

DISCLAIMER

This Molina Clinical Policy (MCP) is intended to facilitate the Utilization Management process. Policies are not a supplementation or recommendation for treatment; Providers are solely responsible for the diagnosis, treatment, and clinical recommendations for the Member. It expresses Molina's determination as to whether certain services or supplies are medically necessary, experimental, investigational, or cosmetic for purposes of determining appropriateness of payment. The conclusion that a particular service or supply is medically necessary does not constitute a representation or warranty that this service or supply is covered (e.g., will be paid for by Molina) for a particular Member. The Member's benefit plan determines coverage – each benefit plan defines which services are covered, which are excluded, and which are subject to dollar caps or other limits. Members and their Providers will need to consult the Member's benefit plan to determine if there are any exclusion(s) or other benefit limitations applicable to this service or supply. If there is a discrepancy between this policy and a Member's plan of benefits, the benefits plan will govern. In addition, coverage may be mandated by applicable legal requirements of a State, the Federal government or CMS for Medicare and Medicaid Members. CMS's Coverage Database can be found on the CMS website. The coverage directive(s) and criteria from an existing National Coverage Determination (NCD) or Local Coverage Determination (LCD) will supersede the contents of this MCP and provide the directive for all Medicare members. References included were accurate at the time of policy approval and publication.

OVERVIEW

Lung transplantation is a surgical procedure performed to replace a diseased lung with a healthy donor lung. Transplant may be required for those with lung issues that do not respond to other treatments or those with a life expectancy of 12 to 24 months if a transplant is not performed (¹Hachem 2023; ¹OPTN 2023). Previously, the number of completed lung transplants were limited due to high mortality rates from intra- and post-surgical complications; however, advances in surgical technique, post-operative management, recipient selection, and the availability of cyclosporine have improved lung transplant outcomes and made lung transplant an option for patients of all ages (¹Hachem 2023). The primary limiting factors for the number of lung transplants performed is a lack of suitable healthy lung donors and potential complications before and after donor brain death that affect the viability of potential donor lungs (¹Hachem 2023). The number of lung transplants in the United States peaked in 2019 at 2,759 and has subsequently declined because of the COVID-19 pandemic (SRTR 2023). The number of individuals added to the transplant waiting list continues to increase which has led to the development of the "Continuous Distribution Framework" to improve lung allocation (OPTN 2023; SRTR 2023). There is also a focus on the management of patients with end-stage lung disease who are waiting for a suitable donor. Management depends on the cause of lung disease and includes, but is not limited to (²Hachem 2023):

- Lung volume reduction surgery
- Oxygen therapy
- Pulmonary rehabilitation
- Treatment of reversible airway disease
- Vasodilators
- Pulmonary thromboendarterectomy in patients with chronic pulmonary thromboembolic disease

Continuous Distribution Framework and Lung Composite Allocation Score

The Organ Procurement and Transplantation Network (OPTN) developed the "continuous distribution" framework in December 2018 to improve the process of matching organ donors with recipients and make the donation process more equitable and improve waitlist mortality. Each organ will have a "composite allocation score (CAS)" that assigns a score based on attributes such as medical urgency, pediatric age group, post-transplant survival, blood type, sensitization, candidate size, prior living donor status, and placement efficiency. Each attribute has a specific weight that indicates the effect that attribute will have on the total score (¹OPTN 2023).

The lung CAS for lung transplantation was developed and implemented in March 2023 by the OPTN to replace the previously utilized "lung allocation score." The lung CAS has a maximum possible score of 100 points based on waiting list urgency (1-year survival without a transplant), expected 5-year post-transplant survival, biologic compatibility (blood type, calculated panel reactive antigen, and height), patient access, and placement efficiency (travel and proximity to transplant center). The lung CAS "will extend to decimal point values, meaning there should not be many instances where two or more candidates will have the exact same score (³OPTN 2023)." If there are two candidates with the same score, the candidate that was registered first will be prioritized to receive the donor lung (²OPTN 2023). Regarding candidates awaiting multi-organ transplants, "if a heart-lung, lung-liver, or lung-kidney candidate has a lung CAS that is equal to or greater than the threshold for multi-organ transplantation including the lung, the [organ

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procurement organization] must offer both organs to that candidate (²OPTN 2023).”

