2018-3-17 ILD school

Lung transplantation in IPF

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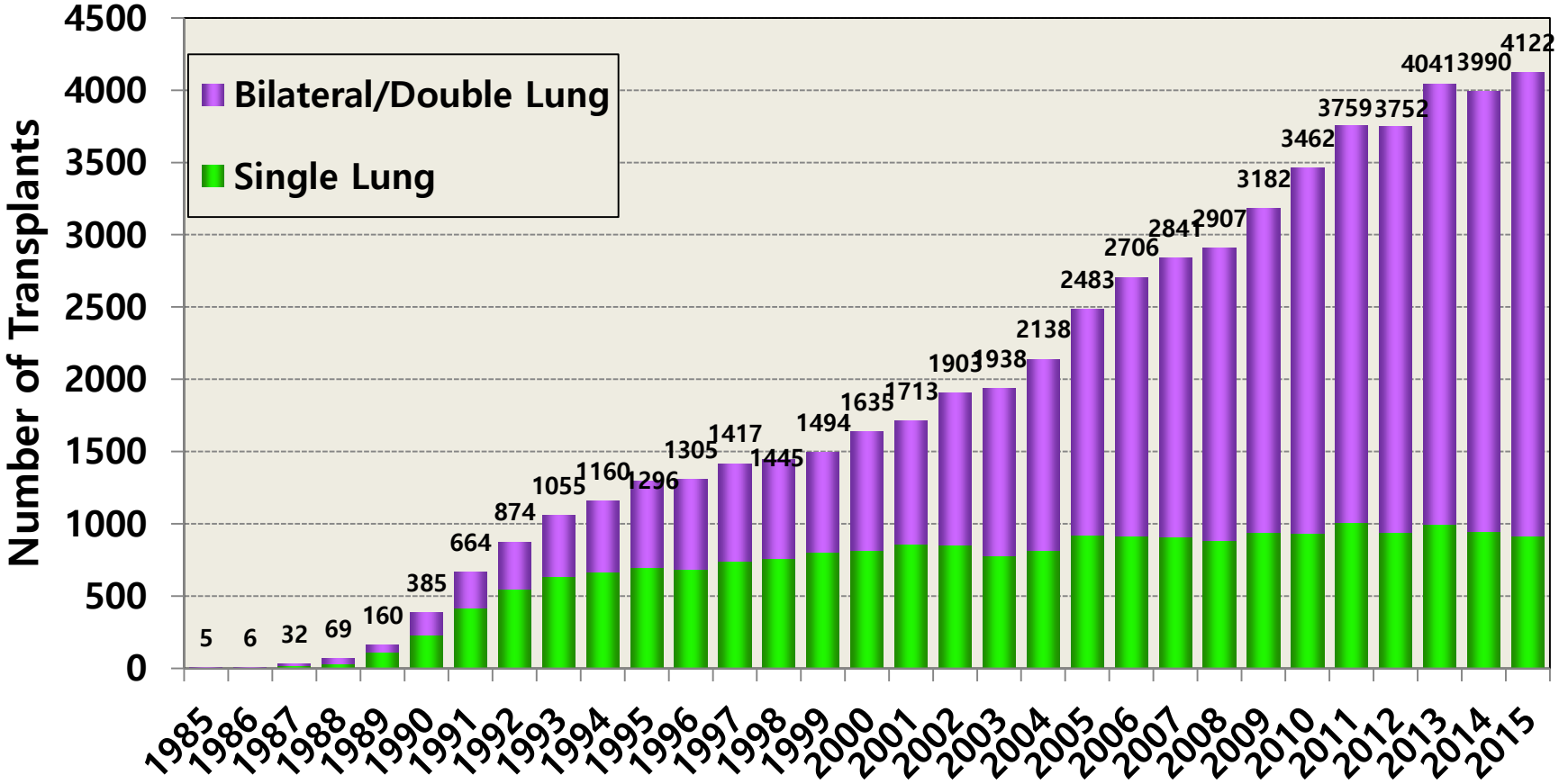
Contents

- Lung transplantation (LTx) current state
- LTx indication and contraindication
- LTx referral timing of IPF
- Outcome
- Special issues
  - Allocation system
  - Single vs. Double LTx
  - Mechanical bridges to LTx
  - Other considerations

Adult Lung Transplants
Number of Transplants by Year and Procedure Type



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2017

JHLT. 2017 Oct; 36(10): 1037-1079

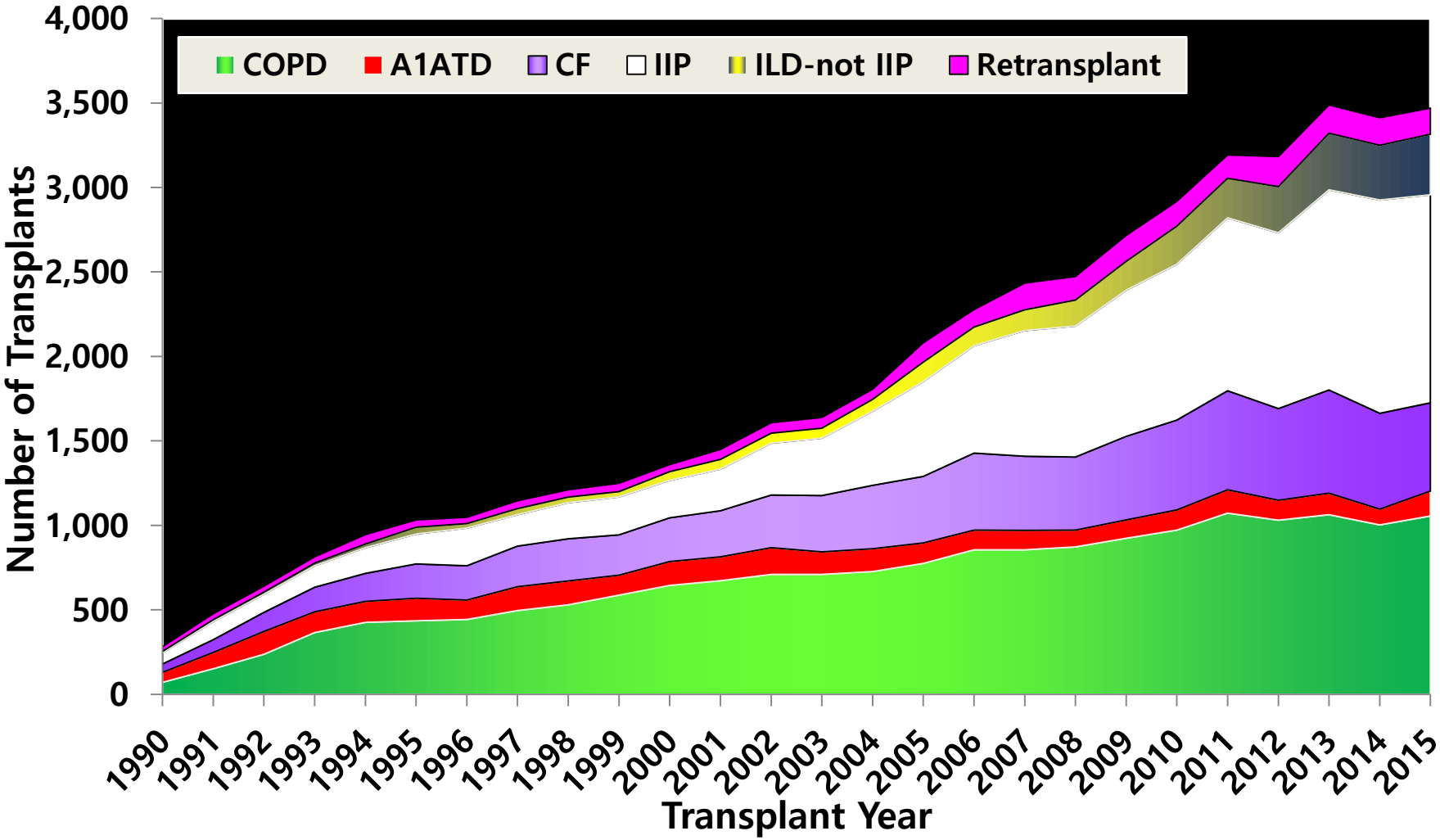
Adult Lung Transplants
Indications (Transplants: January 1995 – June 2016)

Diagnosis	SLT (N=18,207)	BLT (N=36,046)	TOTAL (N=54,253)
COPD	7,266 (39.9%)	9,539 (26.5%)	16,805 (31.0%)
IIP	6,449 (35.4%)	6,990 (19.4%)	13,439 (24.8%)
CF	218 (1.2%)	8,266 (22.9%)	8,484 (15.6%)
ILD-not IIP	1,078 (5.9%)	1,925 (5.3%)	3,003 (5.5%)
A1ATD	797 (4.4%)	1,912 (5.3%)	2,709 (5.0%)
Retransplant	922 (5.1%)	1,269 (3.5%)	2,191 (4.0%)
IPAH	88 (0.5%)	1,481 (4.1%)	1,569 (2.9%)
Non CF-bronchiectasis	67 (0.4%)	1,413 (3.9%)	1,480 (2.7%)
Sarcoidosis	312 (1.7%)	1,026 (2.8%)	1,338 (2.5%)
PH-not IPAH	135 (0.7%)	690 (1.9%)	825 (1.5%)
LAM/tuberous sclerosis	146 (0.8%)	381 (1.1%)	527 (1.0%)
OB	73 (0.4%)	395 (1.1%)	468 (0.9%)
CTD	140 (0.8%)	282 (0.8%)	422 (0.8%)
Cancer	7 (0.0%)	27 (0.1%)	34 (0.1%)
Other	509 (2.8%)	450 (1.2%)	959 (1.8%)

JHLT. 2017 Oct; 36(10): 1037-1079

SEVERANCE

Adult Lung Transplants
Major Indications by Year (Number)



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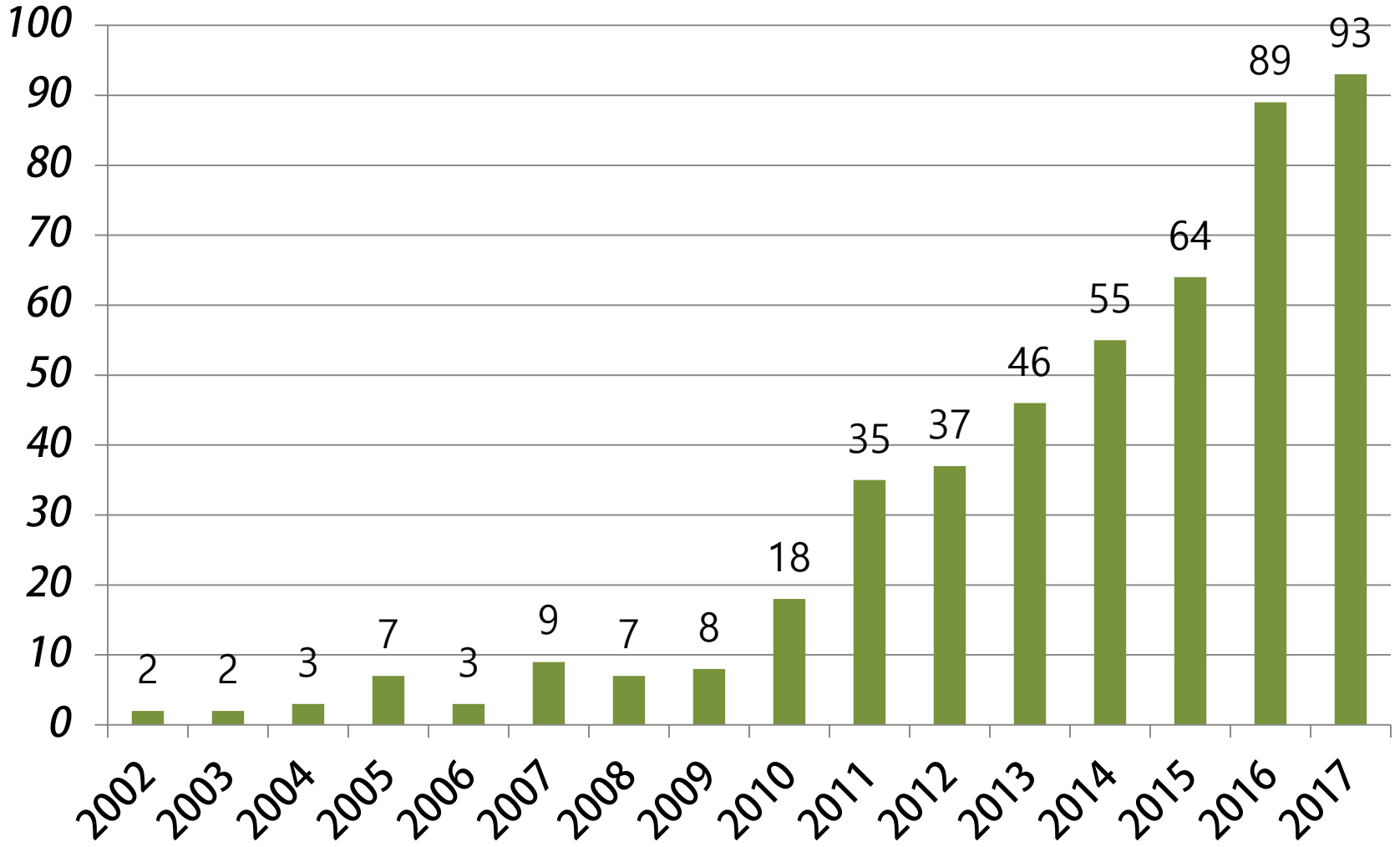
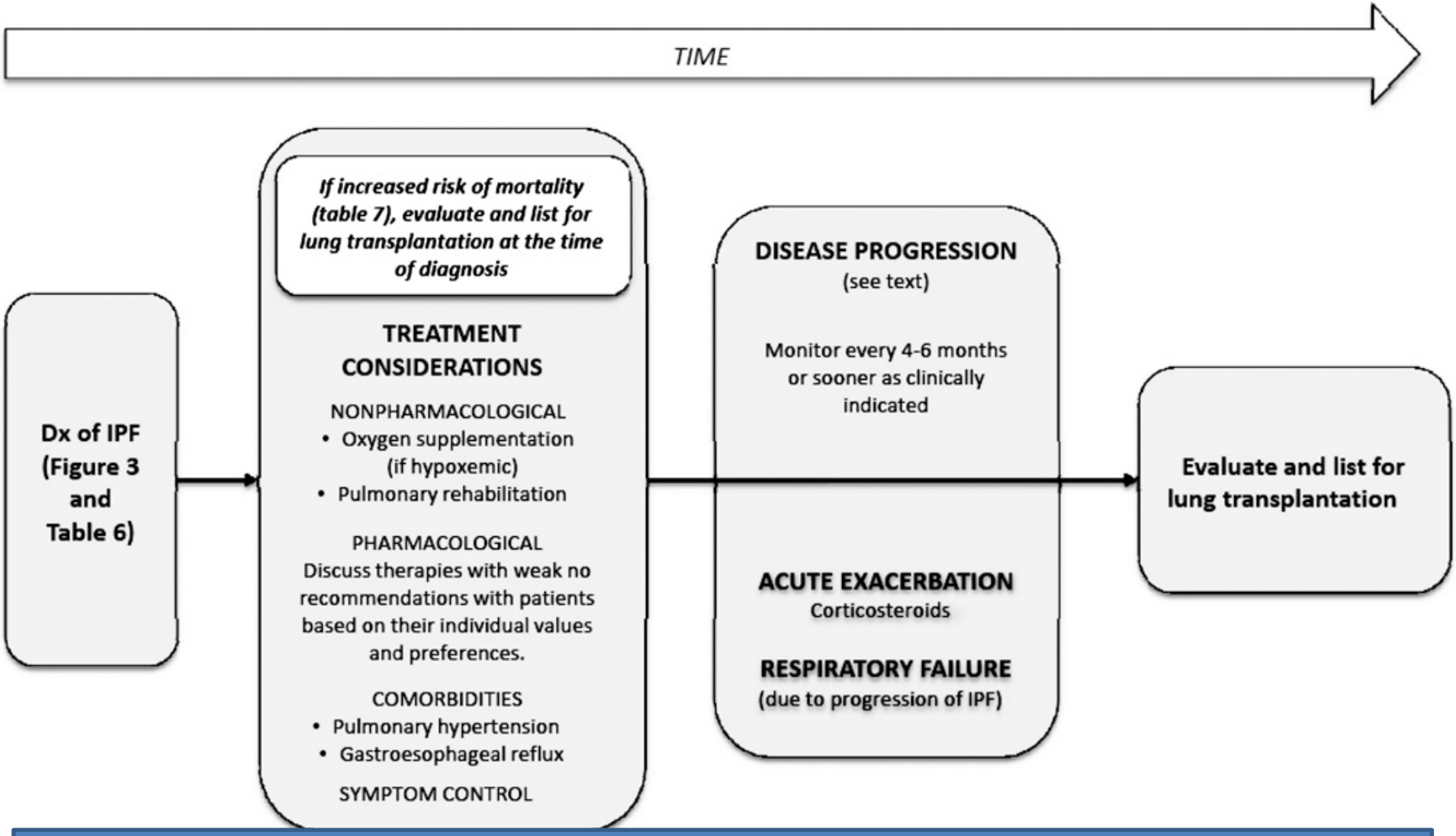
Number of Lung Transplantation-Korea



