	Transplantation of left lung, open approach [allogeneic, syngeneic]
0BYM0Z0-0BYM0Z1	Transplantation of bilateral lungs, open approach [allogeneic, syngeneic]

ICD-10 Diagnosis

All diagnoses

When services are Investigational and Not Medically Necessary:

For the procedure codes listed above when criteria are not met; or when the code describes a procedure indicated in the Position Statement section as investigational and not medically necessary.

References

Peer Reviewed Publications:

- Barr ML, Schenkel FA, Bowdish ME, Starnes VA. Living donor lobar lung transplantation: current status and future directions. *Transplant Proc.* 2005; 37(9):3983-3986.
- Benden C, Edwards LB, Kucheryavaya AY, et al. International Society of Heart and Lung Transplantation. The Registry of the International Society for Heart and Lung Transplantation: fifteenth pediatric lung and heart-lung transplantation report--2012. *J Heart Lung Transplant.* 2012; 31(10):1087-1095.
- Bowdish ME, Pessotto R, Barbers RG, et al. Long-term pulmonary function after living-donor lobar lung transplantation in adults. *Ann Thorac Surg.* 2005; 79(2):418-425.
- Date H, Aoe M, Sano Y, et al. Improved survival after living-donor lobar lung transplantation. *J Thorac Cardiovasc Surg.* 2004; 128(6):933-940.
- Date H, Sato M, Aoyama A, et al. Living-donor lobar lung transplantation provides similar survival to cadaveric lung transplantation even for very ill patients†. *Eur J Cardiothorac Surg.* 2015; 47(6):967-972; discussion 972-973.
- Date H, Shiraishi T, Sugimoto S, et al. Outcome of living-donor lobar lung transplantation using a single donor. *J Thorac Cardiovasc Surg.* 2012; 144(3):710-715.
- Date H, Yamane M, Toyooka S, et al. Current status and potential of living-donor lobar lung transplantation. *Front Biosci.* 2008; 13:1433-1439.
- Dauriat G, Mal H, Thabut G, et al. Lung transplantation for pulmonary Langerhans' cell histiocytosis: a multicenter analysis. *Transplantation.* 2006 81(5):746-750.
- Egan TM, Edwards LB. Effect of the lung allocation score on lung transplantation in the United States. *J Heart and Lung Transplant.* 2016; 35(4):433-439.
- Goldberg HJ, Deykin A. Advances in lung transplantation for patients who have cystic fibrosis. *Clin Chest Med.* 2007; (2):445-457.
- Inci I, Schuurmans MM, Kestenholz P, et al. Long-term outcomes of bilateral lobar lung transplantation. *Eur J Cardiothorac Surg.* 2013; 43(6):1220-1225.
- Kozower BD, Meyers BF, Smith MA, et al. The impact of the lung allocation score on short-term transplantation outcomes: a multicenter study. *J Thorac Cardiovasc Surg.* 2008; 135(1):166-171.
- Kpodonu J, Massad MG, Chaer RA, et al. The US experience with lung transplantation for pulmonary lymphangioleiomyomatosis. *J Heart Lung Transplant.* 2005; 24(9):1247-1253.
- Kreider M, Kotloff RM. Selection of candidates for lung transplantation. *Proc Am Thorac Soc.* 2009; 6(1):20-27.
- Liou TG, Woo MS, Cahill BC. Lung transplantation for cystic fibrosis. *Curr Opin Pulm Med.* 2006; (6):459-463.
- Massad MG, Powell CR, Kpodonu J. Outcomes of lung transplantation in patients with scleroderma. *World J Surg.* 2005; 29(11):1510-1515.
- Maurer JR. Patient selection criteria for lung transplantation. *JAMA.* 2001; 286(21):2720-2721.
- McCue JD, Mooney J, Quail J, et al. Ninety-day mortality and major complications are not affected by use of lung allocation score. *J Heart Lung Transplant.* 2008; 27(2):192-196.
- Nathan SD. Lung transplantation- disease specific considerations for referral. *Chest.* 2005; 127(3):1006-1016.
- Nauser TD, Stites SW. Diagnosis and treatment of pulmonary hypertension. *Am Fam Physician.* 2001; 63(9):1789-1798.
- Orens JB, Garrity ER Jr. General overview of lung transplantation and review of organ allocation. *Proc Am Thorac Soc.* 2009; 6(1):13-19.
- Roy SB, Panchanathan R, Walia R, et al. Lung retransplantation for chronic rejection: A single-center experience. *Ann Thorac Surg.* 2018; 105(1):221-227.
- Ruttmann E, Geltner C, Bucher B, et al. Combined CMV prophylaxis improves outcome and reduces the risk for bronchiolitis obliterans syndrome (BOS) after lung transplantation. *Transplantation.* 2006; 81(10):1415-1420.
- Schaffer JM, Singh SK, Reitz BA, Zamanian RT, Mallidi HR. Single- vs double-lung transplantation in patients with chronic obstructive pulmonary disease and idiopathic pulmonary fibrosis since the implementation of lung allocation based on medical need. *JAMA.* 2015; 313(9):936-948.
- Singer LG, Gould MK, Tomlinson G, Theodore J. Determinants of health utility in lung and heart-lung transplant recipients. *Am J Transplant.* 2005; 5(1):103-109.