Pediatric patients awaiting lung transplant are given preset scores for post-transplant outcomes and patient access goals. Pediatric patients <12 years of age awaiting a lung transplant are assigned either “priority 1” or “priority 2” to indicate medical urgency based on clinical criteria. Additionally, all pediatric patients <12 years of age “are assigned 18.6336 post-transplant outcome points based on their post-transplant survival probability...and all candidates registered before the age of 18, including those younger than age 12, receive an additional 20 points under the patient access goal for pediatric status (²OPTN 2023).” If a pediatric patient is placed on the waiting list prior to age 12 and remains on the waiting list on their 12th birthday, that candidate will receive a calculated waiting list survival and post-transplant survival scores based on scored clinical values rather than the predetermined value based on priority. Those that are placed on the waiting list prior to age 18 and turn 18 years old while still on the waiting list “will continue to receive the 20 points for pediatric status after they turn 18 (²OPTN 2023).”

Conditions Associated with Lung Transplantation

The conditions described below may warrant lung transplantation:

Interstitial Lung Disease (ILD) is a term used to describe lung diseases that begin in the pulmonary interstitium. The diseases are classified together due to similar clinical, radiographic, physiologic, and/or pathologic manifestations (King 2022). The lung diseases are further grouped according to whether the cause of the disease is known or unknown. Unknown causes of ILD are referred to as “idiopathic.” Diseases classified as idiopathic ILD include cryptogenic organizing pneumonia, sarcoidosis, and idiopathic interstitial pneumonias (acute, subacute, smoking-related, and chronic fibrosing) (King 2022). Causes of ILD may include infectious organisms (bacterial, fungal, or viral), exposure to occupational or environmental agents, drug-induced pulmonary toxicity, or radiation-induced lung injury (King 2022). Most of the symptoms for each disease process are nonspecific, making it important to determine the 1) duration and severity of symptoms, 2) past medical, family, and social history, 3) results of radiographic imaging of the chest, and 4) pulmonary function test (PFT) results (King 2022). PFT trending can help determine the severity of reduction and is also used as an indicator for lung transplant referral (King 2023; ISHLT 2021). ILD accounts for approximately 40% of all lung transplants and interstitial pulmonary fibrosis (IPF) is the most common form of ILD that is referred for lung transplantation (King 2023; ISHLT 2021).

Chronic Obstructive Pulmonary Disease (COPD) is the world’s third leading cause of death according to the World Health Organization (WHO 2020). In the United States, COPD was the fourth leading cause of death. Approximately 15.7 million Americans, or roughly 6.4% of the population, have been diagnosed with COPD (CDC 2023). However, there may be a significantly higher number of cases yet to be diagnosed as COPD in the United States as more than 50% of adults with low pulmonary function were not aware that they had COPD when receiving an official diagnosis (CDC 2023). Women are typically diagnosed with COPD during the advanced stages of the disease while men are typically diagnosed in the earlier stages of the disease, leading to a decline in age-adjusted death rates for men while the death rates for women have remained the same (CDC 2023). Treatment for COPD in women tends to be less effective due to the advanced stages of disease on diagnosis. COPD is typically diagnosed using PFT trending, specifically spirometry (CDC 2023). The BODE index is typically used in conjunction with PFTs to assess a patient for referral for transplant evaluation at a transplant center (²Hachem 2023). The BODE index provides a score from 0-10 based on **body mass index, airflow obstruction, dyspnea, and exercise capacity** (²Hachem 2023). A higher score indicates a lower 4-year survival rate (²Hachem 2023). Approximately 30.6% of all lung transplants occur in individuals with COPD (GOLD 2023).

Cystic Fibrosis (CF) is an inherited genetic disorder resulting from mutations in the cystic fibrosis transmembrane conductance regulator gene (CDC 2022). According to Simon (2023), “CF is a multisystem disease” that causes dysfunction of multiple organs. The most common cause of mortality in patients with CF is pulmonary disease as CF causes thick, sticky mucus that blocks the airways and can lead to lung damage (CDC 2022; Simon 2023). In addition, CF can increase the risk of recurrent respiratory infections due to germs becoming trapped in the thick, sticky mucus (CDC 2022). Those with CF have a decreased ability to absorb nutrients from food due to proteins needed for digestion not reaching the intestines. Various organs can be affected by CF which may lead to other health conditions such as diabetes, cirrhosis of the liver, arthritis, reflux, hypersplenism, and osteoporosis (CDC 2022). Due to being inherited, genetic counseling and testing is recommended if there is a family history of CF (CDC 2022). Screening for CF is part of newborn screening panels in the United States as early detection allows for early treatment. Regular treatments for CF consist of airway clearance therapies, bronchodilators, pancreatic enzyme replacement therapies, anti-inflammatory therapies, and infection prevention (Simon 2023). Routine PFTs are also performed to assess and trend

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lung function (Simon 2023). Lung transplantation may be indicated if the disease progresses and symptoms such as massive hemoptysis and recurrent pneumothorax develop (Simon 2023). Other indications for referral for transplant evaluation include rapidly declining PFT results, more than 2 exacerbations per year requiring intravenous antibiotics, a body mass index < 18 despite improving nutritional status, and hypoxemia or hypercarbia (Ramos et al. 2019). Referral for a transplant evaluation is recommended earlier in the disease process “to allow patients and their families to better prepare for transplantation medically and psychologically (2Hachem 2023).” Approximately 35,000 people in the United States have cystic fibrosis (CDC 2022).