Indication of LTx -Korea

Diseases	2010	2011	2012	2013	2014	2015	2016
Total	18	35	37	46	55	64	89
Asbestosis					1		1
Bronchiectasis	1	5	6	1	2	4	4
Cystic fibrosis			1				
Eisenmenger syndrome	1						
Emphysema	1						3
IPF	7	9	12	22	25	30	44
LAM	1	5	2	1	2		1
Primary pulmonary HTN		1	1	3		2	3
BOS after HSCT		1	3	5	5	6	3
Unknown	1	2					
Other	6	12	12	14	20	22	29

2014, 2016 KONOS Annual report



Patients at increased risk of mortality should be considered for LTx

Patients should be made aware of available clinical trials for possible enrollment at all stages.

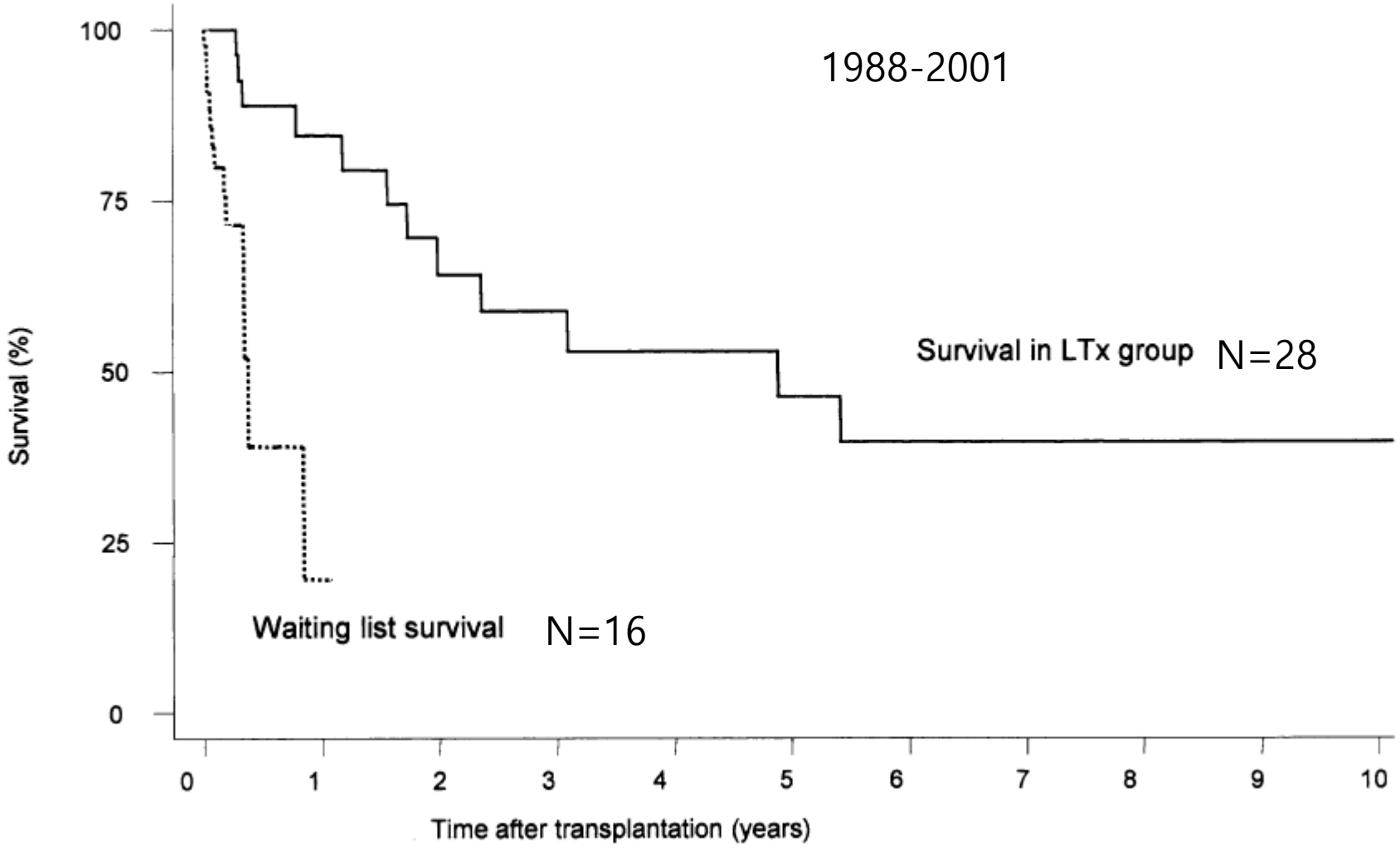
2011 An Official ATS/ERS/JRS/ALAT Statement Am J Respir Crit Care Med 2011;183:788-824

Table 2. Comparison of Recommendations in the 2015 and 2011 Idiopathic Pulmonary Fibrosis Guidelines

Agent	2015 Guideline	2011 Guideline
New and revised recommendations		
Anticoagulation (warfarin)	Strong recommendation against use*	Conditional recommendation against use‡
Combination prednisone + azathioprine + *N*-acetylcysteine	Strong recommendation against use†	Conditional recommendation against use†
Selective endothelin receptor antagonist (ambrisentan)	Strong recommendation against use†	Not addressed
Imatinib, a tyrosine kinase inhibitor with one target	Strong recommendation against use*	Not addressed
Nintedanib, a tyrosine kinase inhibitor with multiple targets	Conditional recommendation for use*	Not addressed
Pirfenidone	Conditional recommendation for use*	Conditional recommendation against use†
Dual endothelin receptor antagonists (macitentan, bosentan)	Conditional recommendation against use†	Strong recommendation against use*
Phosphodiesterase-5 inhibitor (Sildenafil)	Conditional recommendation against use*	Not addressed
Unchanged recommendations		
Antiacid therapy	Conditional recommendation for use‡	Conditional recommendation for use‡
N-acetylcysteine monotherapy	Conditional recommendation against use†	Conditional recommendation against use†
Antipulmonary hypertension therapy for idiopathic pulmonary fibrosis-associated pulmonary hypertension	Reassessment of the previous recommendation was deferred	Conditional recommendation against use‡
Lung transplantation: single vs. bilateral lung transplantation	Formulation of a recommendation for single vs. bilateral lung transplantation was deferred	Not addressed

2015 An Official ATS/ERS/JRS/ALAT Statement Am J Respir Crit Care Med 2015;192:e3-e19

Survival benefit of LTx in IPF



J Thor Cardio Vasc Surg 2003;126:469

IPF 환자에서 폐이식은 대조군 (폐이식 받지 않은 군) 에 비해 생존율을 증가시키는가?

- **결론:** 전체 문헌 검색 중 폐이식군과 폐이식을 진행하지 IPF군 간의 생존율 비교 분석 논문은 3개 이었고, 이중 2개의 문헌에서 메타 분석이 가능하였으며, IPF 환자에서 폐이식은 생존율을 25배 향상시킨다

General candidate for LTx

- Chronic **and**
- End-stage lung disease **and**
- Following criteria
  - High (>50%) risk of death from lung disease within 2yrs if LTx is not performed
  - High (>80%) likelihood of survival at least 90days after LTx
  - High (>80%) likelihood of 5-yr post transplant survival from a general medical perspective provided that there is adequate graft function

ISHLT 2015 J Heart Lung Transplant 2015;34:1-15

General guideline for recipient selection

- **ATS and ISHLT**
  - Appropriate age :
    - heart-lung <55yrs, single <65yrs, bilateral <60yrs
  - Ineffective or unavailable medical tx
  - Limited life expectancy (<50% in 2yrs)
  - Acceptable nutritional status
    - IBW 80-120% , BMI < 30 Kg/m^2, usually
  - Satisfactory psycosocial profile and support system
  - Adequate financial coverage for the procedure and post-op care

Contraindication-absolute

- Recent history of cancer (2-5 yrs)
- Untreatable adavanced diseases in other organs
- Acute unstable medical problems
- Active TB
- Poorly controlled chronic infection
- Uncorrectable bleeding diasthesis
- Certain abnormalities of the chest wall or spine
- Untreatable psychiatric condition, psychological condition
- Absence of a reliable social support system
- Severely limited exercise capacity
- Morbid obesity (BMI > 35)
- Substance abuse

ISHLT 2015 J Heart Lung Transplant 2015;34:1-15

Contraindicatoin-relative

- Age >65 & low physiologic reserve
- Age> 75
- BMI 30-34.9
- Progressive or severe malnutrition
- Severe, symptomatic osteoporosis
- Extensive prior chest surgery with lung resection
- ECLS – however, carefully selected candidates
- Colonization with highly resistant infectious organism (*Burkhoderia* or certain mycobacterial infection)
- Other medical conditions that are not yet optimally treated (GERD, epilepsy, high BP, or uncontrolled diabetes) that may pose a risk to surviving surgery, wound healing, and/or the new lungs after surgery

ISHLT 2015 J Heart Lung Transplant 2015;34:1-15

Major disease categories

- COPD
- CF , other bronchiectasis
- ILD : IPF, fNSIP, CTD-ILD
- Pulmonary vascular disease

- Other : Sarcoidosis, LAM, BO after HSCT

ISHLT 2015 J Heart Lung Transplant 2015;34:1-15

Indication: ILD –esp. IPF

Referral

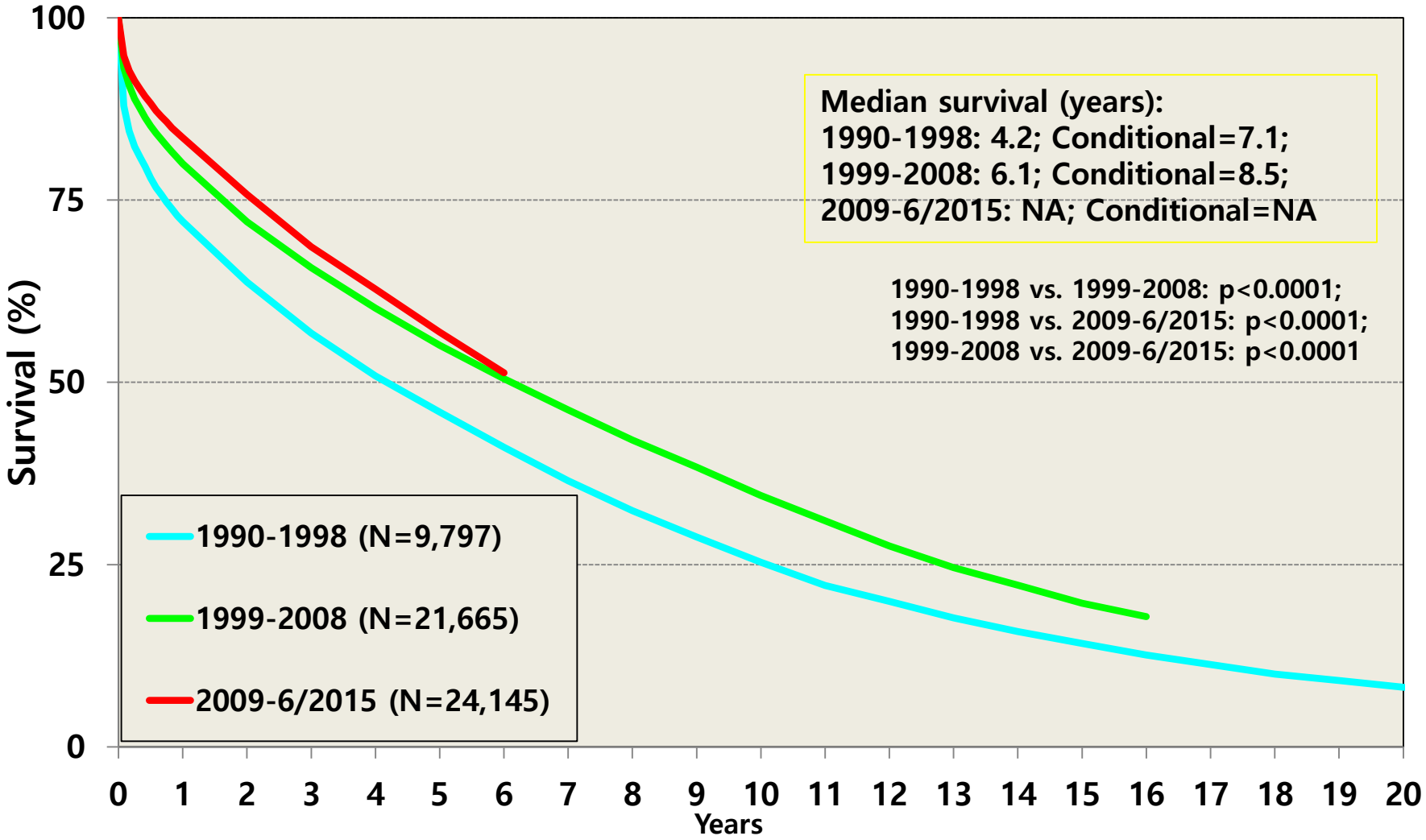
- FVC<80% or DLCO <40%
- Dyspnea, function limitation
- Oxygen requirement
- Failure to improvement after management in other ILD

