Referral of ILD Patient for Lung Transplantation

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Disclosures

• No disclosures relevant to this topic
Objectives

• Prognosis with ILD

• Which patients with ILD should be referred for lung transplantation

• When should patients with ILD be referred for transplantation

• Overview of lung transplant activity

• What can the referring physician and patient expect
  - Evaluation process
  - The waitlist
  - Organ Donors
  - Transplant surgery
Prognosis in IPF

## INDIVIDUAL PREDICTORS OF SURVIVAL IN IDIOPATHIC PULMONARY FIBROSIS

<table>
<thead>
<tr>
<th>Clinical Predictors</th>
<th>Radiographic Predictors</th>
<th>Physiologic Predictors</th>
<th>Pathologic Predictors</th>
<th>Biomarker Predictors</th>
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</thead>
<tbody>
<tr>
<td><strong>Demographic</strong></td>
<td><strong>HRCT</strong></td>
<td><strong>Pulmonary function tests</strong></td>
<td><strong>Histopathology</strong></td>
<td><strong>Blood</strong></td>
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<tr>
<td>Age (older)</td>
<td>UIP pattern</td>
<td>FVC</td>
<td>UIP pattern</td>
<td>BNP</td>
</tr>
<tr>
<td>Sex</td>
<td>Extent of fibrosis</td>
<td>TLC</td>
<td>Fibroblastic foci</td>
<td>Albumin</td>
</tr>
<tr>
<td>Ethnicity</td>
<td></td>
<td></td>
<td></td>
<td>KL-6M</td>
</tr>
<tr>
<td>Smoking status</td>
<td></td>
<td></td>
<td></td>
<td>MP-7</td>
</tr>
<tr>
<td><strong>Symptom-based</strong></td>
<td></td>
<td></td>
<td></td>
<td>CCL-18</td>
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<tr>
<td>Dyspnea scores</td>
<td></td>
<td></td>
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<td>SP-A &amp; -D</td>
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<tr>
<td><strong>Physical examination</strong></td>
<td></td>
<td></td>
<td></td>
<td>Circulating fibrocytes</td>
</tr>
<tr>
<td>Clubbing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI (low)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Comorbidities</strong></td>
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<tr>
<td>Emphysema</td>
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<tr>
<td>Pulmonary hypertension</td>
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<tr>
<td><strong>Exercise tests</strong></td>
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<tr>
<td>6MWT</td>
<td></td>
<td>Desaturation</td>
<td></td>
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<tr>
<td>Distance</td>
<td></td>
<td>Heart rate recovery</td>
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<tr>
<td><strong>Others</strong></td>
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<tr>
<td>15-step test</td>
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<tr>
<td>4-min step test</td>
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</tbody>
</table>
Medical Therapy in IPF - Pirfenidone

Candidate Selection General Guidelines

- Clinically and physiologically severe disease
- Medical therapy not available or ineffective
- Limited life expectancy
- Ambulatory with rehabilitation potential
- Good nutritional status, +/- 20% IBW
- Satisfactory psychosocial profile
- Adequate funding
Idiopathic Pulmonary Fibrosis

- **When to refer?**
  - Histologic or radiographic evidence of usual interstitial pneumonia (UIP)
  - *No such thing as too early*

- **When to transplant?**
  - $D_L CO$ under 40%
  - Rapid decline in FVC
  - Development of pulmonary hypertension
  - Hypercapnea
  - Severe honeycombing
Candidate Selection Relative Contraindications

- Age
  - > 65 (single)
  - > 60 (double)
  - > 55 (heart/lung)
- Acute illness
- Poor rehab potential - frailty
- Obesity (BMI > 30 Kg/m²)
- Underweight - BMI < 18Kg/m²
- Extensive pleural thickening
- Prior thoracic surgery

- Colonization with resistant organisms
- Severe osteoporosis
- Mechanical ventilation
- Chronic steroid therapy on more than 20 mg prednisone
- Insurance limitations
- Other co-morbidities (i.e. severe GERD)
- HIV Disease
Candidate Selection Absolute Contraindications

- Malignancy
- Multiorgan system dysfunction
- Extra-thoracic involvement in systemic disease
- Chronic, untreatable infection
- Chest wall/Spinal deformity
- Medical noncompliance
- Uncontrolled psychiatric disease
- Lack of social support
- Substance abuse
Transplanting the Marginal Recipient

- The older patient
- The patient with CAD
- The patient with history of malignancy
- The ventilated patient
- The ECMO patient
- The previously transplanted patient
- The sensitized patient
Centers performing transplants or listing active lung candidates, ages 18 years or older, within DSAs, 2012-2014
Adult and Pediatric Lung Transplants
Number of Transplants by Year and Procedure Type

<table>
<thead>
<tr>
<th>Year</th>
<th>Bilateral/Double Lung</th>
<th>Single Lung</th>
</tr>
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<tbody>
<tr>
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<td>5</td>
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<td>7</td>
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<td>2007</td>
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<td>2009</td>
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<td>2010</td>
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<td>4098</td>
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<tr>
<td>2011</td>
<td>4098</td>
<td>4218</td>
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</tbody>
</table>