Bronchopulmonary dysplasia (BPD) is a chronic lung disease that is most common in infants born prematurely due to underdeveloped and immature lungs, but it may also affect older infants that are born with conditions that affect normal lung development (NORD 2023). BPD develops after birth and affects normal breathing with some infants requiring supplemental oxygen therapy following discharge from the hospital (NORD 2023). While many children recover, BPD may cause long-term breathing difficulties due to progressive pulmonary deterioration which could warrant a lung transplant (Dani et al. 2023). The disease affects 10,000-15,000 infants annually in the United States. The risk of developing BPD increases with a lower birth weight (< 2.2 pounds) and a lower gestational age at birth (NORD 2023). The incidence of BPD has continued to increase as medical teams are able to keep infants with much lower gestational ages and birth weights alive compared to the past due to advances in medicine, such as surfactant and improved mechanical ventilation and non-invasive ventilation strategies (Dani et al. 2023; NORD 2023).

Other conditions that may warrant lung transplantation include pulmonary hypertension, and heart disease or heart defects. Hereditary conditions and other diseases causing severe lung damage such as sarcoidosis, histiocytosis, and lymphangioleiomyomatosis may also necessitate transplantation. *Lung cancer is not a condition for which transplant is generally recommended.*

Transplant Risks

Risks of lung transplantation include bleeding, infection, blockage of the arteries and/or blood vessels to the new lung(s), blockage of the airways, severe pulmonary edema, and blood clots (Ahya & Kawut 2022). A major risk of transplant is allograft rejection which is the body’s normal reaction to a foreign object or tissue (Ahya & Kawut 2022). Immunosuppressive agents are typically used to reduce the risk of allograft rejection; however, there are several side effects associated with immunosuppression that may complicate the recovery period. Each transplant program is responsible for assessing each recipient’s individual risk factors to determine if there are contraindications to transplant (ISHLT 2021).

Types of Lung Transplantation

Single Lung Transplant (SLT): This type of transplant “accounts for approximately 15-20% of adult lung transplantations (Hartwig & Klapper 2023).” SLT is commonly performed in patients with idiopathic pulmonary fibrosis and may also be performed in patients with other disease processes, such as COPD and mild to moderate pulmonary hypertension, as a means to extend the limited supply of donor lungs (3Hachem 2023; Hartwig & Klapper 2023). The lung with worse pulmonary function is chosen for replacement (Hartwig & Klapper 2023). If both lungs function equally, then the right lung is usually favored for removal, as this avoids having to maneuver around the heart which is required for excision of the left lung (Hartwig & Klapper 2023).

Bilateral Lung Transplant (BLT): A BLT can be performed sequentially, en bloc, or simultaneously. Removal of both lungs is mandatory in patients with end stage CF as SLT “provides less lung function as a buffer for late complications..” BLT is also preferred for patients with severe pulmonary hypertension and bronchiectasis (Hartwig & Klapper 2023).

Heart-Lung Transplant (HLT): An HLT refers to transplantation of the heart and one or both lungs from a single cadaver donor. An HLT is intended to prolong survival and improve function in recipients with end stage cardiopulmonary disease. Indications for an HLT include complex congenital heart disease with Eisenmenger syndrome, nonidiopathic pulmonary hypertension due to congenital heart disease, CF, cardiomyopathy, and idiopathic pulmonary hypertension. Advancements in the medical management of pulmonary hypertension and congenital heart disease (including Eisenmenger syndrome) have decreased the need for HLT. In addition, HLT is less preferred to isolated lung and heart transplantation as there are disadvantages to combined HLT including “the need to procure a heart-lung block [leading] to increased waiting time and increased mortality among patients awaiting combined HLT” and “exposure of the recipient to the risks of both graft coronary artery vasculopathy and chronic lung allograft dysfunction (Singer & Mooney 2023).”