Listing

- FVC decline ≥ 10% for 6 months
- DLCO decline ≥ 15% for 6 months
- Sat< 88 % or <250m on 6MWT
- Distance decline>50m for 6months on 6MWT
- Pul HTN : Rt cath, Echo
- Hospitalization because of respiratory decline, pneumothorax, or AE

ISHLT 2015 J Heart Lung Transplant 2015;34:1-15

Adult Lung Transplants
Kaplan-Meier Survival by Era
(Transplants: January 1990 – June 2015)



2017

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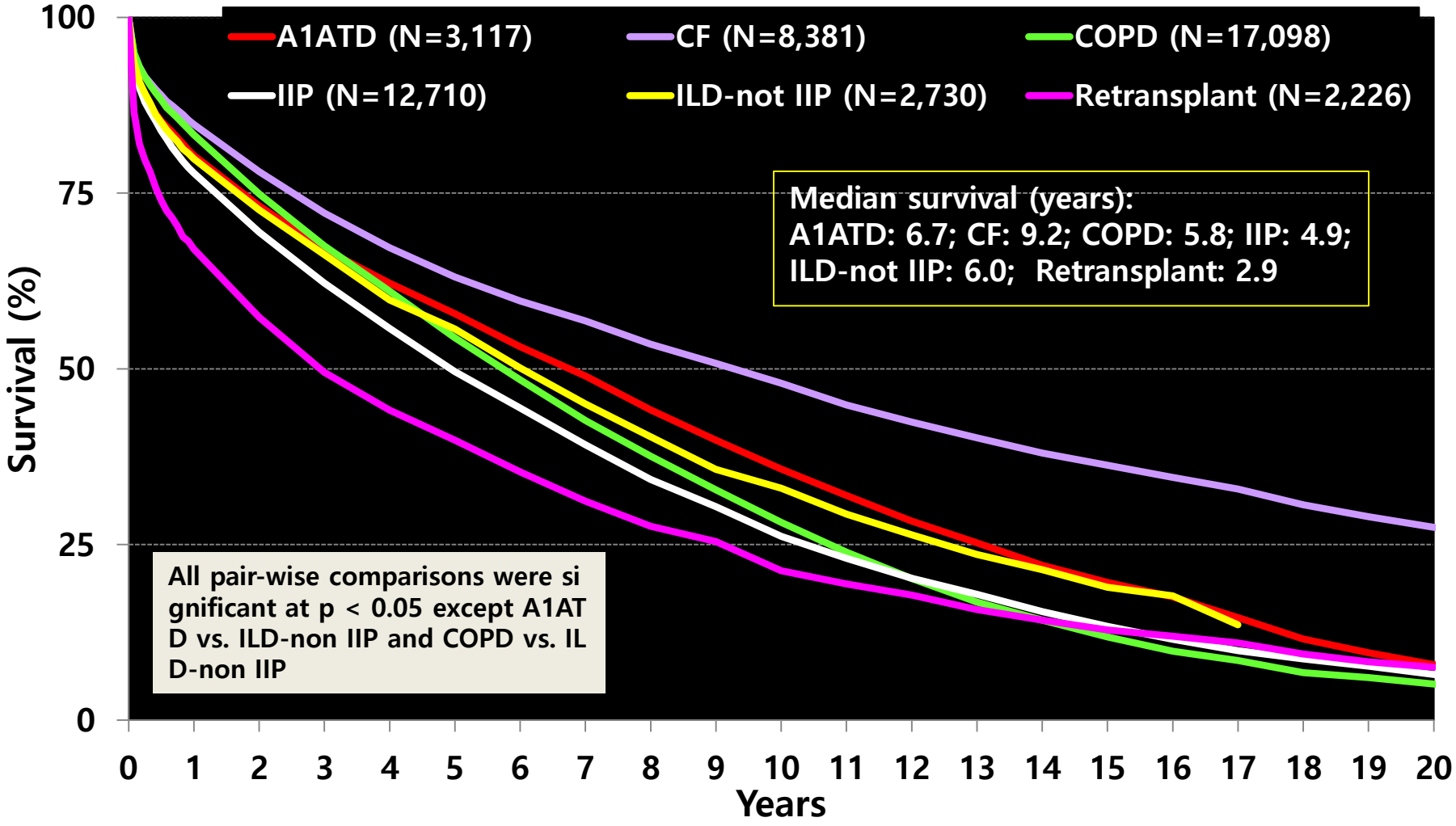
JHLT. 2017 Oct; 36(10): 1037-1079

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



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JHLT. 2017 Oct; 36(10): 1037-1079

Death during lung waiting list

Lung waiting list reported deaths and
Annual death rates per 1000 patient-year at risk

	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Patients	4868	5141	5374	5399	5549	5650	5269	4798	4676	4119
Deaths	599	519	532	529	489	512	398	300	317	266
Rate	190.5	152.6	149.1	145	131.5	135	115.5	101.7	125.9	128

USA

2009

Data from OPTN/SRTR Data as of May 4, USA

Mortality rate among wait- listed for LTx

Table 3 Pre-transplant mortality rates among adult patients wait-listed for a lung transplant

	Obstructive lung disease[1]	Pulmonary vascular disease[2]	Cystic fibrosis and immunodeficiency disorders	Idiopathic pulmonary fibrosis and re-transplant
1998-99	10.8	17.2	21.6	32.1
2000-01	9.7	13.1	17.8	23.1
2002-03	8.7	10.6	14.8	22.1
2004-05	7.7	7.3	14.4	19.9
2006-07	6.9	8.7	10.7	19.2
2008-09	5.5	14.2	15.3	22.5
2010-11	6.7	19.9	15.5	26.9

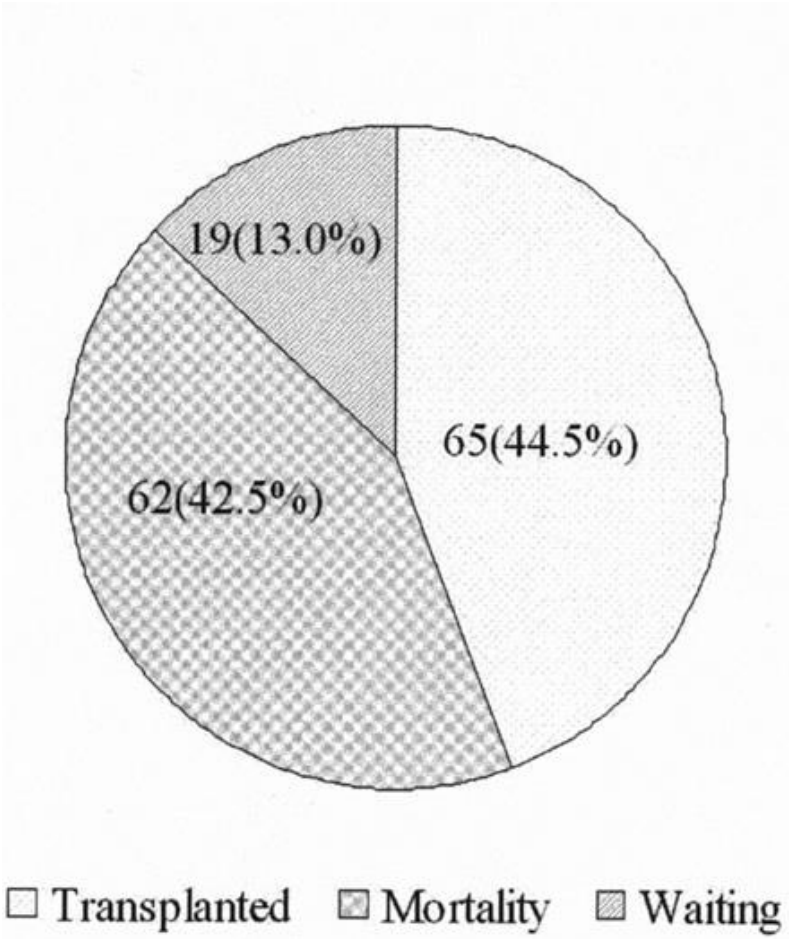
[1]e.g., chronic obstructive pulmonary disease/emphysema.
[2]e.g., idiopathic pulmonary arterial hypertension.
Mortality rates are computed as the number of deaths per 100 patient years of waiting time in the given 2-year interval. Waiting time is calculated as the total waiting time in the interval for patients in that group. Only deaths that occur prior to removal from the waiting list are counted.

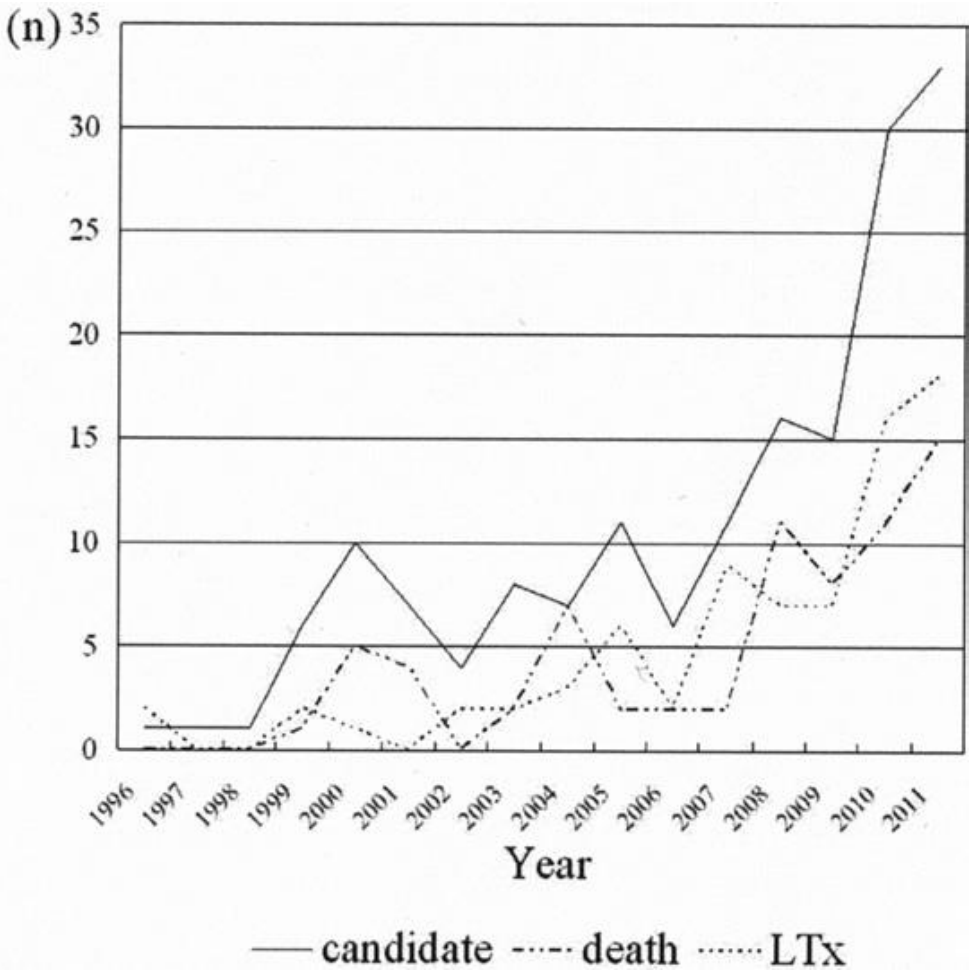
BMC pulmonary medicine 2014;14:139

Wait list mortality in IPF pts

	No. of IPF patients	% died on wait list
OPTN data, IPF patients on the lung transplant list between January 1995 and December 2000 [60]	2,115	31%
IPF patients, recorded in the OPTN database between June 30, 2004 and July 22, 2005, with 6-months of follow-up who did not undergo lung transplantation [61]	209	23%
IPF patients on the wait list at the University of California San Diego from January 1990 to February 1999 [62]	25	28%
IPF patients awaiting lung transplantation in five institutions and listed in The Korean Network for Organ Sharing (KONOS) from May 1996 to May 2011 [56]	61	57%
IPF patients who underwent assessment for lung transplantation at a single center in the UK [63]	42	64%
IPF patients at Inova Fairfax Hospital who were on the wait list for lung transplantation from 2000 to 2005 [64]	74	18%
IPF patients assessed for lung transplantation from January 1991 to June 1995 at the Toronto Lung Transplant Program [65]	26	19%
single center study of IPF patients at a single institution in Brazil registered on the waiting list from 2001 to June 2008 [66]	33	24%
single center study in France that included 46 IPF patients on the waiting list from 1988 to July 2001 [33]	46	35%
IPF patients referred for lung transplantation and lung-and-heart transplantation at a single center in Poland September 1999 and December 2004 [57]	24	67%
IPF patients enrolled at a lung transplant program in Italy (100 month time period) [58]	53	44%
Consecutive IPF patients assessed for lung transplantation between January 1997 and May 2006 at a single center in Israel (Pulmonary Institute of Rabin Medical Center) [67]	85	48%
IPF Patients enrolled from January – June 2004 at a single center in Israel (Pulmonary Institute of Rabin Medical Center) and followed from enrollment for a median of 2.4 years (range 2.0 to 3.1 years) [68].	51	14%

BMC pulmonary medicine 2014;14:139





Korea

1996-2011
146 pts: waiting list

Transplant Proc 2014;44,:865–869

현 행	개 정
응급도 0 - 입원한 환자로 다음 한가지 이상 해당 하여야 한다.(8일이내 재등록) 1) 호흡부전증으로 인공호흡기 2) 체외막형 심폐기를 가동중인 환자	**응급도 0** (현행유지)
응급도 1 (2개월마다 재등록하며 1)의 경우 재등록시점 1달이내의 검사를 인정한다. 단, 2).3)의 경우 처음 등록시 결과만으로도 재등록이 가능) - 다음 한가지 이상 해당하여야 한다. **1)NYHA IV 이면서 산소 투여 없이 측정한 동맥혈 가스 검사상 PaO2< 55mmHg** **2)NYHA IV 이면서 평균 폐동맥혈압 >65mmHg, 또는 평균 우심방 혈압 >15mmHg** **3) Cardiac index< 2L/min/m2 인 경우**	**응급도 1** (60일마다 재등록하며 검사결과는 검사시점과 상관없이 인정한다) - 다음 한가지 이상 해당하여야 한다. **1) 산소 투여 없이 측정한 동맥혈 가스 검사상 PaO2< 55mmHg** **2) 평균 폐동맥혈압 >65mmHg, 또는 평균 우심방 혈압 >15mmHg** **3) (현행유지)** **4) 동맥혈검사상 PCO2≧80mmHg인 경우** **5) 입원환자중 고유량비강캐뉼라 highflow nasal cannula 30L FiO2≧0.6로 2주 이상 유지중인 경우(유지중에만 인정)**
응급도 2 다음 한가지 이상 해당하여야 한다.(등록시점 30일 이내의 검사결과로 등록할 수 있으며 6개월마다 연장할 수 있다. 검사결과는 등록시점 검사결과만으로 연장이 가능하다.) **1)폐기능 검사에서 1초 강제호기량(FEV1)< 25%** **2)산소 없이 측정한 동맥혈 가스 검사상PaO2< 60mmHg** **3) 평균 우심방 혈압이 10-15mmHg인 경우** **4) 평균 폐동맥압력이 55-65mmHg인 경우** **5) Cardiac index< 2-2.5L/min/m2 인 경우**	**응급도 2** - 다음 한가지 이상 해당하여야 한다.(등록시점 30일 이내의 검사결과로 등록할 수 있으며 180일마다 연장할 수 있다. 검사결과는 처음 등록시점 검사결과만으로 연장이 가능하다.) 1)~5) (현행유지) **6) 동맥혈검사상 70mmHg ≦ PCO2 < 80mmHg 인 경우** **7) DLCO <30%인 경우**

