

Medical Policy

**Transplantation of Lung or Lobar Lung**

**Policy Number:** OCA 3.24

**Version Number:** 19

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<b>Product Applicability</b>		<input checked="" type="checkbox"/> <b>All Plan<sup>+</sup> Products</b>
<b>WellSense Health Plan</b>	<b>Boston Medical Center HealthNet Plan</b>	
<input checked="" type="checkbox"/> NH Medicaid	<input checked="" type="checkbox"/> MassHealth ACO	
<input checked="" type="checkbox"/> NH Medicare Advantage	<input checked="" type="checkbox"/> MassHealth MCO	
	<input checked="" type="checkbox"/> Qualified Health Plans/ConnectorCare/Employer Choice Direct	
	<input checked="" type="checkbox"/> Senior Care Options	

+ Note: Disclaimer and audit information is located at the end of this document.

**Policy Summary**

The Plan considers lung transplantation for end-stage pulmonary disease for adults and children to be **medically necessary** when applicable Plan medical criteria are met, including lobar lung transplant and lung transplantation (single-lung or double-lung replacement). All transplant-related consults, evaluations, procedures, and post-transplant follow-up services should be managed within the Plan’s provider network or at the most appropriate preferred transplant facility (depending upon the type of transplant and clinical appropriateness) and according to the guidelines specified in the Plan’s *Transplant Administration* policy, policy number OCA 3.10.

**Prior authorization is required for ALL transplantation services provided to a Plan member (even when a separate Plan authorization has already been obtained for an inpatient admission but the authorization does NOT include transplantation services), with final approval required by a Plan Medical Director.** Prior authorization requests for transplantation services are evaluated with medical necessity criteria in the applicable Plan medical policy. If there is no Plan medical policy for the requested type of transplantation, the Plan uses InterQual® criteria to determine the medical

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necessity. It will be determined during the Plan's prior authorization process if the specific transplant service is considered medically necessary for the requested indication within the Plan's provider network, as appropriate. The Plan member must meet eligibility criteria from the transplanting institution for the requested transplantation services. The eligibility criteria of the transplanting institution must follow applicable United Network for Organ Sharing (UNOS) guidelines. The hospital in which the organ transplant is performed must be a member of the Organ Procurement and Transplantation Network (OPTN) and comply with applicable OPTN organ allocation and procurement guidelines.

## **Clinical Criteria**

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Lobar lung (from one or two donors) or lung transplantation (single-lung or double-lung replacement) is considered medically necessary when the medical record documentation supports that the member meets ALL of the following applicable criteria met in items A and B:

### **A. Initial Transplantation and Re-transplantation Criteria for Adult and Pediatric Members -**

Applicable criteria are met in EITHER item 1 or item 2:

#### **1. Initial Transplantation Criteria - ALL of the following criteria in items a through n must be met:**

- a. Diagnosis of end-stage lung disease for which maximum medical therapy is ineffective or unavailable; AND
- b. Limited life expectancy of no more than two (2) years; AND
- c. The likelihood of surviving at least 90 days after lung transplantation; AND
- d. Substantial limitation of daily activities; AND
- e. Evaluation demonstrating absence of potential complications and/or non-pulmonary medical comorbidity that could diminish the success of transplantation and limit the life expectancy substantially in the first five (5) years after transplantation; AND
- f. Evaluation of symptomatic gastroesophageal reflux disease (GERD); AND
- g. Acceptable nutritional status; AND
- h. Good rehabilitation potential; AND
- i. Compliance with medical management; AND
- j. Satisfactory psychosocial profile and emotional support system; AND

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- k. Abstinence from smoking for at least six (6) months when history includes smoking; AND
- l. Pre-surgical clearance by a cardiologist for the transplantation; AND
- m. All the transplanting institution's eligibility criteria are met; AND
- n. The transplant meets ONE (1) of the following criteria in item (1) or item (2):
  - (1) A deceased donor will be used for the lung transplant or lobar lung transplant; OR
  - (2) A living donor will be used rather than deceased donor for lobar lung transplant when the transplant team has determined the member is a suitable candidate for a living donor transplant and ONE (1) of the following criteria is met in items (a) through (c):
    - (a) A deceased donor is unavailable; OR
    - (b) Member is deteriorating clinically to the point of transplant ineligibility while waiting for deceased donor organ donation; OR
    - (c) Member is a critically ill child (due to shortage of suitable deceased donors); OR

2. **Re-transplantation Criteria** - Re-transplantation is covered when BOTH of the following criteria are met in items a and b:

- a. ALL criteria are met for the initial transplantation; AND
- b. The member has at least ONE (1) of the following indications listed in items (1) through (3):
  - (1) Graft failure of an initial lung or lobular lung transplant due to a technical reason (excluding serious reportable event and/or provider-preventable condition) or hyperacute rejection; OR
  - (2) Chronic rejection; OR
  - (3) Recurrent disease; AND

B. **Disease-Specific Criteria for Adult and Pediatric Members** - BOTH criteria must be met in items 1 and 2:

- 1. ALL applicable criteria are met for EITHER an initial transplant or re-transplantation; AND
- 2. The member has at least ONE (1) of the following diseases and ALL applicable criteria are met for that disease, as specified below in items a through e:

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- a. **Bronchiectatic Disease** - Includes but is not limited to cystic fibrosis, acquired bronchiectasis, or congenital bronchiectasis with ALL of the following clinical indications listed in items (1) through (4):
- (1) Forced expiratory volume in 1 second (FEV1)  $\leq$  30% of predicted value or rapid respiratory deterioration with FEV1  $>$ 30%; AND
  - (2) PaCO<sub>2</sub>  $>$  50 mm Hg; AND
  - (3) PaO<sub>2</sub>  $<$  55 mm Hg; AND
  - (4) Increasing frequency and severity of exacerbations; OR
- b. **Nonbronchiectatic Disease** - Includes but not limited to COPD, emphysema, alpha-1 antitrypsin disease, bronchiolitis obliterans syndrome, chronic bronchitis and ALL criteria are met in items (1) through (5):
- (1) FEV1  $<$  25% of the predicted value; AND
  - (2) PaCO<sub>2</sub>  $\geq$  55 mm Hg; AND
  - (3) PaO<sub>2</sub>  $<$  55-60 mm Hg; AND
  - (4) Elevated pulmonary artery pressures (secondary pulmonary hypertension); AND
  - (5) Clinical course - rapid rate of decline in FEV1 or life-threatening exacerbations; OR
- c. **Interstitial Lung Disease** - Includes but not limited to idiopathic pulmonary fibrosis, interstitial pulmonary fibrosis, sarcoidosis, scleroderma, lymphangiomyomatosis, eosinophilic granuloma, pneumoconiosis or other lung disease due to external agents such as asbestos, crystalline silica, organic coal dust, histiocytosis X and ALL of the following clinical indications in items (1) through (5) are documented:
- (1) Symptomatic, progressive disease with failure to respond to optimal treatment; AND
  - (2) Vital capacity  $<$  60% to 65% of predicted value; AND
  - (3) Diffusing capacity of lung for carbon monoxide  $<$  50% to 60% of predicted value; AND
  - (4) Resting hypoxemia with PaO<sub>2</sub>  $<$  55 mm Hg; AND
  - (5) Rapid progression of IPF warrants early referral; OR

