I. Description

The heart/lung transplantation involves a coordinated triple operative procedure consisting of procurement of a donor heart-lung block, excision of the heart and lungs of the recipient, and implantation of the heart and lungs into the recipient. A heart/lung transplantation refers to the transplantation of one or both lungs and heart from a single cadaver donor.

Background

Combined heart/lung transplantation is intended to prolong survival and improve function in patients with end-stage cardiac and pulmonary diseases. The majority of recipients have Eisenmenger syndrome (37%), followed by idiopathic pulmonary artery hypertension (28%) and cystic fibrosis (14%). Eisenmenger syndrome is a form of congenital heart disease in which systemic-to-pulmonary shunting leads to pulmonary vascular resistance. Eventually, pulmonary hypertension may lead to a reversal of the intracardiac shunting and inadequate peripheral oxygenation, or cyanosis. (1)

However, the total number of patients with Eisenmenger syndrome has been declining in recent years, as a result of corrective surgical techniques and improved medical management of pulmonary hypertension. Heart/lung transplants have not increased appreciably for other indications either, as it has become more common to transplant a single or double lung and maximize medical therapy for heart failure, rather than perform a combined transplant. In these, patient survival rates are similar to lung transplant rates. Bronchiolitis obliterans syndrome is a major complication; 1-, 5-, and 10-year patient survival rates are 68%, 50%, and 40%, respectively. (1)
In 2010, 40 adults and 1 child received heart/lung transplants in the United States. In 2009, 26 adults and 3 children received heart/lung transplants. As of the end of September 2011, there were 71 patients on the waiting list. (2)

II. Policy

Heart/lung transplantation is covered (subject to Administrative Guidelines) for carefully selected patients with end-stage cardiac and pulmonary disease including, but not limited to, one of the following diagnoses:

- Irreversible primary pulmonary hypertension with heart failure;
- Non-specific severe pulmonary fibrosis, with severe heart failure;
- Eisenmenger complex with irreversible pulmonary hypertension and heart failure;
- Cystic fibrosis with severe heart failure;
- Chronic obstructive pulmonary disease with heart failure;
- Emphysema with severe heart failure;
- Pulmonary fibrosis with uncontrollable pulmonary hypertension or heart failure.

III. Policy Guidelines

Potential contraindications subject to the judgment of the transplant center:

1. Known current malignancy, including metastatic cancer
2. Recent malignancy with high risk of recurrence
3. Untreated systemic infection making immunosuppression unsafe, including chronic infection
4. Other irreversible end-stage disease not attributed to heart or lung disease
5. History of cancer with a moderate risk of recurrence
6. Systemic disease that could be exacerbated by immunosuppression
7. Psychosocial conditions or chemical dependency affecting ability to adhere to therapy

When the candidate is eligible to receive a heart in accordance with United Network for Organ Sharing (UNOS) guidelines for cardiac transplantation, the lung(s) shall be allocated to the heart-lung candidate from the same donor. When the candidate is eligible to receive a lung in accordance with the UNOS Lung Allocation System (LAS), the heart shall be allocated to the heart-lung candidate from the same donor if no suitable Status 1A isolated heart candidates are eligible to receive the heart. Status 1A is described below. (3)

Cardiac Specific

The United Network for Organ Sharing (UNOS) prioritizes donor thoracic organs according to the severity of illness as follows:

Status 1A
A patient is admitted to the listing transplant center hospital and has at least 1 of the following devices or therapies in place:

A. Mechanical circulatory support for acute hemodynamic decompensation that includes at least one of the following:

1. Left and/or right ventricular assist device implanted
2. Total artificial heart
3. Intra-aortic balloon pump, or
4. Extracorporeal membrane oxygenator (ECMO)

B. Mechanical circulatory support
C. Mechanical ventilation
D. Continuous infusion of inotropes and continuous monitoring of left ventricular filling pressures
E. If criteria A, B, C and D are not met such status can be obtained by application to the applicable Regional Review Board.

Status 1B

A patient has at least 1 of the following devices or therapies in place:

1. Left and/or right ventricular device implanted, or
2. Continuous infusion of intravenous inotropes

A patient that does not meet Status 1A or 1B is listed as Status 2.

Status 7 patients are considered temporarily unsuitable to receive a thoracic organ transplant.