26. Smeritschnig B, Jaksch P, Kocher A, et al. Quality of life after lung transplantation: a cross-sectional study. *J Heart Lung Transplant*. 2005; 24(4):474-480.
27. Todd JL, Christie JD, Palmer SM. Update in lung transplantation 2013. *Am J Respir Crit Care Med*. 2014; 190(1):19-24.
28. Toyooka S, Yamane M, Oto T, et al. Bronchial healing after living-donor lobar lung transplantation. *Surg Today*. 2009; 39(11):938-943.
29. Trulock EP, Edwards LB, Taylor DO, et al. The Registry of the International Society for Heart and Lung Transplantation: twenty-first official adult lung and heart-lung transplant report – 2004. *J Heart Lung Transplant*. 2004; 23(7):804-815.
30. Vizza CD, Yusef RD, Lynch JP, et al. Outcome of patients with cystic fibrosis awaiting lung transplantation. *Am J Respir Care Med*. 2000; 162(3 Pt 1):819-825.
31. Yusef RD. Technology and outcomes assessment in lung transplantation. *Proc Am Thorac Soc*. 2009; 6(1):128-136.

Government Agency, Medical Society, and Other Authoritative Publications:

1. Abecassis M, Adams M, Adams P, et al.; Live Organ Donor Consensus Group. Consensus statement on the live organ donor. *JAMA*. 2000; 284(22):2919-2926.
2. Leard LE, Holm AM, Valapour M, et al. Consensus statement. Consensus document for the selection of lung transplant candidates: an update from the International Society for Heart and Lung Transplantation. *J Heart Lung Transplant*. 2021; 40(11):1349-1379.
3. Organ Procurement and Transplantation Network (OPTN) and Scientific Registry of Transplant Recipients (SRTR). OPTN/SRTR 2021 Annual Data Report. U.S. Department of Health and Human Services, Health Resources and Services Administration; 2023. Available at: http://srtr.transplant.hrsa.gov/annual_reports/Default.aspx. Accessed October 9, 2023.
4. Steinman TI, Becker BN, Frost AE, et al.; Clinical Practice Committee, American Society of Transplantation. Guidelines for the referral and management of patients eligible for solid organ transplantation. *Transplantation*. 2001; 71(9):1189-1204.
5. United Network for Organ Sharing. Policy 10: Allocation of Lungs. Effective September 28, 2023. Available at: https://optn.transplant.hrsa.gov/media/1200/optn_policies.pdf. Accessed on October 5, 2023.
6. United Network for Organ Sharing. Lung Continuous Distribution Policy. Effective March 9, 2023. Available at: <https://optn.transplant.hrsa.gov/professionals/by-organ/heart-lung/lung-continuous-distribution-policy/>. Accessed on October 9, 2023.
7. Verleden GM, Glanville AR, Lease ED, et al. Chronic lung allograft dysfunction: Definition, diagnostic criteria, and approaches to treatment – A consensus report from the Pulmonary Council of the ISHLT. *J Heart Lung Transplant*. 2019; 38(5):493-503.
8. Weill D, Benden C, Corris PA, et al. A consensus document for the selection of lung transplant candidates: 2014--an update from the Pulmonary Transplantation Council of the International Society for Heart and Lung Transplantation. *J Heart Lung Transplant*. 2015; 34(1):1-15.

Websites for Additional Information

1. American Lung Association. Available at: <https://www.lung.org/>. Accessed on October 5, 2023.
2. American Thoracic Society (ATS). Available at: <http://www.thoracic.org>. Accessed on October 5, 2023.
3. Cystic Fibrosis Foundation (CFF) Lung Transplant Referral Guidelines. Available at: <https://www.cff.org/medical-professionals/lung-transplant-referral-guidelines#lung-transplant-referral-for-individuals-with-cystic-fibrosis-executive-summary>. Accessed on October 9, 2023.
4. Primary Pulmonary Hypertension Association. Available at: <http://www.phassociation.org/>. Accessed on October 5, 2023.
5. Pulmonary Fibrosis Foundation. Available at: <http://www.pulmonaryfibrosis.org/>. Accessed on October 5, 2023.
6. Scientific Registry of Transplant Recipients. Available at: <http://www.srtr.org/>. Accessed on October 5, 2023.
7. The International Society for Heart & Lung Transplantation. Available at: <http://www.isHLT.org>. Accessed on October 5, 2023.
8. United Network for Organ Sharing. Available at: <http://www.unos.org/>. Accessed on October 5, 2023.