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- d. **Pulmonary Hypertension** - Includes but is not limited to primary or secondary due to cardiac disease, idiopathic pulmonary hypertension, pulmonary emboli, or Eisenmenger's syndrome with ALL of the following clinical indications listed in items (1) through (5):
  - (1) New York Heart Association functional class III or IV; AND
  - (2) Mean right atrial pressure of greater than 10 mm Hg; AND
  - (3) Mean pulmonary arterial pressure of greater than 50 mm Hg; AND
  - (4) Cardiac index of less than 2.5 L/min/m<sup>2</sup>; AND
  - (5) Failure of therapy with long-term prostacyclin infusion; OR
- e. **Untreatable End-Stage Pulmonary Disease of Any Etiology**

## **Limitations and Exclusions**

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1. **Heart-Lung Transplantation:** Plan Medical Director Review is required for requests for a heart-lung transplantation. The eligibility criteria of the transplanting institution must comply with the applicable United Network for Organ Sharing (UNOS) guidelines and recipient selection criteria developed by the International Society of Heart and Lung Transplantation (ISHLT).
2. **Genetic Testing:** Plan prior authorization is required for genetic testing according to the guidelines in the Plan's *Genetic/Genomic Testing and Pharmacogenetics* medical policy, policy number OCA 3.727, including genetic testing to estimate the probability of active rejection with AlloMap, AlloSure, or myTAIHEART. Plan-adopted InterQual® criteria must be met.
3. **Services Considered Experimental and Investigational or NOT Medically Necessary:**

The Plan considers ANY of the following services experimental and investigational or NOT medically necessary due to limited evidence demonstrating the clinical utility or clinical validity of treatment, as specified below in items a through c:

  - a. Lung transplantation for an individual with coronary artery disease not amenable to percutaneous intervention or bypass grafting, or an individual with coronary artery disease associated with significant impairment of left ventricular function.
  - b. Lung xenotransplantation (e.g., porcine xenografts) for any indication.
  - c. Prophylactic anti-reflux surgery to improve lung function and survival in lung transplant recipient without gastroesophageal reflux disease.

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4. **Contraindications:** The treating provider must submit clinical documentation explaining why the member with any of the following contraindications is an appropriate candidate for the requested transplant, as specified below in item a or item b:
- a. **Absolute contraindications**, where there is generally no reasonable circumstance for undertaking transplant surgery, are specified below in items (1) through (3):
- (1) Irreversible end-stage disease not attributed to lung disease; OR
  - (2) Immunosuppressed or potentially exacerbated by immunosuppression with at least ONE (1) of the following conditions, as specified below in items (a) through (i):
    - (a) Known active malignancy, including metastatic cancer, other than non-melanomatous skin cancer; OR
    - (b) Recently treated malignancy within two years of curative treatment with no evidence of recurrence (within five years for breast cancer, colorectal cancer, melanoma); this does NOT include early stage cancer when cancerous growth or tumor is confined to the original site and has not spread to surrounding tissue or other organs (i.e., carcinoma in situ, preinvasive carcinoma, in situ lesions); OR
    - (c) Malignancy with a moderate or high risk of recurrence; OR
    - (d) AIDS (diagnosis based on CDC definition of CD4 count, 200cells/mm<sup>3</sup>) **unless** ALL of the following are noted, as specified below in items i through iv:
      - i. CD4 count >200cells/mm<sup>3</sup> for > 6 months; AND
      - ii. HIV-1 RNA undetectable; AND
      - iii. On stable anti-retroviral therapy > 3 months; AND
      - iv. No other complications from AIDS; OR
    - (e) Complicated or uncontrolled diabetes mellitus; OR
    - (f) Hepatitis B virus antigen positive (surface, core or both) based on criteria established by the transplantation center; OR
    - (g) Cirrhosis; OR
    - (h) Significant untreatable infection outside lungs and upper respiratory tract; OR

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- (i) Other systemic disease that could be exacerbated by immunosuppression.
- (3) Member has at least ONE (1) of the following other conditions in items (a) through (q):
- (a) Active substance abuse or active smoking within the last six (6) months; OR
  - (b) Psychosocial or other conditions affecting the member's ability to adhere to the therapeutic regimen necessary to preserve the transplant; OR
  - (c) Acute or chronic infection that is not adequately treated; OR
  - (d) Active/symptomatic coronary artery disease with any of the following conditions in items i through iii:
    - i. Not amenable to percutaneous intervention or bypass grafting; OR
    - ii. Associated with significant impairment of left ventricular function; OR
    - iii. Without cardiac clearance for transplantation; OR
  - (e) Active systemic collagen vascular (connective tissue) disease; OR
  - (f) Body mass index  $35\text{kg}/\text{m}^2$  or higher; OR
  - (g) Cardiac insufficiency - right or left ventricular ejection fraction less than 20 percent; OR
  - (h) Demonstrated patient noncompliance which would place the organ at risk by not adhering to medical recommendations; OR
  - (i) Non-rehabilitative pulmonary disability; OR
  - (j) Donor recipient incompatible as proven by positive cross match testing; OR
  - (k) Member lack of acceptance of potential complications from immunosuppressive medications; OR
  - (l) Significantly impaired hepatic function characterized by persistent and marked elevation of INR or severe liver dysfunction from antituberculous therapy; OR
  - (m) Surgically remediable chronic thromboembolic disease; OR

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- (n) For a pediatric member (less than age 18 on the date of service), dysfunction of major organs other than the lung, particularly renal dysfunction with creatinine clearance of < 50, because of the impact of immunosuppressive drugs on renal function (and multiple-organ transplant may be considered as an alternative); OR
- (o) For an adult member (age 18 or older on date of service), extra-pulmonary, end-stage organ disease (and multiple-organ transplant may be considered as an alternative, when clinically appropriate); OR
- (p) Active mycobacterium tuberculosis; OR
- (q) Member is receiving high dose steroid therapy (more than 40 mg daily) that cannot be tapered or discontinued.

b. **Relative contraindications** are listed below in items (1) through (8):

- (1) Body mass index (BMI) less than 17 kg/m<sup>2</sup> or BMI 30 kg/m<sup>2</sup> to or 34.9 kg/m<sup>2</sup>; OR
- (2) Dependence on mechanical ventilation with clinically unstable pulmonary function tests; OR
- (3) Age greater than 65 years old on the date of service; OR
- (4) Significant chest wall or spinal deformity; OR
- (5) Previous pleurodesis, pleurectomy, or complicated cardiothoracic surgery (excluding simple pneumothorax treated with closed tube thoracostomy, open lung biopsy, or uncomplicated lobectomy) which increases the technical difficulty of extracting the native lung and the operative risk of lung transplantation; OR
- (6) Presence of significant esophageal dysfunction with ineffective esophageal motility that is likely to cause chronic rejection manifested as bronchiolitis obliterans syndrome, as determined by the treating provider or transplant surgeon; OR
- (7) For a pediatric member (less than age 18 on the date of service), severe musculoskeletal disease affecting the thorax (e.g., kyphoscoliosis) and progressive neuromuscular disease; OR
- (8) Member with another medical condition that may cause end-organ damage when the condition is not optimally treated before transplantation.