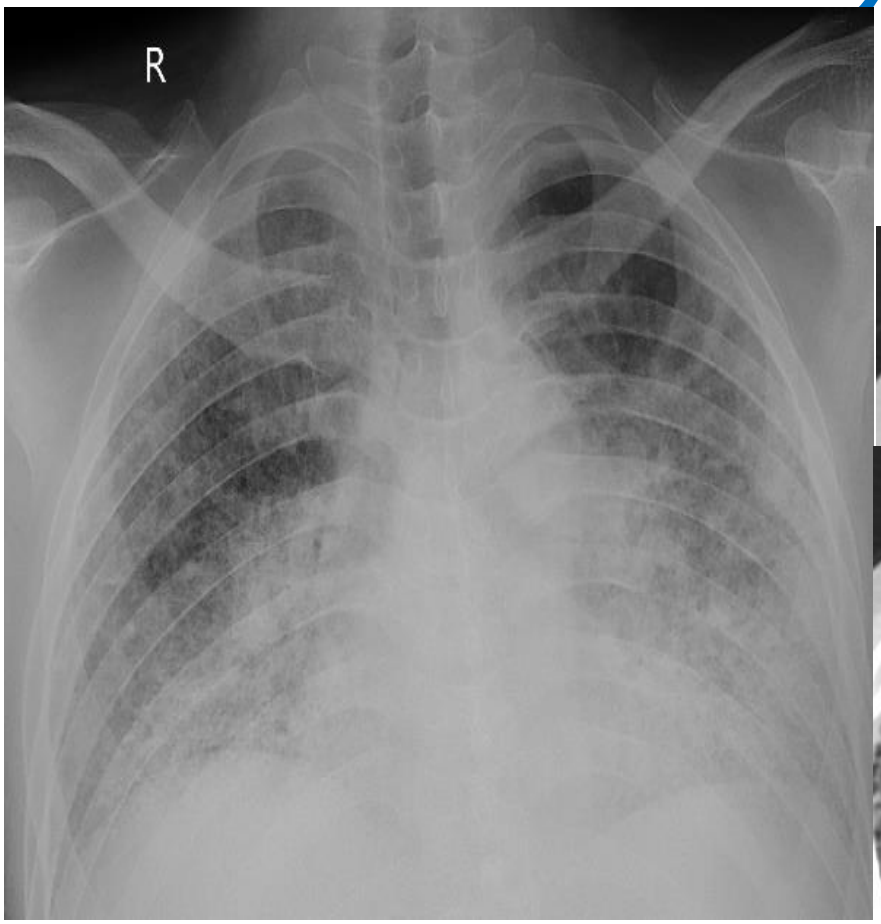
응급도 3 - 다음 한가지 이상 해당하여야 한다.(응급도 0과 1, 2에서 동일 응급도로 연장하지 않은 경우 현재의 환자 상태 해당 응급도로 변경한다. 그렇지 않으면 응급도 3으로 떨어진다.) 1) 단독 폐이식이 필요한 경우 2) 폐기종, 폐고혈압, DILD 3) 폐기능검사에서 노력호기량 < 30% 4) 호흡 부전증으로 3번이상 입원한 경우	**응급도 3** (현행유지)
<u>응급도 7</u> 응급도가 0,1,2,3에 해당 되지 않는 모든 대기자	**<u>응급도 4</u>** (현행유지)

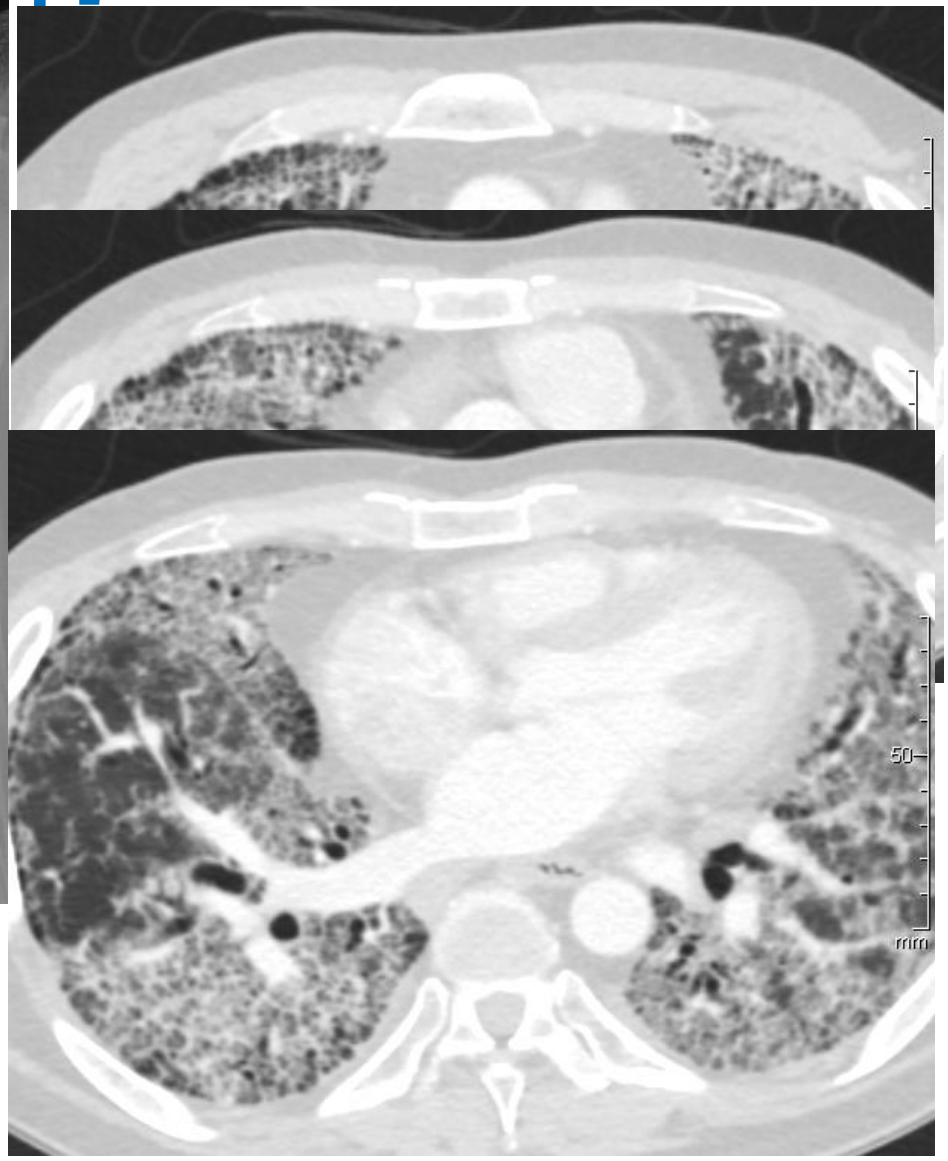
Current problem

- *같은 점수의 환자는 모두 동일한 상태인가?*

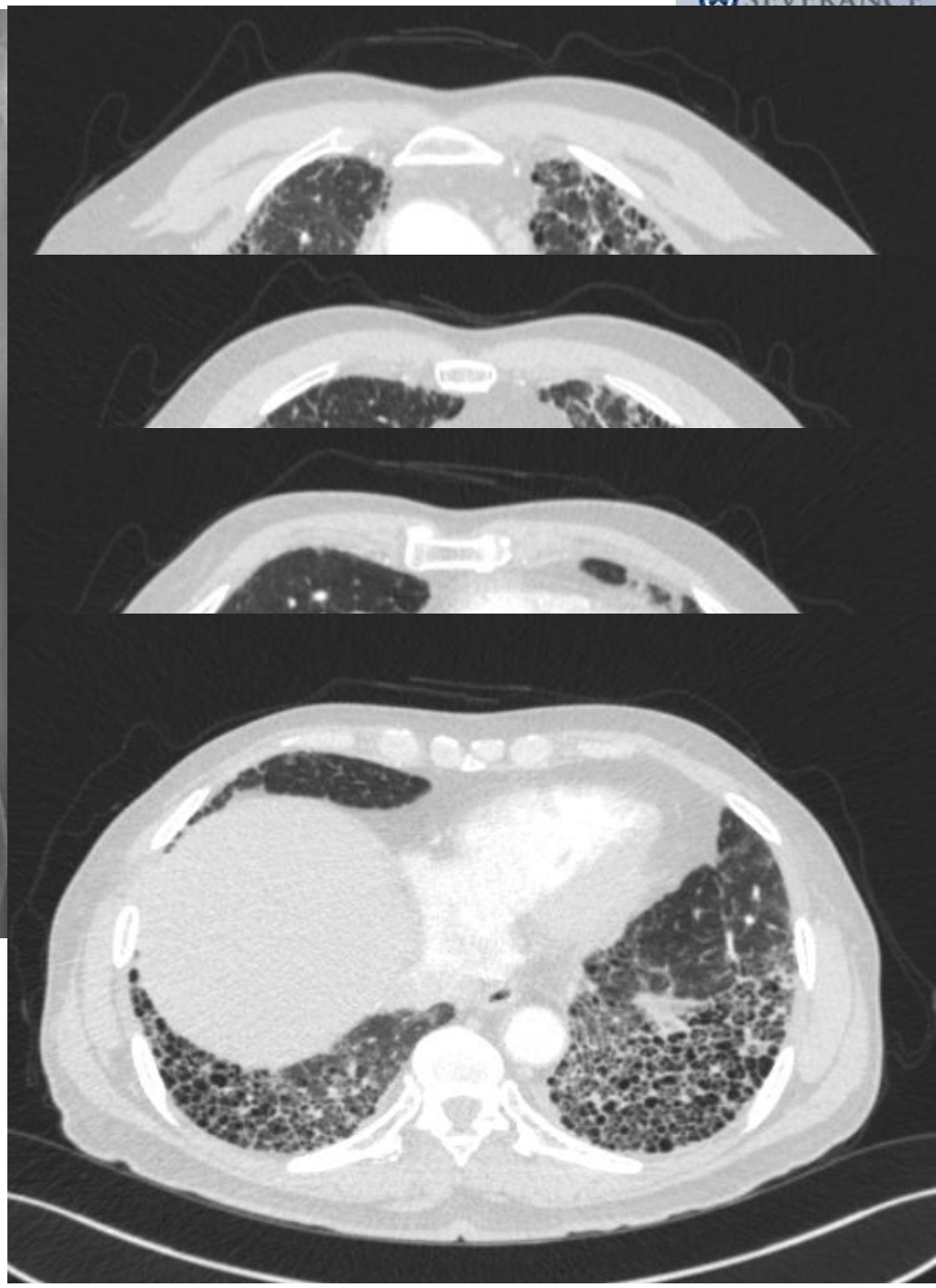
- Disease category – IPF, PPH …
- Other organ function- renal function..
- Functional status - rehabilitation
- Transplant benefit –predictive model …
- Severity – hospitalized vs. non hospitalized..

같은 점수의 환자는 모두 동일한 상태인가?



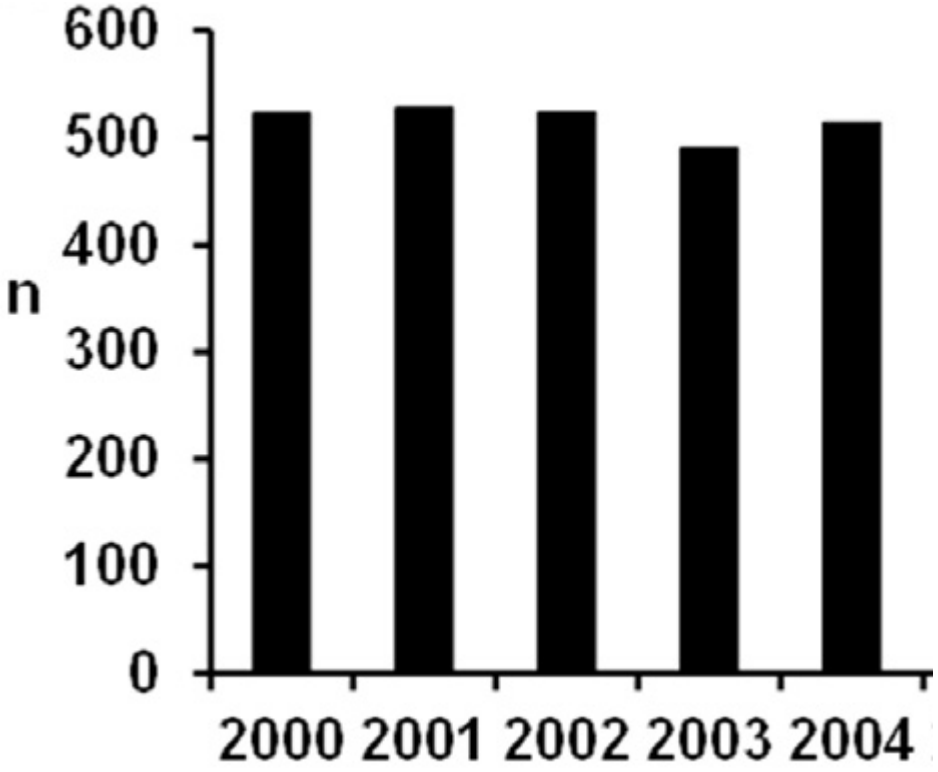


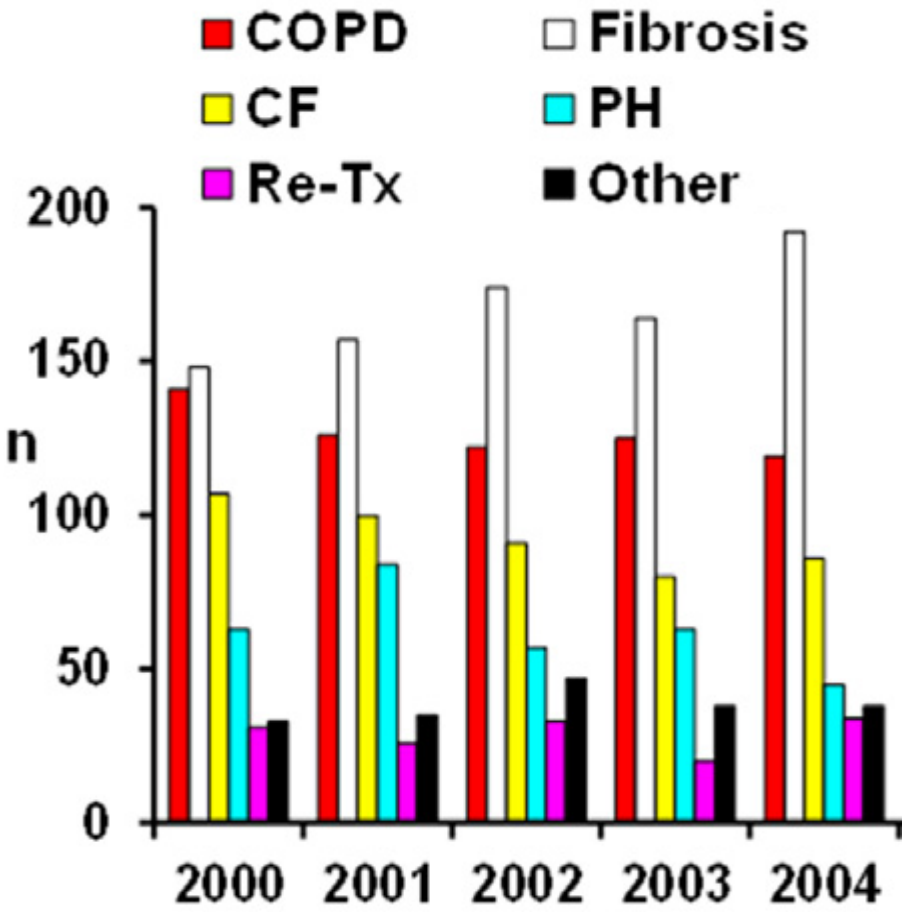
M/41 IPF
ER→ mask 10L
ABG 7.45/34/39
응급도 1 HOD 77 Lung transplantation