IV. Administrative Guidelines

Precertification is required. To precertify, please complete HMSA's Precertification Request and mail or fax the form as indicated along with the required documentation.

<table>
<thead>
<tr>
<th>CPT</th>
<th>Description</th>
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<tbody>
<tr>
<td>33930</td>
<td>Donor cardiectomy-pneumonectomy (including cold preservation)</td>
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<tr>
<td>33933</td>
<td>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</td>
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<tr>
<td>33935</td>
<td>Heart-lung transplant with recipient cardiectomy-pneumonectomy</td>
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<tr>
<td>33960 - 33961</td>
<td>Prolonged extracorporeal circulation; code range</td>
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Heart/Lung Transplant

V. Rationale

The most recent literature search was performed for the period September 2010 through September 2011. Due to the nature of the population, there were no randomized controlled trials (RCTs) comparing heart/lung transplant to alternatives. Systematic reviews are based on case series and registry data. The extant RCTs compare surgical technique, infection prophylaxis, and immunosuppressive therapy and are not germane to this policy. The following is a summary of evidence based on registries, case series, and expert opinion.

Patient Selection

Patients who are eligible for heart/lung transplantation can be listed under both the heart and lung allocation systems in the United States. In 2005, UNOS changed the method by which lungs were allocated, from one based on length of time on the waiting list, to a system that incorporates the severity of the patient’s underlying disease, as well as likelihood of survival. However, it has been noted that the individual systems underestimate the severity of illness in patients with both end-stage heart and lung failure, and modification of the lung allocation score can be appealed for patients who meet the following criteria:

- Deterioration on optimal therapy
- Right arterial pressure greater than 15 mm Hg
- Cardiac index less than 1.5L/min/m2

Pediatric Considerations

In 2010, Aurora and colleagues reported on pediatric heart/lung transplants which have reported to the international registry. They note that the numbers of pediatric heart/lung transplants have been declining in recent years. Survival has been trending higher in this group in recent years, with a 5-year survival rate of 49%, which is comparable to lung transplant survival rate, in which the necessary immunosuppression would lead to hastened demise, such as active untreated infection. However, stable chronic infections have not always been shown to reduce life expectancy in heart transplant patients.

Potential Contraindications

Individual transplant centers may differ in their guidelines, and individual patient characteristics may vary within a specific condition. In general, heart transplantation is contraindicated in patients who are not expected to survive the procedure, or in whom patient-oriented outcomes, such as morbidity or mortality, are not expected to change due to comorbid conditions unaffected by transplantation e.g., imminently terminal cancer or other disease. Further, consideration is given to conditions in which the necessary immunosuppression would lead to hastened demise, such as
active untreated infection. However, stable chronic infections have not always been shown to reduce life expectancy in heart transplant patients.

Malignancy

Concerns regarding a potential recipient’s history of cancer were based on the observation of significantly increased incidence of cancer in kidney transplant patients. (5) In fact, carcinogenesis is two to four times more common in both heart transplant and lung transplant patients, likely due to the higher doses of immunosuppression necessary for the prevention of allograft rejection, the majority of which are skin cancers. (1, 6) The incidence of de novo cancer in heart transplant patients approaches 26% at 8 years post-transplant, the rate for lung transplant is 28% at 10 years. For renal transplant patients who had a malignancy treated prior to transplant, the incidence of recurrence ranged from zero to more than 25%, depending on the tumor type. (7,8) However, it should be noted that the availability of alternate treatment strategies informs recommendations for a waiting period following high-risk malignancies: in renal transplant, a delay in transplantation is possible due to dialysis; end-stage cardiopulmonary failure patients may not have an option. A small study (n=33) of survivors of lymphoproliferative cancers who subsequently received cardiac transplant had 1-, 5-, and 10-year survival rates of 77%, 64%, and 50%, respectively. (9) By comparison, overall 1-, 5-, and 10-year survival rates are expected to be 88%, 74%, and 55%, respectively for the general transplant candidate. The evaluation of a candidate who has a history of cancer must consider the prognosis and risk of recurrence from available information including tumor type and stage, response to therapy, and time since therapy was completed. Although evidence is limited, patients in whom cancer is thought to be cured should not be excluded from consideration for transplant. United Network for Organ Sharing (UNOS) has not addressed malignancy in current policies.