## Variations

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The Plan uses guidance from the Centers for Medicare & Medicaid Services (CMS) for medical necessity and coverage determinations for Senior Care Options (SCO) members and WellSense Medicare Advantage HMO members, including but not limited to national coverage determinations (NCDs), local coverage determinations (LCDs), local coverage articles (LCAs), and documentation included in Medicare manuals. At the time of the Plan's most recent policy review, no applicable clinical guidelines were found from CMS. Verify CMS criteria in effect for the requested service on the date of the prior authorization request for a SCO or WellSense Medicare Advantage HMO member. When there is no guidance from CMS for the requested service for the specified indication on the date of the prior authorization request, Plan-adopted clinical review criteria will be used to determine the medical necessity of the service.

## Applicable Coding

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The Plan uses and adopts up-to-date Current Procedural Terminology (CPT) codes from the American Medical Association (AMA), International Statistical Classification of Diseases and Related Health Problems, 10th revision (ICD-10) diagnosis codes developed by the World Health Organization and adapted in the United States by the National Center for Health Statistics (NCHS) of the Centers for Disease Control under the U.S. Department of Health and Human Services, and the Health Care Common Procedure Coding System (HCPCS) established and maintained by the Centers for Medicare & Medicaid Services (CMS). Since the AMA, NCHS, and CMS may update codes more frequently or at different intervals than Plan policy updates, the list of applicable codes included in this Plan policy is for informational purposes only, may not be all inclusive, and is subject to change without prior notification. Whether a code is listed in the Applicable Coding section of this Plan policy does not constitute or imply member coverage or provider reimbursement. Providers are responsible for reporting all services using the most up-to-date industry-standard procedure and diagnosis codes as published by the AMA, NCHS, and CMS at the time of the service.

Providers are responsible for obtaining prior authorization for the services specified in the Clinical Criteria and Limitation and Exclusions sections of this Plan policy, even if an applicable code appropriately describing the service that is the subject of this Plan policy is not included in this Applicable Coding section. Review the Plan's reimbursement policies for Plan billing guidelines. Coverage for services is subject to benefit eligibility under the member's benefit plan in effect at the time of the service. Member benefit documents are available at the following websites: [www.bmchp.org](http://www.bmchp.org) for BMC HealthNet Plan members, [www.SeniorsGetMore.org](http://www.SeniorsGetMore.org) for Senior Care Options members, [www.wellsense.org](http://www.wellsense.org) for WellSense New Hampshire Medicaid members, and [www.WellSense.org/Medicare](http://www.WellSense.org/Medicare) for WellSense Medicare Advantage HMO members.

CPT Codes	Description: Codes Covered When Medically Necessary
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

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<b>CPT Codes</b>	<b>Description: Codes Covered When Medically Necessary</b>
	bypass
32854	Lung transplant, double (bilateral sequential or en bloc); with cardiopulmonary bypass

<b>HCPCS Codes</b>	<b>Description: Codes Covered When Medically Necessary</b>
S2060	Lobar lung transplantation  Plan note: This code is NOT payable for the Senior Care Options product.
S2061	Donor lobectomy (lung) for transplantation, living donor  Plan note: This code is NOT payable for the Senior Care Options product.

## References

Ahmad U, Wang Z, Bryant AS, Kim AW, Kukreja J, Mason DP, Bermudez CA, Detterbeck FC, Boffa DJ. Outcomes for lung transplantation for lung cancer in the United Network for Organ Sharing Registry. *Ann Thorac Surg*. 2012 Sep; 94(3):935-40; discussion 940-1. doi: 10.1016/j.athoracsur.2012.04.069. Epub 2012 Jul 25. PMID: 22835555.

Allen JG, Arnaoutakis GJ, Weiss ES, Merlo CA, Conte JV, Shah AS. The impact of recipient body mass index on survival after lung transplantation. *J Heart Lung Transplant*. 2010 Sep; 29(9):1026-33. doi: 10.1016/j.healun.2010.05.005. Epub 2010 Jun 16. PMID: 20558085.

Allen JG, Weiss ES, Merlo CA, Baumgartner WA, Conte JV, Shah AS. Impact of donor-recipient race matching on survival after lung transplantation: analysis of over 11,000 patients. *J Heart Lung Transplant*. 2009 Oct; 28(10):1063-71. doi: 10.1016/j.healun.2009.06.012. PMID: 19782288.

American College of Cardiology (ACC), American Heart Association (AHA), Heart Failure Society of America (HFSA). Yancy CW, Jessup M, Bozkurt B, Butler J, Casey DE Jr, Colvin MM, Drazner MH, Filippatos GS, Fonarow GC, Givertz MM, Hollenberg SM, Lindenfeld J, Masoudi FA, McBride PE, Peterson PN, Stevenson LW, Westlake C. 2017 ACC/AHA/HFSA Focused Update of the 2013 ACCF/AHA Guideline for the Management of Heart Failure: A Report of the ACC/AHA Task Force on Clinical Practice Guidelines and the HFSA. *Circulation*. 2017 Aug 8; 136(6):e137-e161. doi: 10.1161/CIR.0000000000000509. Epub 2017 Apr 28. PMID: 28455343.

American Society of Transplantation (AST). Fischer SA, Lu K; AST Infectious Diseases Community of Practice. Screening of donor and recipient in solid organ transplantation. *Am J Transplant*. 2013 Mar; 13 Suppl 4:9-21. doi: 10.1111/ajt.12094. PMID: 23464994.

American Society of Transplantation (AST). Guidelines and Opinions. Infectious Diseases, Kidney, Liver/Intestines, Heart and Lung.

## American Society of Transplantation (AST). Key Position Statements

American Society of Transplantation (AST). Kobashigawa J, Dadhania D, Bhorade S, Adey D, Berger J, Bhat G, Budev M, Duarte-Rojo A, Dunn M, Hall S, Harhay MN, Johansen KL, Joseph S, Kennedy CC, Kransdorf E, Lentine KL, Lynch RJ, McAdams-DeMarco M, Nagai S, Olymbios M, Patel J, Pinney S, Schaenman J, Segev DL, Shah P, Singer LG, Singer JP, Sonnenday C, Tandon P, Tapper E, Tullius SG, Wilson M, Zamora M, Lai JC. Report from the AST on frailty in solid organ transplantation. *Am J Transplant*. 2018 Dec 1. doi: 10.1111/ajt.15198. Epub 2018 Dec 22. PMID: 30506632.