M/68, IPF
FVC 1.76L(42%)/FEV1 1.51L(53)/
DLCO 31
ABG 7.41/38/48 , O2 1L PRN
응급도 1

Lung transplant waitlist deaths (USA)





J Heart Lung Transplant2016;35:433–439

Lung Allocation Socre (USA)

Predicted risk of death on the waiting list

Predicted likelihood of survival following after LTx within 1yr

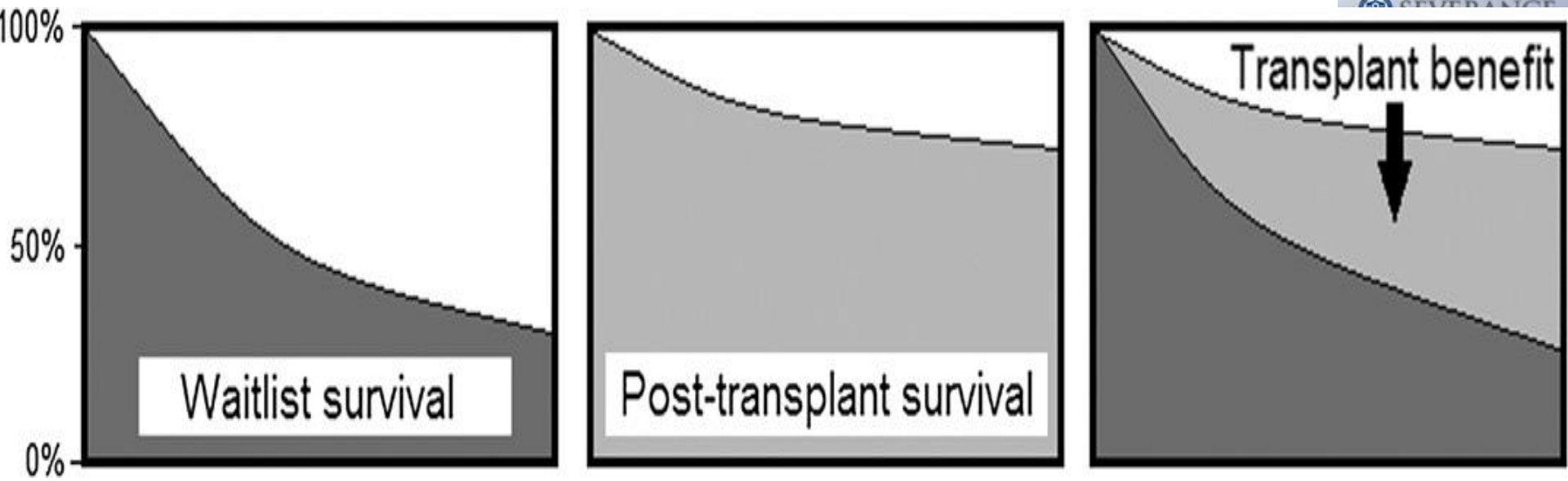
Factors Used to Predict Waiting List Survival	Factors Used to Predict Posttransplant Survival
Forced vital capacity (FVC) (% predicted)	FVC (% predicted)
Pulmonary artery systolic pressure	Mean pulmonary capillary wedge pressure ≥20 mm Hg
O_2 required at rest (L/min)	Continuous mechanical ventilation
Age at offer	Age at transplant
Body mass index	Serum creatinine (mg/dL)
New York Heart Association (NYHA) functional status	NYHA functional status
Diagnosis	Diagnosis
Six-minute walk distance <150 feet	
Continuous mechanical ventilation	
Diabetes	

Clin Chest Med 2011;32:213-222

Table 1
Diagnosis groups and their constituent diagnoses

LAS Group A	LAS Group B	LAS Group C	LAS Group D
Obstructive Lung Disease	Pulmonary Vascular Disease	Cystic Fibrosis or Immunodeficiency Disorders	Restrictive Lung Disease
Chronic obstructive pulmonary disease	Primary pulmonary hypertension	Cystic fibrosis	Idiopathic pulmonary fibrosis
Emphysema	Eisenmenger syndrome	Common variable immune deficiency	Bronchiolitis obliterans and organizing pneumonia
α1-Antitrypsin deficiency	All specific pulmonary vascular diseases including pulmonary venous obstructive disease, chronic thromboembolic disease, and secondary pulmonary hypertension	Hypogamma-globulinemia	Hypersensitivity pneumonitis
Lymphangioleio-myomatosis			Acute respiratory distress syndrome/ pneumonia
Bronchiectasis			Bronchoalveolar carcinoma
Sarcoidosis with mean pulmonary artery pressure ≤30 mm Hg			Lung retransplant/graft failure

Clin Chest Med 2011;32:213-222



Geographic zones
ABO match
Size matching
Donor/recipient
Cytomegalovirus serology

Urgency + **Net transplant benefit**

Clin Chest Med 2011;32:213-222

Lung diagnosis code
Date of birth
Height and weight
Functional status (performs activities of daily living with no, some, or total assistance)
Presence of diabetes
Forced vital capacity, percent predicted
Six-minute walk test, distance walked in feet
Oxygen requirement at rest
Assisted ventilation (none, BiPAP, CPAP, continuous or intermittent mechanical)
Pulmonary artery pressure, mean and systolic
Pulmonary capillary wedge pressure, mean
PCO_2 (highest, lowest, current)
Serum creatinine

Semin Respir Crit Care Med 2013;34:275–280.

LAS results should not be considered definitive; they are merely a snapshot based upon the values entered and can vary daily.

Date of Birth * (mm/dd/yyyy)

10/16/1968

Height *

4 ft 11 in

150 cm

Weight *

121 lbs

55 kg

Total Bilirubin (mg/dL)

Current	1.7
Highest	5
Lowest	1.0

Reset Calculate

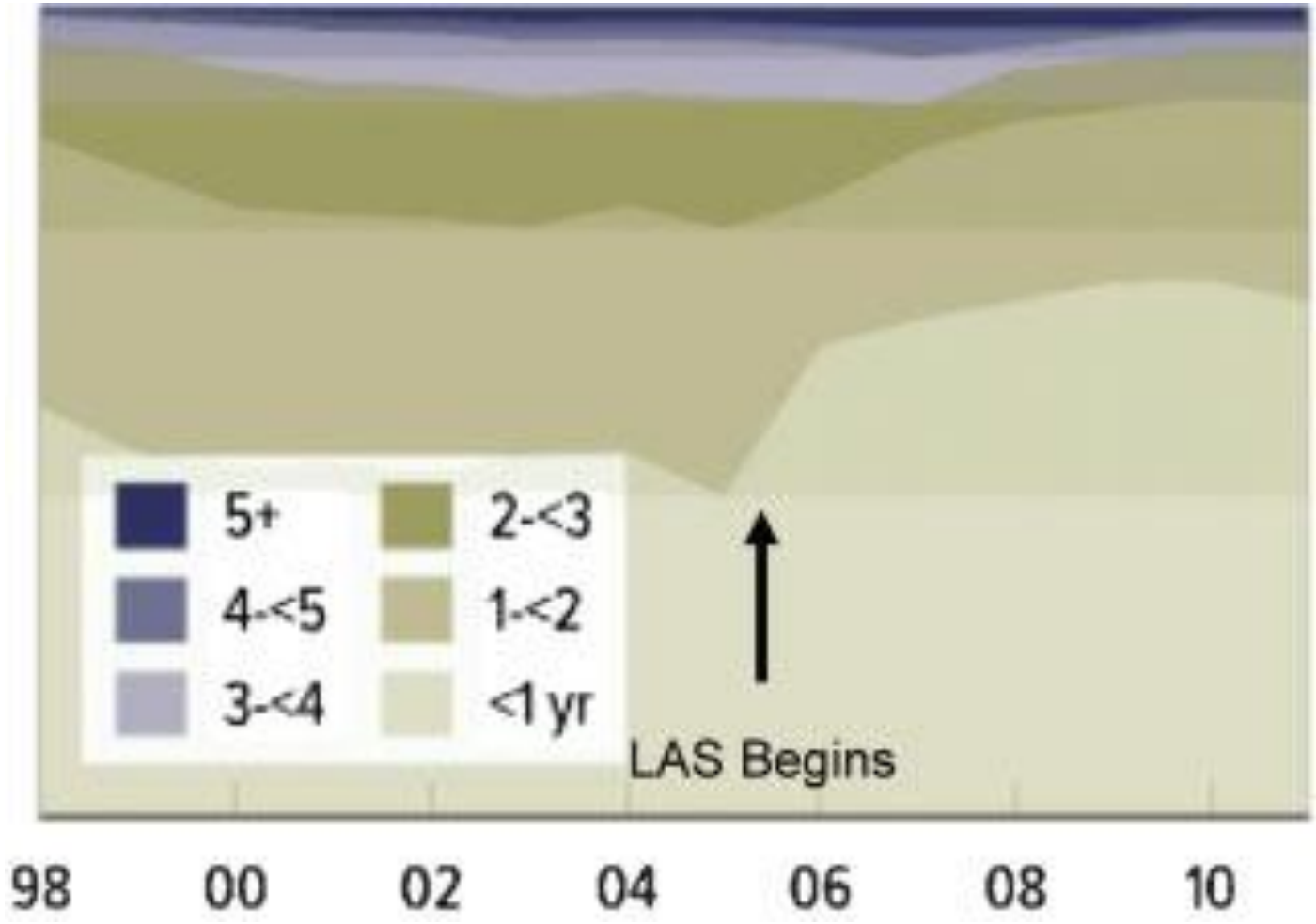
LUNG ALLOCATION SCORE (LAS): 66.6932

WAITLIST URGENCY MEASURE: 161 day(s)

POST-TRANSPLANT SURVIVAL MEASURE: 322 day(s)

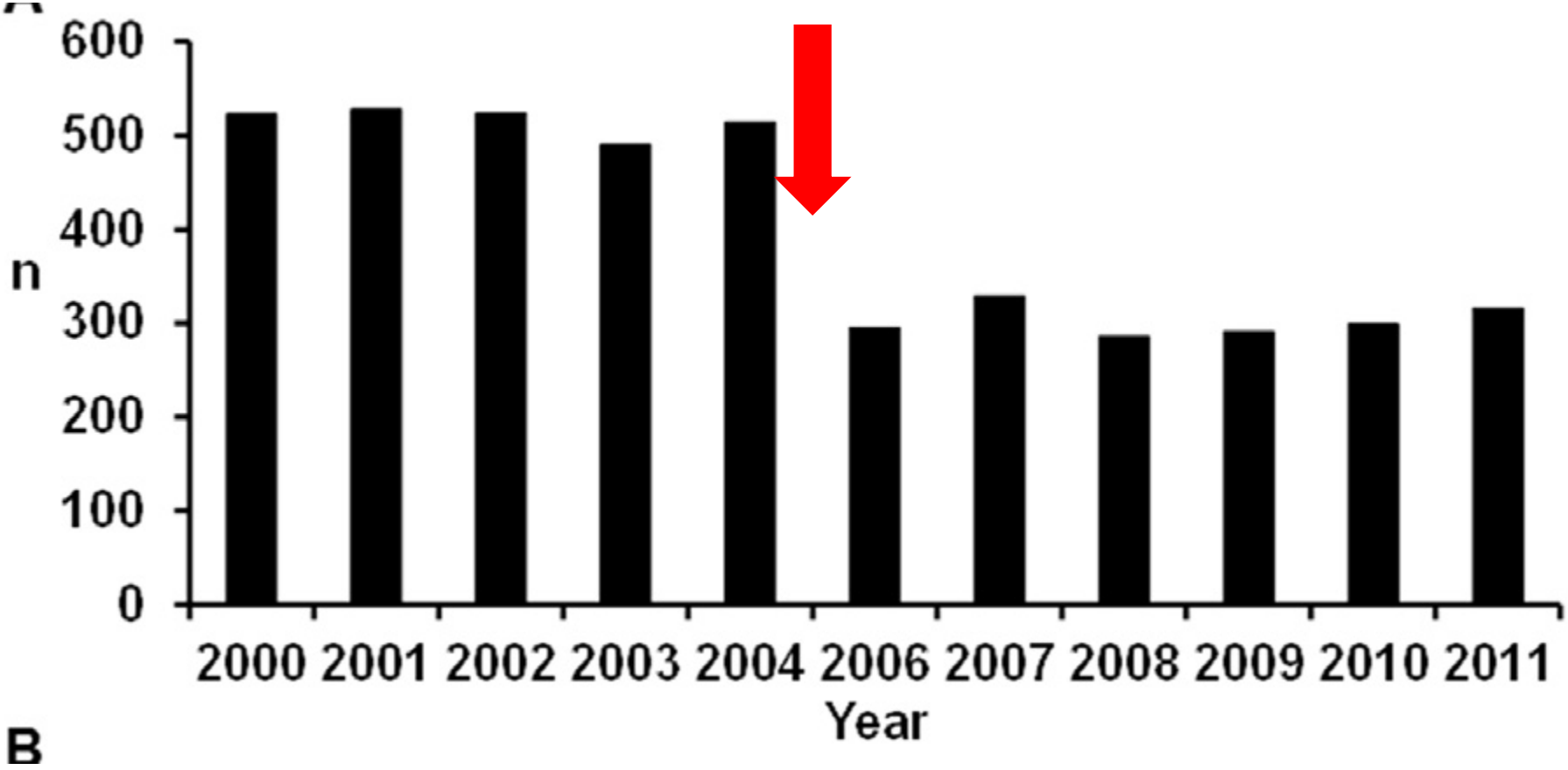
https://optn.transplant.hrsa.gov/resources/allocation-calculators/las-calculator/