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Living Donor Lobar Transplant: Living donor lobar lung transplantation involves the transplantation of a lung lobe or lobes from one or two healthy donors to replace the diseased lung(s) of a recipient with end-stage lung disease. The indications for this type of transplant include improvement of functional status and quality of life as well as to prolong survival in a patient who requires lung transplantation but whose deteriorating condition will likely lead to death before a cadaveric organ becomes available. Each donor donates only one lung lobe. The decision concerning which lobe should be donated is based on an optimal size match between the potential donor and the recipient. This transplant option is "limited to children and adults with small stature." Most living donor lung recipients are patients with CF and most lung donors are first-degree relatives who are compatible in terms of size and ABO blood group. Living donation is an alternative to cadaveric organ donation particularly when cadaveric transplantation is unavailable, or in patients who are deteriorating clinically to the point of transplant ineligibility while waiting for a cadaveric donor. Living donation may also be an option for critically ill children, due to a shortage of suitable cadaveric donors for this patient population (³Hachem 2023).

Split Lung Bilateral Lobar Transplant: With this procedure, a single left lung from a donor who is approximately 15% taller than the recipient is divided such that the left upper and lower lobes are implanted into the recipient's right and left hemithorax, respectively. The principal advantage of split lung bilateral lobar transplantation is that it permits single lung transplantation from a donor with a large size discrepancy with the recipient, such as a small adult or child (³Hachem 2023).

Retransplantation: Retransplantation refers to replacing a previously transplanted lung or lungs (primary transplant) with a new donor lung or lungs following graft failure. Retransplantation is only considered in carefully selected patients due to the difficulties associated with retransplantation. The surgical procedure is much more complicated due to the thoracic adhesions present from the primary transplantation. In addition, survival following retransplantation is significantly worse with median survival post-transplant currently 3.1 years versus 6.2 years for primary transplantation (³Hachem 2023).

COVERAGE POLICY

All **transplants** require prior authorization from the Corporate Transplant Department. Solid organ transplant requests will be reviewed by the Corporate Senior Medical Director or qualified clinical designee. All other transplants will be reviewed by the Corporate Senior Medical Director or covering Medical Director. If the criteria are met using appropriate NCD and/or LCD guidelines, State regulations, and/or MCP policies the Corporate Senior Medical Director's designee can approve the requested transplant.

Office visits with participating Providers do NOT require prior authorization. Providers should see the Member in office visits as soon as possible and without delay. Failure to see the Member in office visits may be considered a serious quality of care concern.

Please see MCP-459 Pre-Transplant and Transplant Evaluation for pre-transplant criteria and transplant evaluation criteria that must be met prior to solid organ transplant.

Adult and Pediatric Criteria for Lung Transplantation

Member must meet **ONE** of the following:

1. Single, bilateral, or donor lobar lung organ transplantation from a deceased or a living donor **is considered medically necessary** in adult and pediatric members when **ALL** the following criteria are met:
 - a. All transplant evaluation criteria are met
 - b. Documentation that all medical, pharmaceutical, and surgical alternatives to lung transplant have been utilized if applicable that includes, but is not limited to:
 - Oxygen therapy
 - Pulmonary rehabilitation
 - Lung volume reduction surgery for patients with chronic obstructive lung disease.

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- c. Living Donor lobar lung transplant requests require documentation supporting the Member's inability to survive the wait for a deceased donor allograft:
 - If donor lobar lung transplant is not performed, they may become ineligible for lung transplantation due to clinical deterioration
 - Ambulatory with meeting requirements for receiving pulmonary rehab
 - End stage pulmonary disease with a life expectancy < 18 months without a transplant
 - No other serious systemic disease or condition affecting long term survival
 - No documented history of non-compliance.
- d. For multi-organ heart and lung transplant requests, criteria must be met for each organ requested (see individual policy for heart transplantation criteria)