Beatty CA, George TJ, Kilic A, Conte JV, Shah AS. Pre-transplant malignancy: an analysis of outcomes after thoracic organ transplantation. *J Heart Lung Transplant*. 2013 Feb; 32(2):202-11. doi: 10.1016/j.healun.2012.11.003. PMID: 23265911.

Belli EV, Landolfo K, Keller C, Thomas M, Odell J. Lung cancer following lung transplant: single institution 10 year experience. *Lung Cancer*. 2013 Sep; 81(3):451-4. doi: 10.1016/j.lungcan.2013.05.018. Epub 2013 Jul 5. PMID: 23831244.

Benden C. Pediatric lung transplantation. *J Thorac Dis*. 2017 Aug; 9(8):2675–83. doi: 10.21037/jtd.2017.07.84. PMID: 28932575.

Benden C, Ridout DA, Edwards LB, Boehler A, Christie JD, Sweet SC. Body mass index and its effect on outcome in children after lung transplantation. *J Heart Lung Transplant*. 2013 Feb; 32(2):196-201. doi: 10.1016/j.healun.2012.11.002. Epub 2012 Nov 28. PMID: 23200225.

Bosanquet JP, Witt CA, Bemiss BC, Byers DE, Yusen RD, Patterson AG, Kreisel D, Mohanakumar T, Trulock EP, Hachem RR. The impact of pre-transplant allosensitization on outcomes after lung transplantation. *J Heart Lung Transplant*. 2015 Nov; 34(11):1415-22. doi: 10.1016/j.healun.2015.06.003. Epub 2015 Jun 10. PMID: 26169666.

Brennan DC, Rodeheffer RJ, Ambinder RF. Development of malignancy following solid organ transplantation. *UpToDate*. 2019 Aug 19.

Canadian Society of Transplantation (CST). Reference Documents.

Castleberry A, Mulvihill MS, Yerokun BA, Gulack BC, Englum B, Snyder L, Worni M, Osho A, Palmer S, Davis RD, Hartwig MG. The utility of 6-minute walk distance in predicting waitlist mortality for lung transplant candidates. *J Heart Lung Transplant*. 2017 Jul;36(7):780-6. doi: 10.1016/j.healun.2016.12.015. Epub 2016 Dec 30. PMID: 28131666.

Castleberry AW, Martin JT, Osho AA, Hartwig MG, Hashmi ZA, Zanotti G, Shaw LK, Williams JB, Lin SS, Davis RD. Coronary revascularization in lung transplant recipients with concomitant coronary artery disease. *Am J Transplant*. 2013 Nov;13(11):2978-88. doi: 10.1111/ajt.12435. Epub 2013 Sep 18. PMID: 24102830.

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Castor JM, Wood RK, Muir AJ, Palmer SM, Shimpi RA. Gastroesophageal reflux and altered motility in lung transplant rejection. *Neurogastroenterol Motil.* 2010 Aug; 22(8):841–50. doi: 10.1111/j.1365-2982.2010.01522.x. PMID: 20507544.

Cedars-Sinai. For Referring Physicians. When to Refer Patients for Lung Transplantation.

Centers for Disease Control and Prevention (CDC). Transplant Safety. Current Guideline for Organ Transplants.

Centers for Medicare & Medicaid Services (CMS). Conditions for Coverage (CfCs) & Conditions of Participations (CoPs). Transplant Centers.

Centers for Medicare & Medicaid Services (CMS). Manuals. Publication # 100-02. Medicare Benefit Policy Manual.

Centers for Medicare & Medicaid Services (CMS). Manuals. Publication # 100-03. Medicare National Coverage Determinations (NCD) Manual.

Centers for Medicare & Medicaid Services (CMS). Medicare Coverage Database (MCD).

Centers for Medicare & Medicaid Services (CMS). Medicare Managed Care Manual. Chapter 4 – Benefits and Beneficiary Protections. 10.11 Transplant Services. Rev 121. Issued 2016 Apr 22.

Centers for Medicare & Medicaid Services (CMS). Quality, Safety & Oversight – Certification & Compliance. Transplant. 2021 Oct 8.

Centers of Medicare & Medicaid Services (CMS). State Operations Manual. Appendix A - Survey Protocol, Regulations and Interpretive Guidelines for Hospitals. Rev. 200. 2020 Feb 21.

Centers of Medicare & Medicaid Services (CMS). Transplant.

Chandrashekar S, Keller CA, Kremers WK, Peters SG, Hathcock MA, Kennedy CC. Weight loss prior to lung transplantation is associated with improved survival. *J Heart Lung Transplant.* 2015 May;34(5):651–7. doi: 10.1016/j.healun.2014.11.018. Epub 2014 Nov 17. PMID: 25578626.

Chan EY, Goodarzi A, Sinha N, Nguyen DT, Youssef JG, Suarez EE, Kaleekal T, Graviss EA, Bruckner BA, MacGillivray TE, Scheinin SA. Long-Term Survival in Bilateral Lung Transplantation for Scleroderma-Related Lung Disease. *Ann Thorac Surg.* 2018 Mar; 105(3):893-900. doi: 10.1016/j.athoracsur.2017.09.038. Epub 2018 Feb 1. PMID: 29394994.

Chapman JR, Webster AC, Wong G. Cancer in the transplant recipient. *Cold Spring Harb Perspect Med.* 2013 Jul 1; 3(7) pii: a015677. doi: 10.1101/cshperspect.a015677. PMID: 23818517.

Commonwealth of Massachusetts. Division of Insurance (DOI) Bulletins.

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Commonwealth of Massachusetts. MassHealth Guidelines for Medical Necessity Determination. Organ Transplant Procedures. Executive Office of the Health and Human Services.

Commonwealth of Massachusetts. MassHealth Provider Bulletins.

Commonwealth of Massachusetts. MassHealth Provider Manuals.

Commonwealth of Massachusetts. MassHealth Transmittal Letters.

Cooper DKC. The case for xenotransplantation. *Clin Transplant*. 2015 Apr; 29(4):288–93. doi: 10.1111/ctr.12522. PMID: 25728841.

Date H, Sato M, Aoyama A, Yamada T, Mizota T, Kinoshita H, Handa T, Tanizawa K, Chin K, Minakata K, Chen F. Living-donor lobar lung transplantation provides similar survival to cadaveric lung transplantation even for very ill patients. *Eur J Cardiothorac Surg*. 2015 Jun; 47(6):967-72; discussion 972-3. doi: 10.1093/ejcts/ezu350. Epub 2014 Sep 16. PMID: 25228745.

Davis CS, Shankaran V, Kovacs EJ, Gagermeier J, Dilling D, Alex CG, Love RB, Sinacore J, Fisichella PM. Gastroesophageal reflux disease after lung transplantation: pathophysiology and implications for treatment. *Surgery*. 2010 Oct;148(4):737-44; discussion 744-5. doi: 10.1016/j.surg.2010.07.011. Epub 2010 Aug 21. PMID: 20727564.