NOTE: This figure includes only the lung transplants that are reported to the ISHLT Transplant Registry. As such, this should not be construed as representing changes in the number of lung transplants performed worldwide.
Adult Lung Transplants
Diagnosis Distribution by Procedure Type
(Transplants: January 1995 – June 2016)
Adult Lung Transplants
Procedure Type within Indication, by Year

Bilateral/Double Lung Transplant
Single Lung Transplant

% of Transplants

A1ATD COPD IIP ILD-non IIP

2001 2003 2005 2007 2009 2011 2013 2015

JHLT. 2017 Oct; 36(10): 1037-1079
Adult Lung Transplants
Kaplan-Meier Survival by Procedure Type for Primary Transplant Recipients (Transplants: January 1990 – June 2015)

Median survival (years):
Double Lung = 7.4; Conditional = 9.9
Single Lung = 4.6; Conditional = 6.4

p<0.0001
Adult Lung Transplants
Kaplan-Meier Survival by Diagnosis
(Transplants: January 1990 – June 2015)

All pair-wise comparisons were significant at p < 0.05 except A1ATD vs. ILD-non IIP and COPD vs. ILD-non IIP

Median survival (years):
A1ATD: 6.7; CF: 9.2; COPD: 5.8; IIP: 4.9; ILD-not IIP: 6.0; Retransplant: 2.9
Adult Lung Transplants
Kaplan-Meier Survival by Diagnosis
(Transplants: January 1990 – June 2014)

No pair-wise comparisons were significant at $p < 0.05$. 
Adult Lung Transplants

Freedom from Bronchiolitis Obliterans Syndrome
Conditional on Survival to 14 days (Transplants: January 1994 – June 2015)
Patient death among lung transplant recipients aged 12 years or older
Adult Lung Transplants
Functional Status of Surviving Recipients
(Follow-ups: January 2009 – June 2016)
## Waiting List Candidates by Organ Type - All Patient States
Based on OPTN data as of January 15, 2018

<table>
<thead>
<tr>
<th>Organ</th>
<th>Candidates</th>
</tr>
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<tbody>
<tr>
<td>Kidney</td>
<td>95,626</td>
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<tr>
<td>Liver</td>
<td>13,902</td>
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<tr>
<td>Pancreas</td>
<td>910</td>
</tr>
<tr>
<td>Kidney/Pancreas</td>
<td>1,692</td>
</tr>
<tr>
<td>Heart</td>
<td>3,925</td>
</tr>
<tr>
<td>Lung</td>
<td>1,366</td>
</tr>
<tr>
<td>Heart/Lung</td>
<td>43</td>
</tr>
<tr>
<td>Intestine</td>
<td>257</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>115,105</strong></td>
</tr>
</tbody>
</table>

### % Transplant Candidates

- Kidney: 82%
- Liver: 12%
- Pancreas: 1%
- Kidney/Pancreas: 1%
- Heart: 4%
- Lung: 1%
- Heart/Lung: 0.12%
- Intestine: 0.22%

[Source: cedars-sinai.edu]
OPTN/SRTR 2016 Annual Data Report: Lung
New Candidates Added to the Waiting List

![Graph showing the number of active, inactive, and all lung candidates over years from 2004 to 2016. The number of candidates increases over time, with a significant rise in the last two years.](http://onlinelibrary.wiley.com/doi/10.1111/ajt.14562/full#ajt14562-fig-0001)
Distribution of candidates aged 12 years or older actively waiting for lung transplant by diagnosis group
Deceased donor lung transplant rates among active waitlist candidates aged 12 years or older by diagnosis group
OPTN/SRTR 2016 Annual Data Report: Lung Median LAS at Transplant by Diagnosis

American Journal of Transplantation
pages 363-433, 2 JAN 2018 DOI: 10.1111/ajt.14562
OPTN/SRTR 2016 Annual Data Report: Lung
Three Year Wait List Outcomes

American Journal of Transplantation
pages 363-433, 2 JAN 2018 DOI: 10.1111/ajt.14562
Pre-transplant mortality rates among candidates aged 12 years or older waitlisted for lung transplant by diagnosis group

Deaths per 100 waitlist years

Year

2005-06  2009-10  2013-14

A

B

C

D

American Journal of Transplantation
pages 363-433, 2 JAN 2018 DOI: 10.1111/ajt.14562
20% increase in transplants over 5 years*

* Based on OPTN | UNOS data as of January 9, 2017. Data subject to change based on future data submission or correction.

Matching organs. Saving lives.
OPTN/SRTR 2016 Annual Data Report: Lung Donation Rates

No data  1.22  1.79  2.30  3.00

0.71 5.71
OPTN/SRTR 2016 Annual Data Report: Deceased Organ Donation

Donations per 100 eligible deaths

- ALL
- Kidney
- Pancreas
- Liver
- Heart
- Lung
Transplant Surgery

- Bilateral vs. Single
- On-pump vs. off-pump
- Sternotomy vs. thoracotomy
- EVLP
- Ischemic time
Questions/Comments