2. Disease specific criteria as outlined below:

- a. **Chronic Obstructive Lung Disease** (e.g., COPD, emphysema, alpha-1 antitrypsin disease, Bronchiolitis Obliterans Syndrome [BOS], bronchiectasis). SLT or BLT is indicated and guidelines for transplantation include:
 - BODE index score of ≥ 7 measured by a six-minute walk test and the presence of **ONE** of the following:
 - i. History of hospitalization for exacerbation of COPD associated with acute hypercapnia (partial pressure of carbon dioxide in arterial blood [PaCO_2] ≥ 50 mmHg)
 - ii. Three or more severe exacerbations within the preceding year
 - iii. Refractory dependence on noninvasive ventilatory assistance
 - iv. Forced expiratory volume in one second (FEV_1) < 20% of predicted, without reversibility
 - v. Elevated $\text{PaCO}_2 > 50$ mmHg with progressive deterioration requiring long term oxygen therapy (defined as ≥ 6 months)
 - vi. Moderate to severe pulmonary hypertension (e.g., mean pulmonary artery pressure greater than 35 mmHg or mean right atrial pressure greater than 15 mmHg) or cor pulmonale despite oxygen therapy.
- b. **Cystic Fibrosis**. Only BLT is indicated and guidelines for transplantation include **ANY** of the following:
 - Congenital pulmonary disease (e.g., pulmonary hypoplasia, bronchopulmonary dysplasia, surfactant disorders, hereditary hemorrhagic telangiectasia)
 - $\text{FEV}_1 \leq 30\%$ of predicted value
 - Hypercapnia (defined as $\text{PaCO}_2 \geq 50$ mm hg)
 - Increasing frequency of exacerbations requiring cycling antibiotic therapy
 - Oxygen-dependent respiratory failure
 - Pulmonary hypertension (mean pulmonary artery pressure > 20 mmHg)
 - Refractory and/or recurrent pneumothorax
 - Refractory dependence on noninvasive ventilatory assistance
 - Rapid respiratory deterioration with $\text{FEV}_1 < 30\%$ with **ONE** of the following despite medical management:
 - i. Increasing numbers of hospitalizations
 - ii. Exacerbation requiring ICU stay or mechanical ventilation
 - iii. Refractory or recurrent pneumothorax
 - iv. Recurrent hemoptysis not controlled by embolization
 - v. Ongoing weight loss despite aggressive nutritional supplementation.
- c. **Interstitial Lung Disease** (e.g., IPF and interstitial pneumonia). SLT or BLT is indicated and guidelines for transplantation include:
 - Histologic or radiographic evidence of IPF and **ANY** of the following:
 - i. Symptomatic (e.g., oxygen desaturation with rest or exercise), progressive disease with failure to improve or maintain lung function despite standardized optimal therapy (e.g., supplemental oxygen, pulmonary rehabilitation)
 - ii. A 10% or greater decrease in forced vital capacity (FVC) during 6 months of follow-up

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- iii. Diffusion capacity for carbon monoxide (DLCO) < 40% of predicted or decline of 15% or more over 6 months
 - iv. Extensive reticulation or honeycomb change on CT scan
 - v. Pulse oximetry less than 88% or distance less than 250 meters (820 feet) during 6-minute walk test
 - vi. Pulmonary hypertension (mean pulmonary artery pressure > 20 mmHg)
 - vii. Decrease in 6-minute walk test distance by more than 50 meters (165 feet) over 6 months.
- d. **Sarcoidosis.** SLT or BLT is indicated and guidelines for transplantation include:
- New York Heart Association (NYHA) functional class III or IV and ANY of the following:
 - i. Pulmonary hypertension (mean pulmonary artery pressure > 20 mmHg)
 - ii. Hypoxemia at rest (partial pressure of oxygen in arterial blood [PaO₂] < 55 mmHg)
 - iii. Right atrial pressure > 15 mmHg.
- e. **Scleroderma.** SLT or BLT is indicated and guidelines for transplant include:
- FVC below 70% to 80% predicted at the time of diagnosis.
- f. **Pulmonary Hypertension** (e.g., idiopathic pulmonary hypertension or IPH). BLT is preferred and guidelines for transplantation include:
- No feasible pulmonary thromboendarterectomy for patients with chronic pulmonary thromboembolic disease
 - No successful control of pulmonary hypertension with pharmacogenic agents (e.g., calcium channel blockers or endothelin receptor antagonists)
 - **ANY** of the following:
 - i. Persistent NYHA functional class III or IV despite maximal medical therapy for 3 months (e.g., combination therapy including prostanoids)
 - ii. Low (350 meter) six-minute walk test
 - iii. Cardiac index < 2 liters per minute per square meter
 - iv. Right atrial pressure >15 mm Hg
 - v. Mean pulmonary arterial pressure > 20 mm hg
 - vi. Refractory right heart failure (progressive renal insufficiency, increasing bilirubin, refractory ascites, increasing brain natriuretic peptide levels).
- g. **Congenital Heart Disease** (e.g., Eisenmenger syndrome). SLT or BLT is indicated and guidelines for transplant include **ALL** the following:
- NYHA functional class III or IV
 - Pulmonary hypertension
 - Severe progression of symptoms despite optimal medical management.
- h. **Pulmonary Langerhans Cell Histiocytosis (PLCH), Lymphangioleiomyomatosis (LAM) and Eosinophilic Granuloma.** SLT or BLT is indicated and guidelines include:
- NYHA functional class III or IV and **ANY** of the following:
 - i. Severe impairment in lung function and exercise capacity (VO₂ max < 50%)
 - ii. Hypoxemia at rest (PaO₂ < 55 mmHg).
- i. **Graft versus host disease** and **ANY** of the following:
- Progressive lung damage resulting in severe compromise of activities of daily living
 - Life expectancy limited by lung disease.
- j. **Other end-stage lung disease with Member not expected to recover without transplant (e.g., prolonged acute respiratory distress syndrome [ARDS] and acute fulminant lung damage including post-coronavirus 2019 [COVID-19] infection).** BLT is indicated.
- j. **Retransplantation.** When retransplantation is considered, **ALL** the following factors must be present:
- Member must be ambulatory
 - Ventilator independent
 - Free of significant co-morbidities

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- Meet all other requirements for transplantation outlined above and have **ONE** of these indications:
 - i. Non-function of the grafted organ
 - ii. Rejection refractory to immunosuppressive therapy
 - iii. Bronchiolitis obliterans (chronic rejection)
 - iv. Airway complications not correctable by other measures.