Eberlein M, Reed RM, Chahla M, Bolukbas S, Blevins A, Van Raemdonck D, Stanzi A, Inci I, MarascoS, Shigemura N, Aigner C, Deuse T. Lobar lung transplantation from deceased donors: a systematic review. *World J Transplant*. 2017 Feb 24; 7(1):70–80. doi: 10.5500/wjt.v7.i1.70. PMID: 28280698.

Egan TM, Edwards LB. Effect of the lung allocation score on lung transplantation in the United States. *J Heart Lung Transplant*. 2016 Apr;35(4):433-9. doi: 10.1016/j.healun.2016.01.010. Epub 2016 Jan 15. PMID: 26922274.

European Pediatric Pulmonary Vascular Disease Network (EPPVDN), Endorsed by the Association for European Pediatric and Congenital Cardiology (AEPC), European Society for Pediatric Research (ESPR), International Society of Heart and Lung Transplantation (ISHLT). Hansmann G, Koestenberger M, Alastalo TP, Apitz C, Austin ED, Bonnet D, Budts W, D'Alto M, Gatzoulis MA, Hasan BS, Kozlik-Feldmann R, Kumar RK, Lammers AE, Latus H, Michel-Behnke I, Miera O, Morrell NW, Pieles G, Quandt D, Sallmon H, Schranz D, Tran-Lundmark K, Tulloh RMR, Warnecke G, Wahlander H, Weber S, Zertner P. 2019 updated consensus statement on the diagnosis and treatment of pediatric pulmonary hypertension: The EPPVDN, endorsed by AEPC, ESPR and ISHLT. *J Heart Lung Transplant*. 2019 Sep; 38(9):879-901. doi: 10.1016/j.healun.2019.06.022.

European Society of Cardiology (ESC), European Respiratory Society (ERS), International Society of Heart and Lung transplantation (ISHLT). Galiè N, Hoeper MM, Humbert M, Torbicki A, Vachiery JL, Transplantation of Lung or Lobar Lung

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Barbera JA, Beghetti M, Corris P, Gaine S, Gibbs JS, Gomez-Sanchez MA, Jondeau G, Klepetko W, Opitz C, Peacock A, Rubin L, Zellweger M, Simonneau G; ESC Committee for Practice Guidelines (CPG). Guidelines for the diagnosis and treatment of pulmonary hypertension: The task force for the diagnosis and treatment of pulmonary hypertension of the ESC and the ERS, endorsed by the ISHLT. *Eur Heart J*. 2009 Oct; 30(20):2493-537. doi: 10.1093/eurheartj/ehp297. Epub 2009 Aug 27. PMID: 19713419.

Hadjiliadis D, Steele MP, Chaparro C, Singer LG, Waddell TK, Hutcheon MA, Davis RD, Tullis DE, Palmer SM, Keshavjee S. Survival of lung transplant patients with cystic fibrosis harboring panresistant bacteria other than *Burkholderia cepacia*, compared with patients harboring sensitive bacteria. *J Heart Lung Transplant*. 2007 Aug; 26(8):834-8. Epub 2007 Jul 12. PMID: 17692788.

Hachem R. Lung transplantation: General guidelines for recipient selection. UpToDate. 2020 Aug 31.

Hartwig MG. Lung transplantation: Procedure and postoperative management. UpToDate. 2020 Jun 1.

Hathorn KE, Chan WW, Lo WK. Role of gastroesophageal reflux disease in lung transplantation. *World J Transplant*. 2017 Apr 24; 7(2):103-16. doi: 10.5500/wjt.v7.i2.103. PMID: 28507913.

Hayanga AJ, Aboagye J, Esper S, Shigemura N, Bermudez CA, D'Cunha J, Bhama JK. Extracorporeal membrane oxygenation as a bridge to lung transplantation in the United States: an evolving strategy in the management of rapidly advancing pulmonary disease. *J Thorac Cardiovasc Surg*. 2015 Jan; 149(1):291-6. doi: 10.1016/j.jtcvs.2014.08.072. Epub 2014 Sep 17. PMID: 25524684

Hayanga JA, Lira A, Vlahu T, Yang J, Aboagye JK, Hayanga HK, Luketich JD, D'Cunha J. Lung Transplantation in Patients with High Lung Allocation Scores in the US: Evidence for the Need to Evaluate Score Specific Outcomes. *J Transplant*. 2015; 2015:836751. doi: 10.1155/2015/836751. Epub 2015 Dec 21. PMID: 26798504.

Hayes D Jr, Sweet SC, Benden C, Kopp BT, Goldfarb SB, Visner GA, Mallory GB, Tobias JD, Tumin D. Transplant center volume and outcomes in lung transplantation for cystic fibrosis. *Transpl Int*. 2017 Apr; 30(4):371-377. doi: 10.1111/tri.12911. Epub 2017 Feb 17. PMID: 28012223.

Hook JL, Lederer DJ. Selecting lung transplant candidates: where do current guidelines fall short? *Expert Rev Respir Med*. 2012 Feb; 6(1):51-61. doi: 10.1586/ers.11.83. PMID: 22283579.

Huddleston CB. Lung transplantation for pulmonary hypertension in children. *Pediatr Crit Care Med*. 2010 Mar; 11(2 Suppl):S53-6. doi: 10.1097/PCC.0b013e3181c8b697. PMID: 20216165.

Hryhorowicz M, Zeyland J, Stomski R, Lipiński D. Genetically Modified Pigs as Organ Donors for Xenotransplantation. *Mol Biotechnol*. 2017 Oct; 59(9-10):435-44. doi: 10.1007/s12033-017-0024-9. PMID: 28698981.

The International Society for Heart & Lung Transplantation (ISHLT). International Thoracic Organ Transplant (TTX) Registry.

The International Society for Heart and Lung Transplantation (ISHLT). Guidelines, Consensus Documents and Standards Statements.

The International Society for Heart and Lung Transplantation (ISHLT). Lund LH, Khush KK, Cherikh WS, Goldfarb S, Kucheryavaya AY, Levvey BJ, Meiser B, Rossano JW, Chambers DC, Yusen RD, Stehlik J. The Registry of the International Society for Heart and Lung Transplantation: Thirty-fourth Adult Heart Transplantation Report—2017; Focus Theme: Allograft ischemic time. *J Heart Lung Transplant*. 2017 Oct;36(10):1037-46. doi: 10.1016/j.healun.2017.07.019. Epub 2017 Jul 20. PMID: 28779893.

The International Society for Heart and Lung Transplantation (ISHLT). Weill D, Benden C, Corris PA, Dark JH, Davis RD, Keshavjee S, Lederer DJ, Mulligan MJ, Patterson GA, Singer LG, Snell GI, Verleden GM, Zamora MR, Glanville AR. A consensus document for the selection of lung transplant candidates: 2014--an update from the Pulmonary Transplantation Council of the ISHLT. *J Heart Lung Transplant*. 2015 Jan; 34(1):1-15. doi: 10.1016/j.healun.2014.06.014. Epub 2014 Jun 26. PMID: 25085497.