Time on wait list for LTx decreased after implementation of LAS

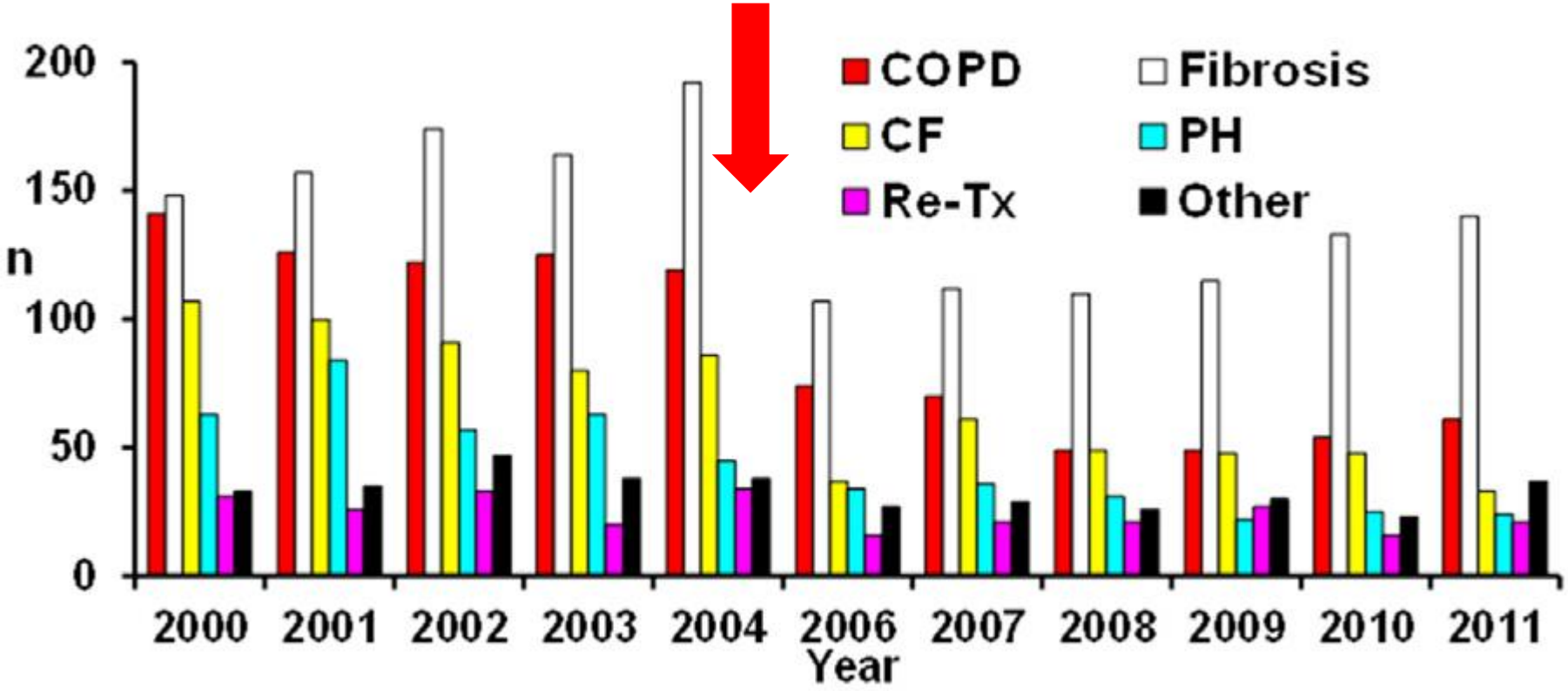


Semin Respir Crit Care Med 2013;34:275–280.

Lung transplant waitlist deaths after introduction of LAS (USA)

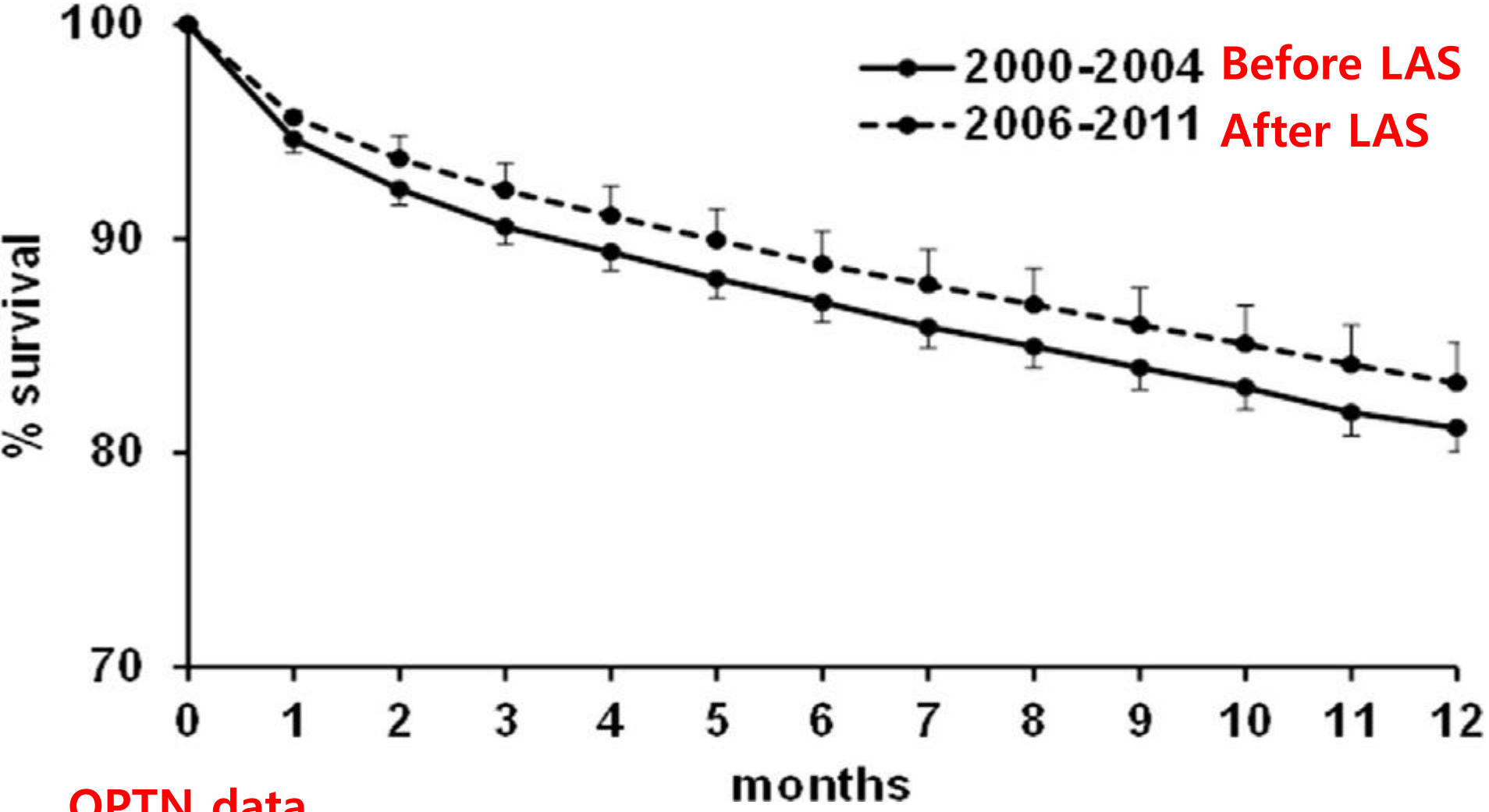


J Heart Lung Transplant2016;35:433–439



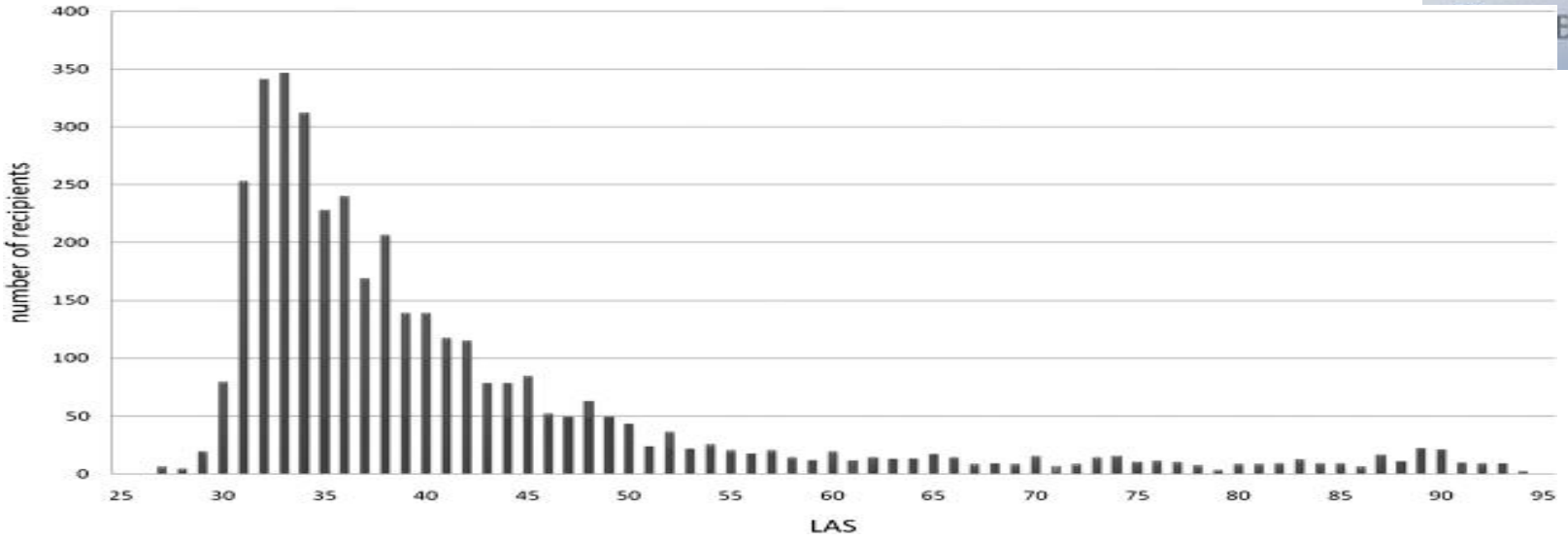
J Heart Lung Transplant2016;35:433–439

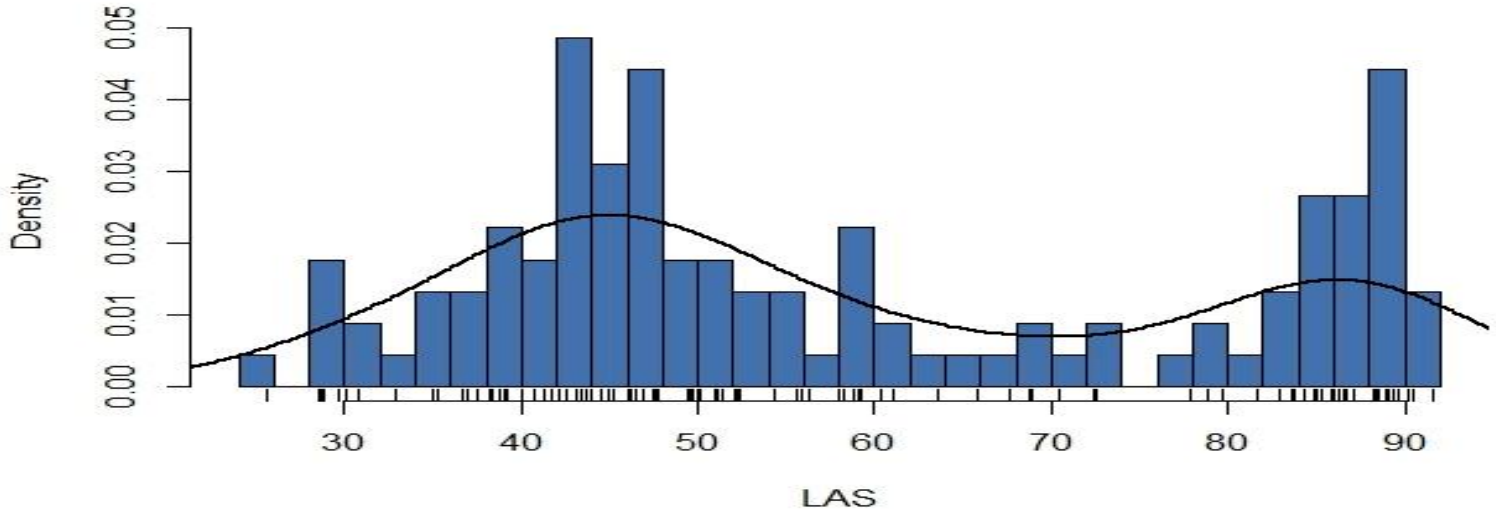
One year post transplant survival after LTx