NOTE: Requests for third or subsequent lung transplantation may not be authorized

3. For HLT, a simultaneous heart and lung transplantation may be authorized when **ALL** the following criteria are met:
 - a. Severe refractory end stage heart failure
 - b. **ONE** of the following conditions:
 - End-stage lung disease
 - Irreversible pulmonary hypertension
 - c. **ONE** of the following conditions:
 - Congenital heart disease with Eisenmenger syndrome
 - Cystic fibrosis
 - End-stage parenchymal lung disease with severely compromised left ventricular function (e.g., sarcoidosis).

Limitations and Exclusions

Single, bilateral, or donor lobar lung organ and heart-lung transplantation **is considered not medically necessary** when the above criteria are not met.

DOCUMENTATION REQUIREMENTS. Molina Healthcare reserves the right to require that additional documentation be made available as part of its coverage determination; quality improvement; and fraud; waste and abuse prevention processes. Documentation required may include, but is not limited to, patient records, test results and credentials of the provider ordering or performing a drug or service. Molina Healthcare may deny reimbursement or take additional appropriate action if the documentation provided does not support the initial determination that the drugs or services were medically necessary, not investigational, or experimental, and otherwise within the scope of benefits afforded to the member, and/or the documentation demonstrates a pattern of billing or other practice that is inappropriate or excessive.

SUMMARY OF MEDICAL EVIDENCE

National and Specialty Organizations

The following national and specialty organization publications are available on the topic of lung and/or heart transplantation. Links are available in the Reference section.

Global Initiative for Chronic Obstructive Lung Disease (GOLD)

GOLD published an updated strategy report in 2023 for the diagnosis, management, and prevention of COPD (GOLD 2023). Recommendations specific to lung transplant referral include patients with COPD who “have progressive disease despite maximal medical treatment, are not candidates for lung volume reduction surgery, have a BODE index of 5 to 6, a PaCO₂ > 50mmHg and/or PaO₂ < 60mmHg and FEV₁ < 25%.” GOLD recommends that patients be listed for transplant “when the BODE index is > 7, FEV₁ is < 15-20%, and they have had three or more severe exacerbations during the previous year, one severe exacerbation with hypercapnic respiratory failure, or have moderate to severe pulmonary hypertension.” GOLD notes that over 70% of lung transplants in patients with COPD are BLTs. SLTs may be performed in patients with COPD but there are potential complications for the native lung, including hyperinflation (15-30% occurrence rate) and lung cancer (occurrence rate 5.2-6.1%). Additionally, patients with advanced emphysema may require lung volume reduction surgery (LVRS) or endoscopic lung volume reduction (ELVR) in the native lung to treat hyperinflation following SLT. Patients with advanced emphysema may also undergo LVRS or ELVR prior to lung transplantation to delay the need for transplant or optimize their condition prior to lung transplantation.

European Society of Cardiology and European Respiratory Society (ESC/ERS)

The ESC/ERS published the 2022 ESC/ERS Guidelines for the Diagnosis and Treatment of Pulmonary Hypertension to propose management strategies for patients with pulmonary hypertension (Humbert et al. 2022). The guidelines recommend evaluation for lung transplant referral in patients that are refractory to optimized medical therapy, present

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with an intermediate-high or high-risk of death, and have a disease variant that responds poorly to medical therapy. The guidelines also recommend referral for progressive disease or recent hospitalization for worsening pulmonary hypertension, a need for intravenous or subcutaneous prostacyclin therapy, and signs of secondary liver or kidney dysfunction due to pulmonary hypertension or other potentially life-threatening complications. Heart-lung transplantation remains an option for those with significant cardiac and pulmonary dysfunction; however, heart-lung transplantation remains limited by the availability of organs and the complexities of a combined heart-lung transplantation. The ESC/ERS states that connective tissue disease is not a contraindication for lung transplantation.