The International Society for Heart and Lung Transplantation (ISHLT). Yusen RD, Christie JD, Edwards LB, Kucheryavaya AY, Benden C, Dipchand AI, Dobbels F, Kirk R, Lund LH, Rahmel AO, Stehlik J; ISHLT. The Registry of the International Society for Heart and Lung Transplantation: Thirtieth Adult Lung and Heart-Lung Transplant Report--2013; focus theme: age. *J Heart Lung Transplant*. 2013 Oct;32(10):965-78. doi: 10.1016/j.healun.2013.08.007. PMID: 24054805.

The International Society for Heart and Lung Transplantation (ISHLT). Yusen RD, Edwards LB, Dipchand AI, Goldfarb SB, Kucheryavaya AY, Levvey BJ, Lund LH, Meiser B, Rossano JW, Stehlik J. The Registry of the International Society for Heart and Lung Transplantation: Thirty-third Adult Lung and Heart-Lung Transplant Report—2016; Focus Theme: Primary Diagnostic Indications for Transplant. *J Heart Lung Transplant*. 2016 Oct; 35(10):1170-84. doi: 10.1016/j.healun.2016.09.001. Epub 2016 Sep 13. PMID: 27772669.

Kachala SS, Murthy SC. Lung transplantation for multifocal lung adenocarcinoma (multifocal lung carcinoma). *Thorac Surg Clin*. 2014 Nov; 24(4):485-91. doi: 10.1016/j.thorsurg.2014.07.011. Epub 2014 Oct 23. PMID: 25441143.

Khan MS, Zhang W, Taylor RA, Dean McKenzie E, Mallory GB, Schechter MG, Morales DL, Heinle JS, Adachi I. Survival in pediatric lung transplantation: The effect of center volume and expertise. *J Heart Lung Transplant*. 2015 Aug; 34(8):1073-81. doi: 10.1016/j.healun.2015.03.008. Epub 2015 Mar 25. PMID: 26023035.

Kilic A, Merlo CA, Conte JV, Shah AS. Lung transplantation in patients 70 years old or older: have outcomes changed after implementation of the lung allocation score? *J Thorac Cardiovasc Surg*. 2012 Nov; 144(5):1133-8. doi: 10.1016/j.jtcvs.2012.07.080. Epub 2012 Aug 31. PMID: 22944081.

Transplantation of Lung or Lobar Lung

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Kirkby S, Hayes D Jr. Pediatric lung transplantation: indications and outcomes. *J Thorac Dis.* 2014 Aug; 6(8):1024–31. doi: 10.3978/j.issn.2072-1439.2014.04.27. PMID: 25132969.

Kistler KD, Nalysnyk L, Rotella P, Esser D. Lung transplantation in idiopathic pulmonary fibrosis: a systematic review of the literature. *BMC Pulm Med.* 2014; 14:139. doi: 10.1186/1471-2466-14-139. PMID: 25127540.

Koprivanac M, Budev MM, Yun JJ, Kelava M, Pettersson GB, McCurry KR, Johnston DR, Mangi AA, Houghtaling PL, Blackstone EH, Murthy SC. How important is coronary artery disease when considering lung transplant candidates? *J Heart Lung Transplant.* 2016 Dec; 35(12):1453-61. doi: 10.1016/j.healun.2016.03.011. Epub 2016 Mar 30. PMID: 27266805.

Lane CR, Tonelli AR. Lung transplantation in chronic obstructive pulmonary disease: patient selection and special considerations. *Int J Chron Obstruct Pulmon Dis.* 2015 Oct 9; 10:2137-46. doi: 10.2147/COPD.S78677. PMID: 26491282.

Lederer DJ, Kawut SM, Wickersham N, Winterbottom C, Bhorade S, Palmer SM, Lee J, Diamond JM, Wille KM, Weinacker A, Lama VN, Crespo M, Orens JB, Sonett JR, Arcasoy SM, Ware LB, Christie JD; Lung Transplant Outcomes Group. Obesity and primary graft dysfunction after lung transplantation: the Lung Transplant Outcomes Group Obesity Study. *Am J Respir Crit Care Med.* 2011 Nov 1; 184(9):1055-61. doi: 10.1164/rccm.201104-0728OC. PMID: 21799077.

Lehr CJ, Zaas DW, Cheifetz IM, Turner DA. Ambulatory extracorporeal membrane oxygenation as a bridge to lung transplantation: walking while waiting. *Chest.* 2015 May;147(5):1213-8. doi: 10.1378/chest.14-2188. PMID: 25940249.

MCG Health. Care Guidelines. Inpatient Surgical Care. 25th Edition. Lung Transplant. S-1300.

National Cancer Institute (NCI). National Institutes of Health. NCI Dictionary of Cancer Terms. Carcinoma In Situ.

National Institute for Health and Clinical Excellence (NICE). Living-donor lung transplantation for end-stage lung disease. *Interventional Procedure Guidance (IPG) 170.* 2006 May.

New Hampshire Department of Health and Human Services. Billing Manuals.

New Hampshire Department of Health and Human Services. Provider Notices.

Organ Procurement and Transplantation Network (OPTN). Allocation Calculators. Calculated Panel Reactive Antibody (CPRA) Calculator, Estimated Post Transplant Survival (EPTS) Calculator,



Kidney Donor Profile Index (KDPI) Calculator, Lung Allocation Score (LAS) Calculator, Model for End-Stage Liver Disease (MELD) and Pediatric End-Stage Liver Disease (PELD) Calculators, Archived Allocation Calculator Resources.

Organ Procurement and Transplantation Network (OPTN). Bylaws

Organ Procurement and Transplantation Network (OPTN). Organ Procurement and Transplantation Network.

Organ Procurement and Transplantation Network (OPTN). Policies.

Organ Procurement and Transplantation Network (OPTN) and United Network for Organ Sharing (UNOS). OPTN/UNOS Ethics Committee. Ethical Principles in the Allocation of Human Organs. 2015 Jun 2.

Organ Procurement and Transplantation Network (OPTN). View Data Reports.

Paraskeva MA, Edwards LB, Levvey B, Stehlik J, Goldfarb S, Yusen RD, Westall GP, Snell GI. Outcomes of adolescent recipients after lung transplantation: An analysis of the International Society for Heart and Lung Transplantation Registry. *J Heart Lung Transplant*. 2018 Mar; 37(3):323-31. doi: 10.1016/j.healun.2017.02.017. Epub 2017 Feb 17. PMID: 28320631.

Patel N, DeCamp M, Criner GJ. Lung transplantation and lung volume reduction surgery versus transplantation in chronic obstructive pulmonary disease. *Proc Am Thorac Soc*. 2008 May 1; 5(4):447-53. doi: 10.1513/pats.200707-107ET. PMID: 18453354.