OPTN data
USA

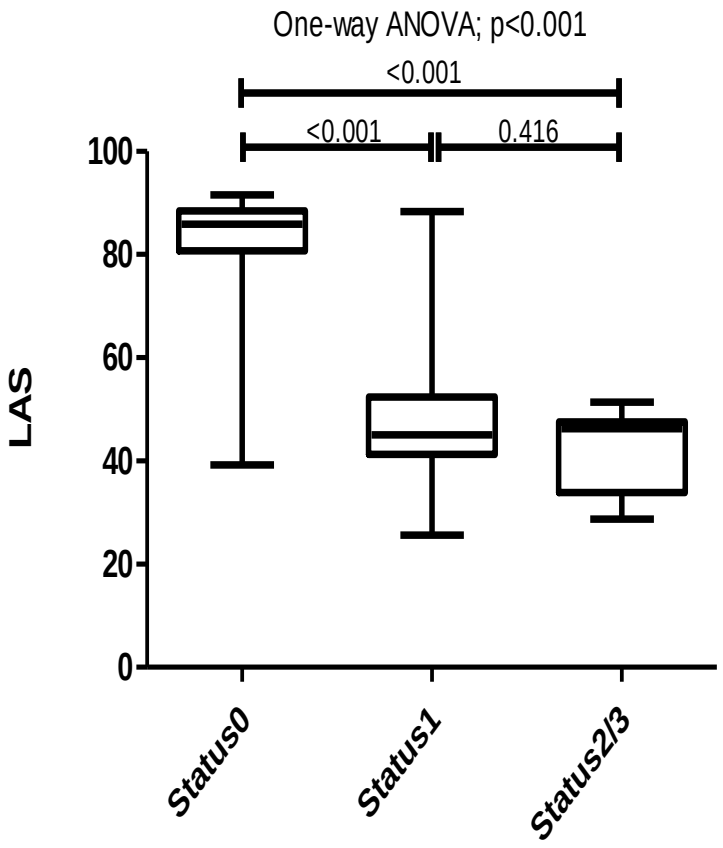
J Heart Lung Transplant2016;35:433–439

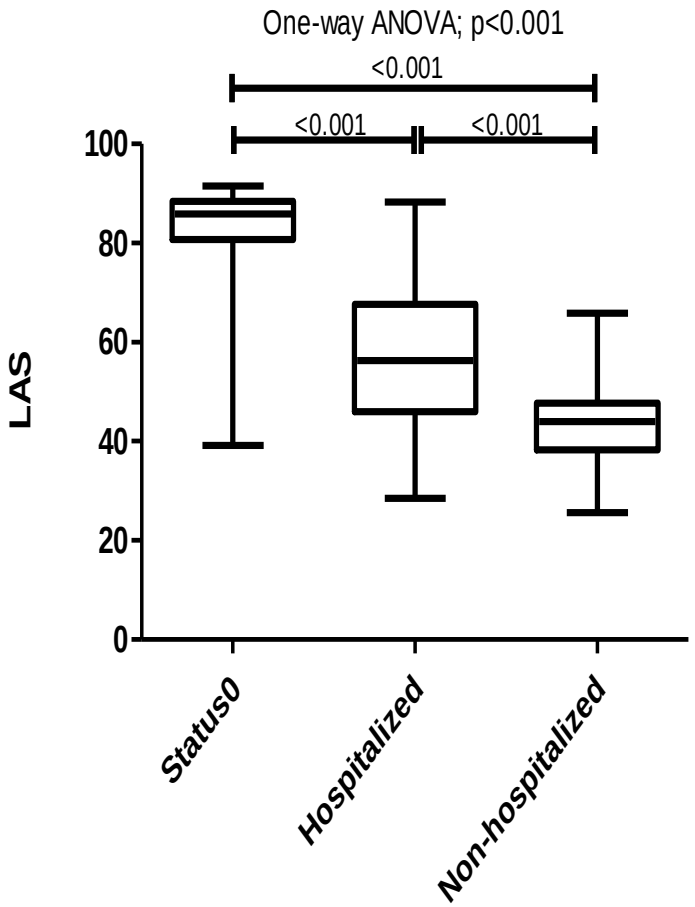




2012-2016
113 pts
Korea

Unpublished data





Unpublished data

Single vs. Double LTx

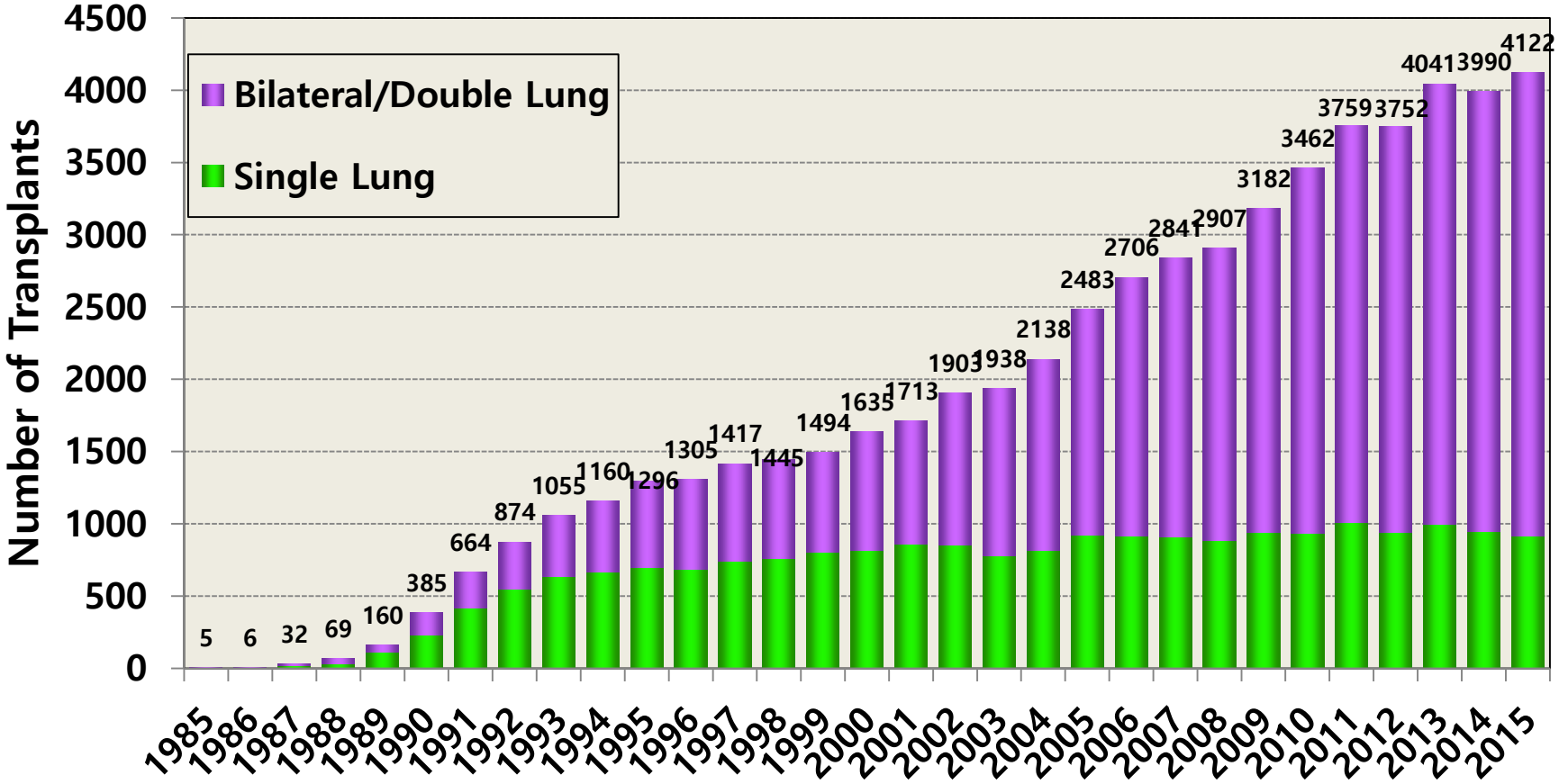
SEVERANCE

Table 2 Survival following single vs. bilateral lung transplantation among IPF patients

Data source	Yr. of transplant	No. of IPF patients	Survival (% IPF patients alive)				
			Median survival	1 yr.	3 yr.	5 yr.	10 yr.
ISHLT, OPTN, and Eurotransplant data							
ISHLT data [12]	1990 - 2011	8,528	NR	SLT: 75 BLT: 74	SLT: 57 BLT: 63	SLT: 43 BLT: 49	SLT: 20 BLT: 35
Analysis of OPTN data (*Force, et al*) [51]	1987 - 2008	3,830	NR	NR	NR	SLT ~53[a] BLT: 60[a]	SLT ~30[a]; BLT: ~48[a]
Analysis of OPTN data (*Thabut et al*) [21]	1987 - 2009	3,327	SLT: 5.2 years (4.3–6.7); BLT: 3.8 years (3.6–4.1)	NR	NR	NR	NR
Analysis of OPTN data (*Nwakanma, et al*) [52]	1998 - 2004	429	30-day SLT: 94 BLT: 95	SLT: 69 BLT: 72	SLT: 52 BLT: 54	SLT: 33 BLT: 54	NR
Eurotransplant (*Smits et al*) [53]	1997 - 1999	104	NR	NR	SLT: 63 BLT: 47	NR	NR
Single center studies							
University of Wisconsin Hospital and Clinics (*De Oliveira, et al*) [49,50]	1993 - 2009	79	NR	SLT: 82 BLT: 86	SLT: 65 BLT: 55	SLT: 65 BLT: 55	SLT: 49 BLT: 55
Cleveland Clinic, US (*Mason, et al*) [48]	1990 - 2005	82	NR	SLT: 67 BLT: 81	NR	SLT: 34 BLT: 55	NR
Alfred Hospital, Melbourne, Australia (*Keating, et al*) [37]	1990 - 2008	67	NR	SLT: 78 BLT: 68	NR	SLT: 49 BLT: 50	SLT: 29 BLT: 50
University of Munich, Germany (*Neurohr, et al*) [34]	1997 - 2008	76	SLT: 83 BLT: 93	SLT: 70 BLT: 80	SLT: 55 BLT: 74	SLT: 42 BLT: 67	NR

BMC pulmonary medicine 2014;14:139

Adult Lung Transplants
Number of Transplants by Year and Procedure Type

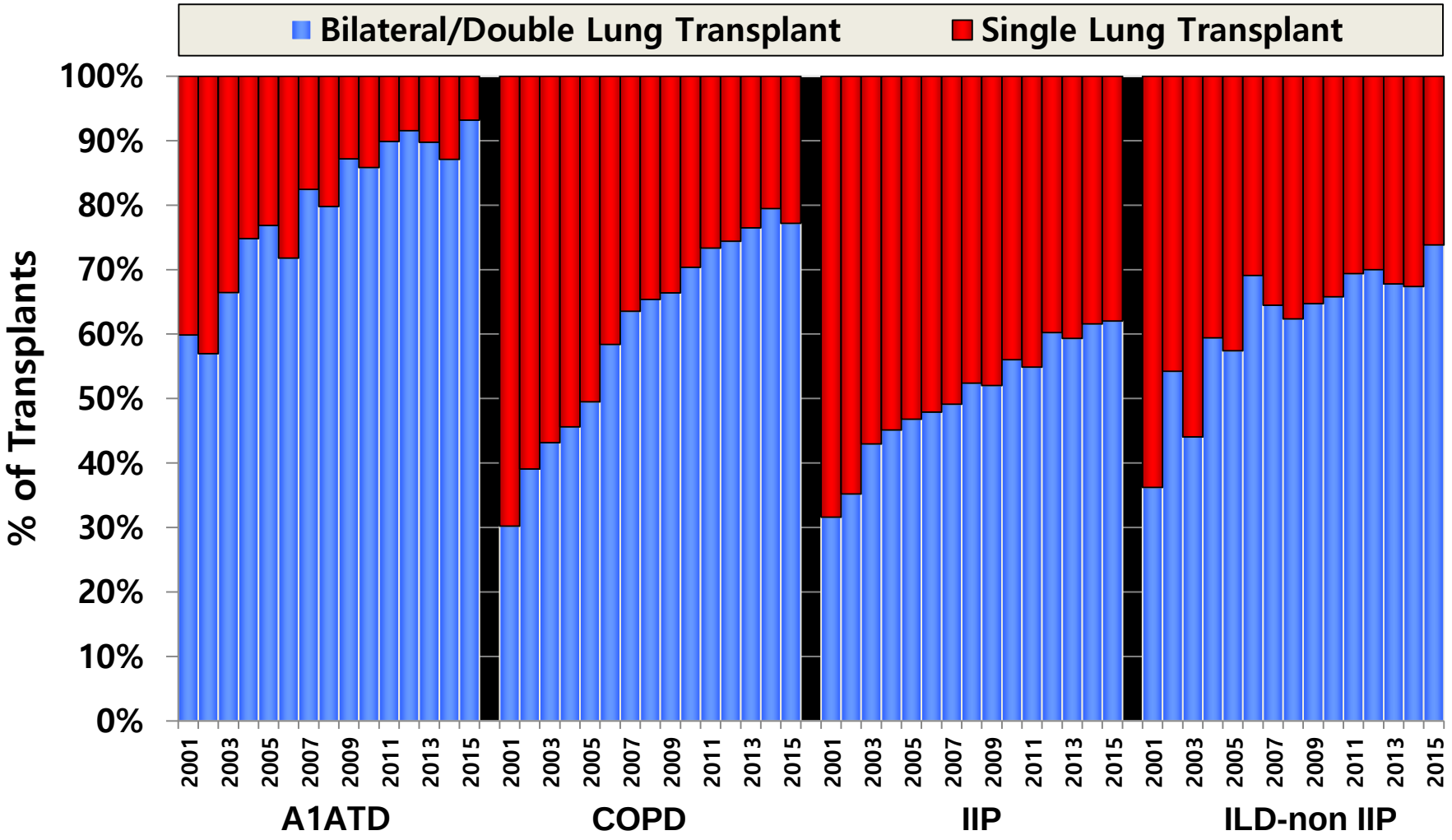


ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION

2017

JHLT. 2017 Oct; 36(10): 1037-1079

Adult Lung Transplants
Procedure Type within Indication, by Year

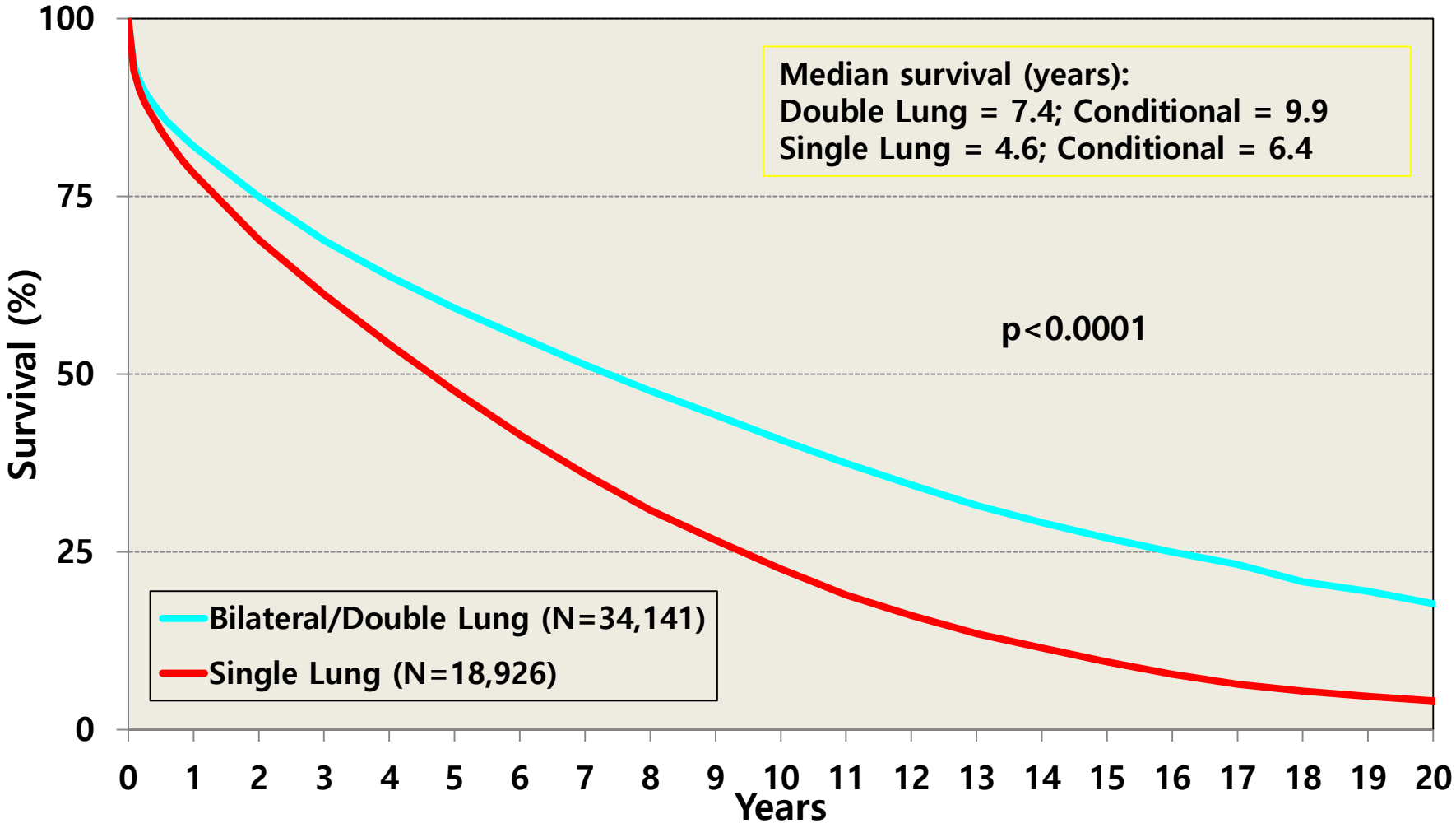


2017

ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION
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)