International Society for Heart and Lung Transplantation (ISHLT)

The ISHLT published the *Consensus Document for the Selection of Lung Transplant Candidates* (Leard et al. 2021) which provides guidance regarding timely referral, assessment, optimization, and listing of potential lung transplant candidates. The 2021 report highlights how comorbidities and other risk factors interact to affect post-transplant survival benefit. The guidelines also list absolute contraindications and notes that “most lung transplant programs should not transplant patients with [those] risk factors except under very exceptional or extenuating circumstances.” The ISHLT agrees that lung transplantation improves survival and quality of life. However, the panel acknowledges that when making recommendations about allocating a scarce resource, survival benefit should be prioritized.

The **Cystic Fibrosis Foundation** published consensus guidelines for lung transplant referral for individuals with CF (Ramos et al. 2019). The following are indications for lung transplant referral:

- Patients that have an FEV₁ < 50% of predicted.
- Patients that have an FEV₁ < 40% predicted and > 2 exacerbations per year requiring intravenous antibiotics or 1 exacerbation requiring positive pressure ventilation regardless of FEV₁.
- Those ≥ 18 years of age who have an FEV₁ < 50% of predicted and rapidly declining (>20% relative decline within 12 months) **or** FEV₁ < 40% of predicted with markers of shortened survival **or** FEV₁ < 30% of predicted.
- Those < 18 years of age who have an FEV₁ < 50% of predicted and rapidly declining (>20 relative decline within 12 months) **or** FEV₁ is < 50% of predicted with markers of shortened survival **or** FEV₁ < 40% of predicted.
- Adults with a body mass index < 18 and FEV₁ < 40% predicted while concurrently working to improve nutritional state.
- Patients with an FEV₁ < 40% predicted and massive hemoptysis requiring intensive care admission or bronchial artery embolization.
- Patients with an FEV₁ < 40% and a pneumothorax.

Markers of shortened survival include a 6-minute walk test distance < 400 meters, hypoxemia at rest or with exertion, hypercarbia (PaCO₂ > 50mmHg) on arterial blood gas, and pulmonary hypertension on echocardiogram (PA systolic pressure > 50mmHg) or evidence of right ventricular dysfunction in the absence of a tricuspid regurgitant jet. The Cystic Fibrosis Foundation also recommends ensuring modifiable barriers, such as nutritional status, diabetes management, physical inactivity or deconditioning, adherence behaviors, mental health issues, substance use, and psychosocial factors be addressed preemptively to optimize transplant candidacy.

National Institute for Health and Clinical Excellence (NICE)

The 2018 guidance *Chronic Obstructive Pulmonary Disease in Over 16s: Diagnosis and Management (NG115)* provides guidance for COPD as well as emphysema and chronic bronchitis in individuals aged 16 and older. A goal is to help providers diagnose patients earlier to obtain optimal benefit from treatments and improve quality of life.

Two major recommendations are also included (NICE 2018). First, referrals should be considered to a multidisciplinary team including lung transplantation specialists for patients who:

- Have severe COPD with FEV₁ less than 50% and breathlessness that affects their quality of life despite optimal medical treatment; and
- Are non-smokers; and
- Have completed pulmonary rehabilitation; and
- Do not have contraindications for transplantation such as comorbidities or frailty.

Secondly, NICE recommends that providers do not use previous lung volume reduction procedures as a reason not to refer a person for assessment for lung transplantation. This was modified previously as evidence demonstrated that

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those with severe COPD had improvements in lung function, exercise capacity, quality of life, and long-term mortality as a result of LVRS.

NICE also published guidelines in 2017 for the diagnosis and management of IPF (NICE 2017). Recommendations specific to lung transplantation include discussing transplantation as a treatment option between 3-6 months after diagnosis unless clinical condition warrants earlier referral and provided there are no absolute contraindications to transplant.

SUPPLEMENTAL INFORMATION

Pulmonary Function Tests

PFTs are performed to assess pulmonary function in patients that have a history, risk factors, or symptoms of lung disease. There are numerous forms of PFTs that may be performed in outpatient or inpatient settings. The outpatient setting is generally preferred as a greater range of testing may be performed with better accuracy. Results from PFTs are interpreted to determine the degree and type of physiologic impairment (restrictive or obstructive). The most common types of PFTs are spirometry, pre- and post-bronchodilator spirometry, lung volumes, and diffusing capacity for carbon monoxide. The most common measurements are (Kaminsky 2022):

- **FVC:** total exhaled volume after maximum inspiration.
- **FEV₁:** the total volume exhaled in the first second of forceful and complete exhalation.
- **FEV₁/FVC:** the proportion of a person's vital capacity they can expire in the first second of forced expiration to the full FVC.
- **DLCO:** measurement of the diffusing capacity of carbon monoxide in a single breath.