Patti MG, Vela MF, Odell DD, Richter JE, Fisichella PM, Vaezi MF. The Intersection of GERD, Aspiration, and Lung Transplantation. *J Laparoendosc Adv Surg Tech A*. 2016 Jul; 26(7):501-5. doi: 10.1089/lap.2016.0170. Epub 2016 May 24. PMID: 27218671.

Plantier L, Skhiri N, Biondi G, Jebrak G, Himbert D, Castier Y, Lesèche G, Mal H, Thabut G, Fournier M. Impact of previous cardiovascular disease on the outcome of lung transplantation. *J Heart Lung Transplant*. 2010 Nov; 29(11):1270-6. doi: 10.1016/j.healun.2010.05.010. Epub 2010 Jul 1. PMID: 20580260.

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 Mar 3; 313(9):936-48. doi: 10.1001/jama.2015.1175. PMID: 25734735.

Scientific Registry of Transplant Recipients (SRTR) and Organ Procurement and Transplantation Network (OPTN). The SRTR/OPTN Annual Data Report. Statistics on donation and transplantation in the United States. Current report and archived reports. 2020 Jan 2.

Shah P, Orens JB. Impact of nutritional state on lung transplant outcomes: The weight of the evidence. *J Heart Lung Transplant*. 2013 Aug; 32(8):755-6. doi: 10.1016/j.healun.2013.06.001. PMID: 23856213.

Singer JP, Chen H, Phelan T, Kukreja J, Golden JA, Blanc PD. Survival following lung transplantation for silicosis and other occupational lung diseases. *Occup Med (Lond)*. 2012 Mar; 62(2):134-7. doi: 10.1093/occmed/kqr171. PMID: 22071439.

Singer JP, Peterson ER, Snyder ME, Katz PP, Golden JA, D'Ovidio F, Bacchetta M, Sonett JR, Kukreja J, Shah L, Robbins H, Van Horn K, Shah RJ, Diamond JM, Wickersham N, Sun L, Hays S, Arcasoy SM, Palmer SM, Ware LB, Christie JD, Lederer DJ. Body composition and mortality after adult lung transplantation in the United States. *Am J Respir Crit Care Med*. 2014 Nov 1; 190(9):1012-21. doi: 10.1164/rccm.201405-0973OC. PMID: 25233138.

Thabut G, Mal H. Outcomes after lung transplantation. *J Thorac Dis*. 2017 Aug;9(8):2684-91. doi: 10.21037/jtd.2017.07.85. PMID: 28932576.

Tomaszek SC, Fibla JJ, Dierkhising RA, Scott JP, Shen KR, Wigle DA, Cassivi SD. Outcome of lung transplantation in elderly recipients. *Eur J Cardiothorac Surg*. 2011 May; 39(5):726-31. doi: 10.1016/j.ejcts.2010.08.034. Epub 2010 Nov 16. PMID: 21084198.

Toyoda Y, Toyoda Y. Heart-lung transplantation: adult indications and outcomes. *J Thorac Dis*. 2014 Aug;6(8):1138-42. doi: 10.3978/j.issn.2072-1439.2014.06.01. PMID: 25132981.

United Network for Organ Sharing (UNOS). Annual Reports.

United Network for Organ Sharing (UNOS). Data.

United Network for Organ Sharing (UNOS). Policy.

United Network for Organ Sharing (UNOS). Transplant Trends

U.S. Food and Drug Administration. Vaccines, Blood & Biologics. Information and Recommendations for Physicians Involved in the Co-Culture of Human Embryos with Non-Human Animal Cells. 2019 Mar 28.

U.S. Food and Drug Administration. Vaccines, Blood & Biologics. Xenotransplantation. 2018 Feb 5.

Valour F, Brault C, Abbas-Chorfa F, Martin C, Kessler L, Kanaan R, Mosnier-Pudar H, Coltey B, Nove-Josserand R, Durupt S, Colin C, Durieu I. Outcome of cystic fibrosis-related diabetes two years after lung transplantation. *Respiration*. 2013; 86(1):32-8. doi: 10.1159/000339928. Epub 2012 Aug 25. PMID: 22922226.

Transplantation of Lung or Lobar Lung

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Van Raemdonck D, Vos R, Yserbyt J, Decaluwe H, De Leyn P, Verleden GM. Lung cancer: a rare indication for, but frequent complication after lung transplantation. *J Thorac Dis.* 2016 Nov;8(Suppl 11):S915–24. doi: 10.21037/jtd.2016.11.05. PMID: 27942415.

Vermeijden JW, Zijlstra JG, Erasmus ME, van der Bij W, Verschuuren EA. Lung transplantation for ventilator-dependent respiratory failure. *J Heart Lung Transplant.* 2009 Apr; 28(4):347-51. doi: 10.1016/j.healun.2009.01.012. PMID: 19332261.

Weill D, Benden C, Corris PA, Dark JH, Davis RD, Keshavjee S, Lederer DJ, Mulligan MJ, Patterson GA, Singer LG, Snell GI, Verleden GM, Zamora MR, Glanville AR. 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 Jan;34(1):1-15. doi: 10.1016/j.healun.2014.06.014. Epub 2014 Jun 26. PMID: 25085497.

Whitson BA, Hayes D Jr. Indications and outcomes in adult lung transplantation. *J Thorac Dis.* 2014 Aug; 6(8):1018-23. doi: 10.3978/j.issn.2072-1439.2014.07.04. PMID: 25132968.

Wigfield CH, Buie V, Onsager D. “Age” in lung transplantation: factors related to outcomes and other considerations. *Curr Pulmonol Rep.* 2016; 5:152–8. doi: 10.1007/s13665-016-0151-y. Epub 2016 Aug 13. PMID: 27610336.

Woll F, Mohanka M, Mullins J, Bollineni S, Kaza V, Torres F, Tanriover B, Banga A. Practice Patterns of Combined Lung Kidney Transplantation Among Lung Transplant Candidates with Chronic Kidney Disease. *Am J Respir Crit Care Med.* 2018:197:A4540?

Yang SM, Huang SC, Kuo SW, Huang PM, Pan SC, Lee JM, Lai HS, Hsu HH. Long-term outcome after bilateral lung transplantation - a retrospective study from a low-volume center experience. *BMC Surg.* 2015 Mar 18;15:28. doi: 10.1186/s12893-015-0010-8. PMID: 25880739.

Yusen RD, Edwards LB, Dipchand AI, Goldfarb SB, Kucheryavaya AY, Levvey BJ, Lund LH, Meiser B, Rossano JW, Stehlik J; International Society for Heart and Lung Transplantation. The Registry of the International Society for Heart and Lung Transplantation: Thirty-third Adult Lung and Heart-Lung Transplant Report-2016; Focus Theme: Primary Diagnostic Indications for Transplant. *J Heart Lung Transplant.* 2016 Oct;35(10):1170-84. doi: 10.1016/j.healun.2016.09.001. Epub 2016 Sep 13. PMID: 27772669.