Index

Chronic Lung Disease
 Chronic Obstructive Pulmonary Disease (COPD)
 Cystic Fibrosis
 Emphysema
 Idiopathic Pulmonary Artery Hypertension (IPAH)
 Idiopathic Pulmonary Fibrosis (IPF)
 Lobar Transplant
 Lung Transplant
 Primary Pulmonary Hypertension (PPH)
 Pulmonary Fibrosis
 Pulmonary Hypertension
 Restrictive Lung Disease
 Septic Lung Disease

Document History

Status	Date	Action
Reviewed	11/09/2023	Medical Policy & Technology Assessment Committee (MPTAC) review. Updated Rationale, References, and Website sections.
	09/27/2023	Updated Coding section to remove CPT codes 0494T, 0495T, 0496T now addressed in TRANS.00039.
Reviewed	11/10/2022	MPTAC review. Updated Rationale, Background, References and Websites sections.
Reviewed	11/11/2021	MPTAC review. Updated Rationale, Background, References and Websites sections.
Reviewed	11/05/2020	MPTAC review. Updated Rationale, Background, References and Websites sections.
Reviewed	11/07/2019	MPTAC review. Updated References and Websites sections.
Reviewed	01/24/2019	MPTAC review. Updated References and Websites sections.
Reviewed	03/22/2018	MPTAC review. Updated References and Websites sections.
Reviewed	02/27/2018	MPTAC review. Updated References and Websites sections.
	12/27/2018	The document header wording updated from "Current Effective Date" to "Publish Date." Updated Coding section with 01/01/2018 CPT changes; added 0494T, 0495T, 0496T.

Reviewed	02/02/2017	MPTAC review. Updated formatting in position statement section. Updated References and Websites sections.
Reviewed	02/04/2016	MPTAC review. Rationale, Background and Reference sections updated. Removed ICD-9 codes from Coding section.
Reviewed	02/05/2015	MPTAC review. Description, Rationale, Background and Reference sections updated.
Reviewed	02/13/2014	MPTAC review. Rationale, Background and Reference sections updated.
Reviewed	02/14/2013	MPTAC review. Rationale and Reference sections updated.
Revised	02/16/2012	MPTAC review. Updated listing of examples of conditions in position statement. Reference and Index sections updated.
Reviewed	02/17/2011	MPTAC review. Rationale, Background, References, and Index updated.
Reviewed	02/25/2010	MPTAC review. References links updated.
Revised	02/26/2009	MPTAC review. Position statement clarified by replacing the wording "obstructive lung disease" with "chronic lung disease". Rationale, background and references updated.
Reviewed	02/21/2008	MPTAC review. Updated description, rationale, background and references. Clarified note for multi-organ requests. The phrase "investigational/not medically necessary" was clarified to read "investigational and not medically necessary." This change was approved at the November 29, 2007 MPTAC meeting.
Revised	03/08/2007	MPTAC review. Clarification of diagnoses added to medical necessity criteria. Updated references and coding.
Reviewed	03/23/2006	MPTAC review. No changes to policy stance. References were updated with updated UNOS information about organ allocation process. .
Revised	04/28/2005	MPTAC review. Revision based on Pre-merger Anthem and Pre-merger WellPoint Harmonization.

Pre-Merger Organizations	Last Review Date	Document Number	Title
Anthem, Inc.	09/19/2003	TRANS.00009	Lung and Lobar Transplantation
WellPoint Health Networks, Inc.	12/02/2004	7.05.01	Lung and Lobar Transplantation

Applicable to Commercial HMO members in California: When a medical policy states a procedure or treatment is investigational, PMGs should not approve or deny the request. Instead, please fax the request to Anthem Blue Cross Grievance and Appeals at fax # 818-234-2767 or 818-234-3824. For questions, call G&A at 1-800-365-0609 and ask to speak with the Investigational Review Nurse.

Federal and State law, as well as contract language, including definitions and specific contract provisions/exclusions, take precedence over Medical Policy and must be considered first in determining eligibility for coverage. The member's contract benefits in effect on the date that services are rendered must be used. Medical Policy, which addresses medical efficacy, should be considered before utilizing medical opinion in adjudication. Medical technology is constantly evolving, and we reserve the right to review and update Medical Policy periodically.

No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, or otherwise, without permission from the health plan.

© CPT Only – American Medical Association