New York Heart Association (NYHA) Functional Classification

NYHA classification has served as a vital tool for risk stratification of heart failure and for determining clinical trial eligibility and medication and device candidate eligibility (AHA 2023):

- **Class I:** Individuals with cardiac disease but without resulting limitation of physical activity; ordinary physical activity does not cause undue fatigue, palpitation, dyspnea, or anginal pain; symptoms only occur on severe exertion.
- **Class II:** Individuals with cardiac disease resulting in slight limitation of physical activity; they are comfortable at rest; ordinary physical activity (e.g., moderate physical exertion such as carrying shopping bags up several flights of stairs) results in fatigue, palpitation, dyspnea, or anginal pain.
- **Class III:** Individuals with cardiac disease resulting in marked limitation of physical activity; they are comfortable at rest; less than ordinary activity causes fatigue, palpitation, dyspnea or anginal pain.
- **Class IV:** Individuals with cardiac disease resulting in inability to carry on any physical activity without discomfort; symptoms of HF or the anginal syndrome may be present even at rest; if any physical activity is undertaken, discomfort is increased.

BODE Index

The BODE index is a measurement to assess risk of mortality in patients with COPD and uses the following factors as indicators: weight (BMI), airway obstruction (FEV₁), dyspnea, and exercise capacity. Factors are calculated together, and the approximate four-year survival interpretation is: 0-2 = 80%, 3-4 = 67%, 5-6 = 57%, 7-10 = 18% (Hachem 2023).

CODING & BILLING INFORMATION

CPT (Current Procedural Terminology) Codes

Code	Description
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

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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
33935	Heart-lung transplant with recipient cardiectomy-pneumonectomy
33930	Donor cardiectomy-pneumonectomy (including cold preservation)
33933	Backbench standard preparation of cadaver donor heart/lung allograft prior to transplantation, including dissection of allograft from surrounding soft tissues to prepare aorta, superior vena cava, inferior vena cava, and trachea for implantation

HCPCS (Healthcare Common Procedure Coding System) Codes

Code	Description
S2060	Lobar lung transplantation
S2061	Donor lobectomy (lung) for transplantation, living donor
S2152	Solid organ(s), complete or segmental, single organ or combination of organs; deceased or living donor(s); procurement, transplantation, and related complications including: drugs; supplies; hospitalization with outpatient follow-up; medical/surgical, diagnostic, emergency, and rehabilitative services; and the number of days pre- and post-transplant care in the global definition

CODING DISCLAIMER. Codes listed in this policy are for reference purposes only and may not be all-inclusive. Deleted codes and codes which are not effective at the time the service is rendered may not be eligible for reimbursement. Listing of a service or device code in this policy does not guarantee coverage. Coverage is determined by the benefit document. Molina adheres to Current Procedural Terminology (CPT®), a registered trademark of the American Medical Association (AMA). All CPT codes and descriptions are copyrighted by the AMA; this information is included for informational purposes only. Providers and facilities are expected to utilize industry standard coding practices for all submissions. When improper billing and coding is not followed, Molina has the right to reject/deny the claim and recover claim payment(s). Due to changing industry practices, Molina reserves the right to revise this policy as needed.

APPROVAL HISTORY

06/12/2024	Coverage criteria revised with removal of transplant evaluation, continuation of therapy, and general contraindication coverage criteria as it is now stipulated in MCP 459 Pre-Transplant and Transplant Evaluation. Annual Review Scheduled for October 2024.
10/12/2023	Policy reviewed, changes to criteria include addition of other end-stage lung disease criteria, removed rapid fall in FEV1 for CF, age for colonoscopy reduced to 45 years, addition of non-life limiting neurological impairment criteria, removal of abnormal serology criteria and cannabis use section, and added substance use/vaping/smoking/inhaled cannabis to absolute contraindications. Updated Overview, Summary of Medical Evidence, and References. IRO Peer Review on September 22, 2023, by a practicing, board-certified physician with specialties in Surgery, Vascular Surgery, and Surgical Critical Care.
10/12/2022	Policy reviewed, no changes to criteria, included section on marijuana use, updated Overview and Summary of Medical Evidence.
10/13/2021	Policy reviewed, no criteria updates, updated references. Coding section updated; removed CPT codes 33930, 33933, 33935.
09/16/2020	Policy updated with additional disease specific criteria for COPD, cystic fibrosis, congenital heart disease, interstitial lung disease, PAH, PLCH, and graft vs. host disease, updated references.
09/18/2019	Policy reviewed, no changes.
09/13/2018	Policy reviewed, no changes.
06/22/2017	Policy reviewed, no changes.
09/15/2016	Policy reviewed, no changes.
04/27/2015	Policy updated with new pretransplant criteria; Summary of Medical Evidence section condensed. Added one new indication for individuals with scleroderma.
08/30/2012	New policy.

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