HIV

Solid organ transplant for patients who are HIV-positive (HIV+) has been controversial, due to the long-term prognosis for human immunodeficiency virus (HIV) positivity and the impact of immunosuppression on HIV disease. Although HIV+ transplant recipients may be a research interest of some transplant centers, the minimal data regarding long-term outcome in these patients consist primarily of case reports and abstract presentations of liver and kidney recipients. Nevertheless, some transplant surgeons would argue that HIV positivity is no longer an absolute contraindication to transplant due to the advent of highly active antiretroviral therapy (HAART), which has markedly changed the natural history of the disease.

In March 2009, the Organ Procurement Transfer Network (OPTN) revised its policies on HIV status in recipients. It reiterates an earlier position that: “A potential candidate for organ transplantation whose test for HIV is positive but who is in an asymptomatic state should not necessarily be excluded from candidacy for organ transplantation, but should be advised that he or she may be at increased risk of morbidity and mortality because of immunosuppressive therapy.” (10)
In 2006, the British HIV Association and the British Transplantation Society Standards Committee published guidelines for kidney transplantation in patients with HIV disease. (11) These criteria may be extrapolated to other organs:

- CD4 count >200 cells/mm at least 6 months
- Undetectable HIV viremia (less than 50 HIV-1 RNA copies/ml) for at least 6 months
- Demonstrable adherence and a stable HAART regimen for at least 6 months
- Absence of AIDS-defining illness following successful immune reconstitution after HAART

However, concerns have been raised about the extrapolation of these criteria to lung transplants.

**Summary**

The literature, consisting of case series and registry data, demonstrates that heart/lung transplantation provides a survival benefit in appropriately selected patients, as compared to the exceedingly poor expected survival without transplant. It may be the only option for some patients with end-stage cardiopulmonary disease. Heart/lung transplant is contraindicated in patients in whom the procedure is expected to be futile due to comorbid disease or in whom post-transplantation care is expected to significantly worsen comorbid conditions.

**Practice Guidelines and Position Statements**

A key publication is the 2006 guidelines from the Pulmonary Scientific Council of the International Society for Heart and Lung Transplantation. (12) The consensus-based guidelines state that, “Lung transplantation is now a generally accepted therapy for the management of a wide range of severe lung disorders....However, the number of donor organs available remains far fewer than the number of patients with end-stage lung disease who might potentially benefit from the procedure. It is of primary importance, therefore, to optimize the use of this resource, such that the selection of patients who receive a transplant represents those with realistic prospects of favorable long-term outcomes. There is a clear ethical responsibility to respect these altruistic gifts from all donor families and to balance the medical resource requirement of one potential recipient against those of others in their society. These concepts apply equally to listing a candidate with the intention to transplant and potentially de-listing (perhaps only temporarily) a candidate whose health condition changes such that a successful outcome is no longer predicted.” Thus, for all patients, including those with end-stage cardiopulmonary disease and HIV infection, evaluation of a candidate for transplant needs to consider the probability of a successful transplant and the limited supply of organs available.

**Medicare National Coverage**

Heart/lung transplantation is covered under Medicare when performed in a facility that is approved by Medicare as meeting institutional coverage criteria, approximately 43 programs across the nation. (13) The Centers for Medicare and Medicaid Services (CMS) has stated that under
certain limited cases, exceptions to the criteria may be warranted if there is justification and if the facility ensures safety and efficacy objectives.

VI. Important Reminder

The purpose of this Medical Policy is to provide a guide to coverage. This Medical Policy is not intended to dictate to providers how to practice medicine. Nothing in this Medical Policy is intended to discourage or prohibit providing other medical advice or treatment deemed appropriate by the treating physician.

Benefit determinations are subject to applicable member contract language. To the extent there are any conflicts between these guidelines and the contract language, the contract language will control.

This Medical Policy has been developed through consideration of the medical necessity criteria under Hawaii’s Patients’ Bill of Rights and Responsibilities Act (Hawaii Revised Statutes §432E-1.4), generally accepted standards of medical practice and review of medical literature and government approval status. HMSA has determined that services not covered under this Medical Policy will not be medically necessary under Hawaii law in most cases. If a treating physician disagrees with HMSA’s determination as to medical necessity in a given case, the physician may request that HMSA reconsider the application of the medical necessity criteria to the case at issue in light of any supporting documentation.

VII. References

2. Organ Procurement and Transplantation Network (OPTN). Last accessed September 2011