## Policy History

Original Approval Date	Original Effective Date* and Version Number	Policy Owner	Original Policy Approved by
Regulatory Approval: N/A  Internal Approval: 08/02/05	10/02/05 Version 1	Medical Policy Manager as Chair of Medical Policy, Criteria, and Technology Assessment Committee (MPCTAC)	Quality and Clinical Management Committee (Q&CMC)

\*Effective Date for the BMC HealthNet Plan Commercial Product: 01/01/12

\*Effective Date of the WellSense New Hampshire Medicaid Product: 01/01/13

\*Effective Date for Senior Care Options Product: 01/01/16

\*Effective Date for the WellSense Medicare Advantage HMO Product: 01/01/22

Policy formerly titled *Lung Transplant* until 07/31/13.

Policy Revisions History			
Review Date	Summary of Revisions	Revision Effective Date and Version Number	Approved by
02/06/07	Updated template and references.	Version 2	02/06/07: Q&CMC
02/19/08	Revised clinical criteria.	Version 3	02/19/08: MPCTAC 02/26/08: Utilization Management Committee (UMC) 03/12/08: QIC
02/24/09	Updated clinical criteria for HIV. Updated coding and references.	Version 4	02/24/09: MPCTAC 02/24/09: UMC 03/25/09: QIC
02/01/10	Updated references.	Version 5	02/22/10: MPCTAC 03/24/10: QIC
03/01/11	Updated references. Updated the clinical guideline statement and the medically appropriate indications with additional criteria. Updated the contraindications.	Version 6	03/16/11: MPCTAC 04/27/11: QIC
03/12/12	Updated references and clinical guideline statement. Updated and clarified contraindications and added relative contraindications.	Version 7	03/21/12: MPCTAC 04/25/12: QIC
08/01/12	Off cycle review for WellSense New Hampshire Medicaid product.	Version 8	08/13/12: MPCTAC 09/06/12: QIC

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## Policy Revisions History

	Reformatted Medical Policy Statement, revised Applicable Coding introduction, updated code list, and revised Limitations section.		
04/01/13	Review for effective date 08/01/13. Revised title, removed redundant text in Clinical Background Information section, revised Summary and Description of Item or Service sections, added clinical criteria and limitations, revised and added definitions, updated language in Applicable Coding section and revised applicable code list, added text to Clinical Background Information section, and added and updated references. Referenced <i>Medically Necessary</i> policy, <i>Experimental and Investigational Treatment</i> policy, and <i>Reimbursement Guidelines: Serious Reportable Event/Provider Preventable Condition</i> .	08/01/13 Version 9	04/17/13: MPCTAC 05/16/13: QIC
03/01/14	Review for effective date 07/01/14. Updated Summary and References sections. Revised criteria in the Medical Policy Statement section and the Limitations section.	07/01/14 Version 10	03/19/14: MPCTAC 04/16/14: QIC
03/01/15	Review for effective 05/01/15. Updated Summary and References sections. Removed Commonwealth Care, Commonwealth Choice, and Employer Choice from the list of applicable products because the products are no longer available.	05/01/15 Version 11	03/18/15: MPCTAC 04/08/15: QIC
11/25/15	Review for effective date 01/01/16. Updated template with list of applicable products and notes. Revised language in the Applicable Coding section.	01/01/16 Version 12	11/18/15: MPCTAC 11/25/15: MPCTAC (electronic vote) 12/09/15: QIC
03/01/16	Review for effective date 07/01/16. Updated Summary, Definitions, Clinical Background Information, References, and References to Applicable Laws and Regulations sections. Administrative changes made to the Medical Policy	07/01/16 Version 13	03/16/16: MPCTAC 04/13/16: QIC

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## Policy Revisions History

	Statement section. Revised criteria in the Limitations section.		
03/01/17	Review for effective date 06/07/17. Updated Summary, Definitions, Clinical Background Information, and References sections. Revised criteria in the Medical Policy Statement and Limitations sections. Plan notes added to the Applicable Coding section.	06/07/17 Version 14	03/15/17: MPCTAC
03/01/18	Review for effective date 04/01/18. Administrative changes made to the Medical Policy Statement and Limitations sections. Updated the Policy Summary, References, and Other Applicable Policies sections.	04/01/18 Version 15	03/21/18: MPCTAC
03/01/19	Review for effective date 06/01/19. Administrative changes made to the, Policy Summary, References, Other Applicable Policies, and Reference to Applicable Laws and Regulations sections. Criteria revised in the Medical Policy Statement and Limitations sections.	06/01/19 Version 16	03/20/19: MPCTAC
03/01/20	Review for effective date 04/01/20. Administrative changes made to the Policy Summary, Limitations, References, Other Applicable Policies, and Reference to Applicable Laws and Regulations sections.	04/01/20 Version 17	03/12/20: MPCTAC (electronic vote)
03/01/21	Review for effective date 06/01/21. Criteria revised in the Medical Policy Statement and Limitations sections. Administrative changes made to the References section.	06/01/21 Version 18	03/17/21: MPCTAC
11/01/21	Review for effective date 12/01/21. Adopted new medical policy template; removed administrative sections, the Medical Policy Statement section renamed the Clinical Criteria section, and the Limitations section renamed the Limitations and Exclusions section. Added WellSense Medicare Advantage HMO as an applicable product effective 01/01/22. Administrative changes	12/01/21 Version 19	11/17/21: MCPTAC

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## Policy Revisions History

	made to the Policy Summary, Clinical Criteria, Limitations and Exclusions, Applicable Coding, and References sections.		
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## Next Review Date

03/01/22

## Authorizing Entity

MPCTAC

### Disclaimer Information: +

Medical Policies are the Plan’s guidelines for determining the medical necessity of certain services or supplies for purposes of determining coverage. These Policies may also describe when a service or supply is considered experimental or investigational, or cosmetic. In making coverage decisions, the Plan uses these guidelines and other Plan Policies, as well as the Member’s benefit document, and when appropriate, coordinates with the Member’s health care Providers to consider the individual Member’s health care needs.

Plan Policies are developed in accordance with applicable state and federal laws and regulations, and accrediting organization standards (including NCQA). Medical Policies are also developed, as appropriate, with consideration of the medical necessity definitions in various Plan products, review of current literature, consultation with practicing Providers in the Plan’s service area who are medical experts in the particular field, and adherence to FDA and other government agency policies. Applicable state or federal mandates, as well as the Member’s benefit document, take precedence over these guidelines. Policies are reviewed and updated on an annual basis, or more frequently as needed. Treating providers are solely responsible for the medical advice and treatment of Members.

The use of this Policy is neither a guarantee of payment nor a final prediction of how a specific claim(s) will be adjudicated. Reimbursement is based on many factors, including member eligibility and benefits on the date of service; medical necessity; utilization management guidelines (when applicable); coordination of benefits; adherence with applicable Plan policies and procedures; clinical coding criteria; claim editing logic; and the applicable Plan – Provider agreement.