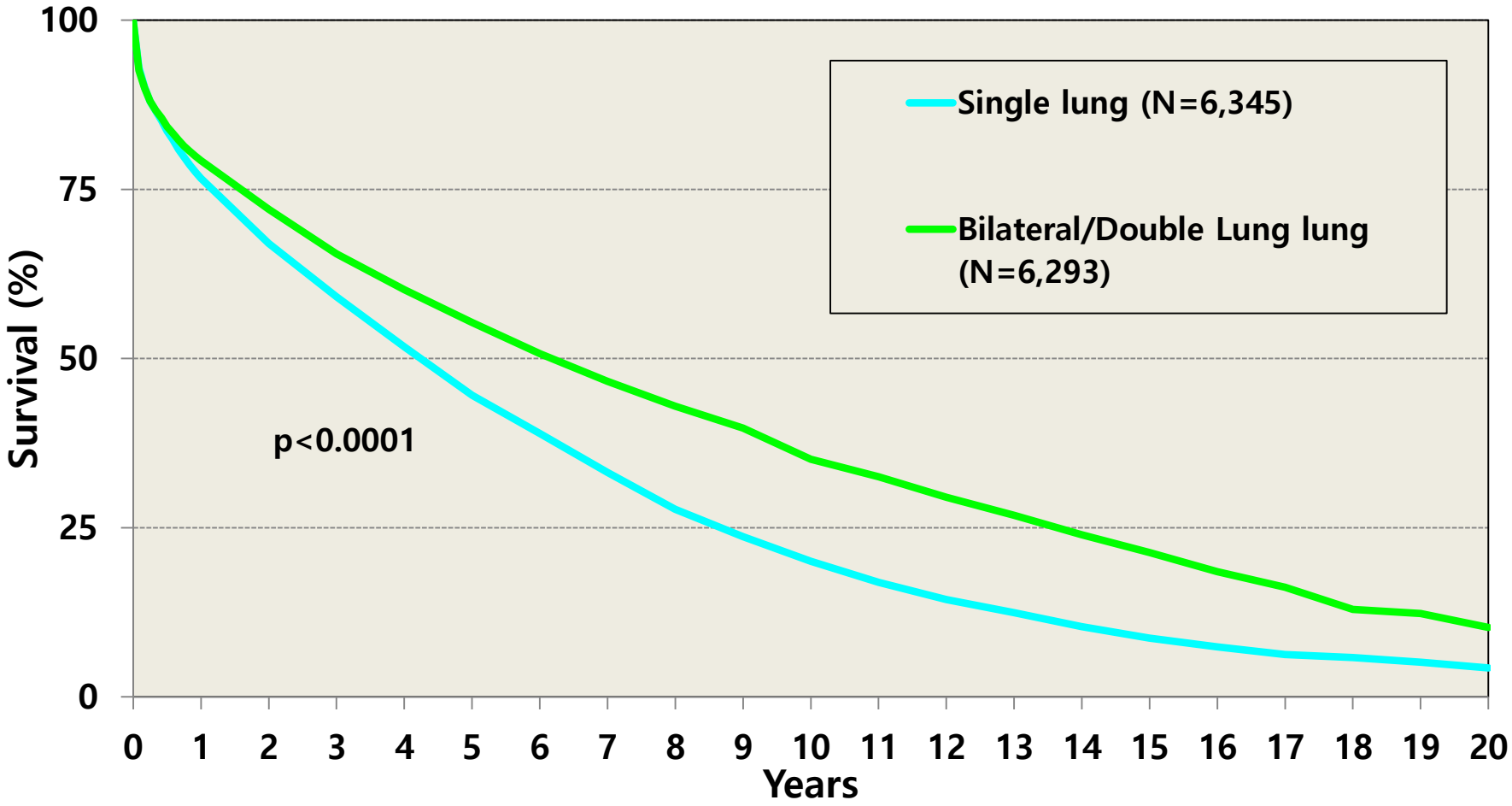


2017

ISHLT • INTERNATIONAL SOCIETY FOR HEART AND LUNG TRANSPLANTATION

JHLT. 2017 Oct; 36(10): 1037-1079

Adult Lung Transplants
Kaplan-Meier Survival by Procedure Type
(Transplants: January 1990 – June 2015)
Diagnosis: IIP



2017

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JHLT. 2017 Oct; 36(10): 1037-1079

Mechanical bridges to LTx

ECLS recommended

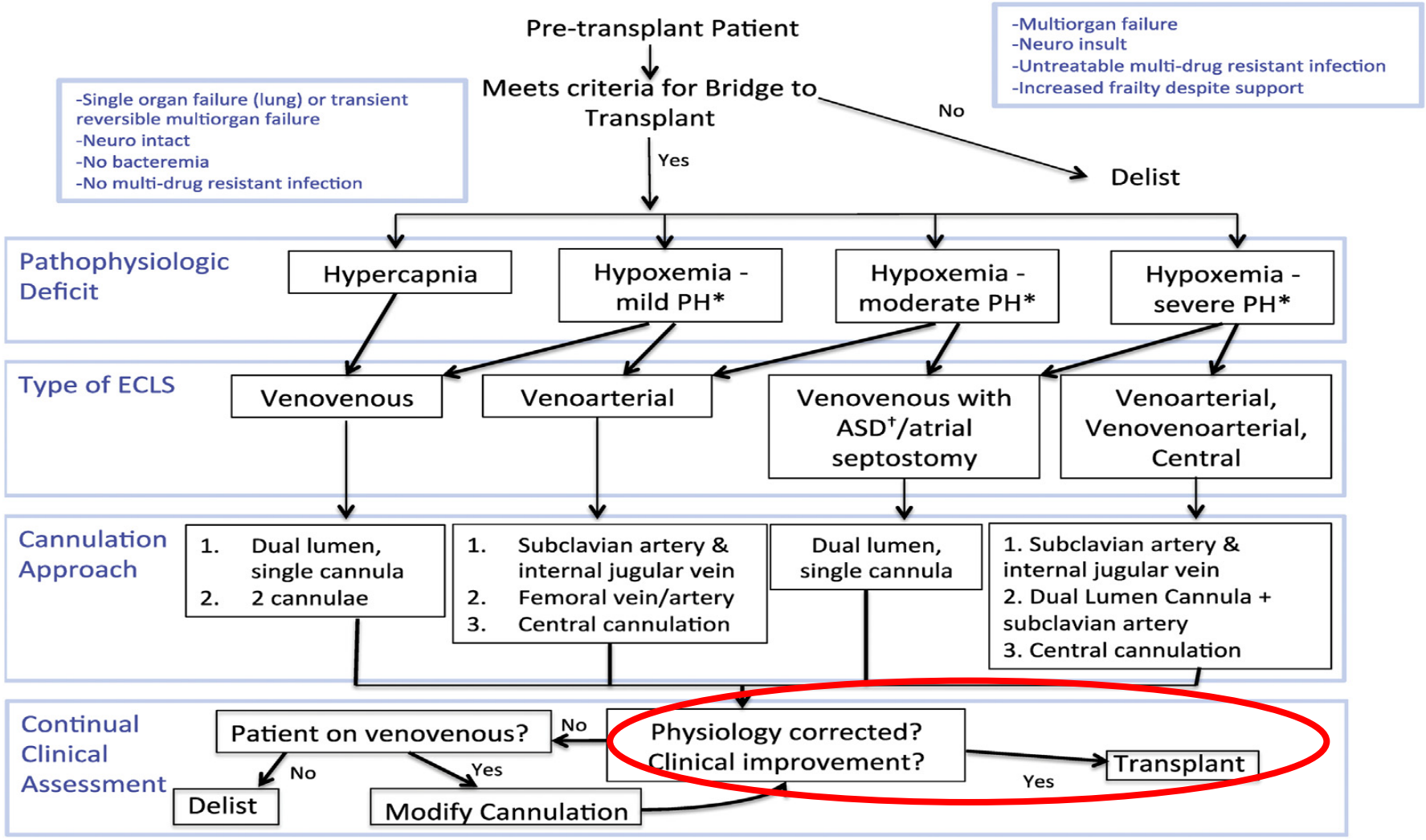
- Young age
- Absence of multi-organ dysfunction
- Good potential for rehabilitation

ECLS not recommended

- Septic shock
- Multi-organ dysfunction
- Severe arterial occlusive diseases
- Heparin induced thrombocytopenia
- Prior prolonged mechanical ventilation
- Advanced age
- Obesity

ISHLT 2015 J Heart Lung Transplant 2015;34:1-15

ECMO bridge to lung transplant



2007-2016 ECMO (NY)
72 bridge to LTx -40 LTx

Ann Thorac Surg 2017;104:412–9

Table 1. Clinical Characteristics of Patients Undergoing Extracorporeal Membrane Oxygenation as a Bridge to Lung Transplantation

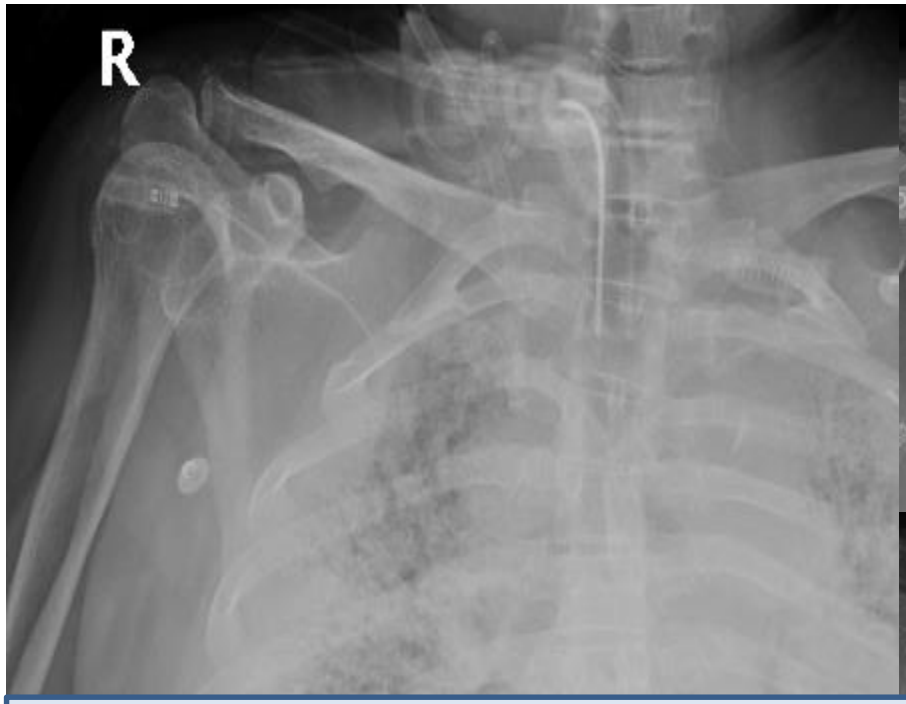
Characteristics	N = 72
Age (y)	42.2 ± 15.1
Female	38 (52.8%)
Body mass index (kg/m^2)	22.7 ± 5.2
Height (cm)	166.1 ± 10.7
Blood type	
A	27 (37.5%)
B	9 (12.5%)
AB	2 (2.8%)
O	34 (47.2%)
Diagnosis	
Cystic fibrosis	27 (37.5%)
Interstitial lung disease	30 (41.7%)
Primary pulmonary hypertension	8 (11.1%)
Chronic obstructive pulmonary disease	3 (4.2%)
Primary ciliary dyskinesia	1 (1.4%)
Sarcoidosis	2 (2.8%)
Bronchiectasis	1 (1.4%)

Details of Clinical Course	N = 72
Ambulation	50 (69.4%)
LTx performed	40
Time between (days [IQR])	
ECMO and LTx	12 (6.25–18.75)
Admission and LTx	25 (13–40)
ICU admission to LTx	19 (11.25–34.25)
Postoperative ECMO	16 (40%)
Secondary ECMO	4 (10%)
LTx not performed	32
Delisted before LTx	23 (31.9%)
Died before LTx	9 (12.5%)
Time between (days [IQR])	
ECMO to delist	14 (7–29)
Hospitalization to delist	32 (18–50)
ICU admission to delist	29 (13–45)
ECMO to death	12 (6–19)
Hospitalization to death	16 (9.5–28.5)
ICU admission to death	15 (9.5–20)

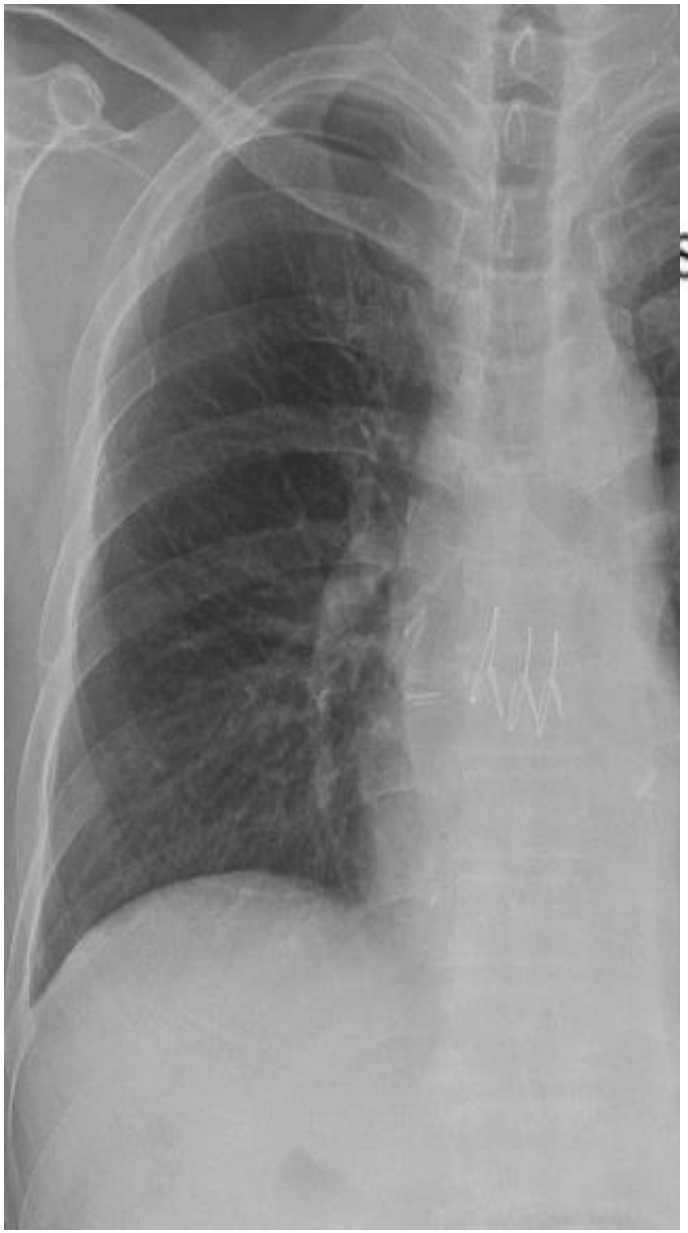
Survival outcomes

Outcomes	No./at Risk	Percentage (%)
All patients	n = 72	
To discharge	37/72	51.4%
1-year	28/63	44.4%
2-year	21/56	37.5%
Patients with cystic fibrosis	n = 27	
To discharge	18/27	66.7%
1-year	16/25	64.0%
2-year	13/23	56.5%
Patients with interstitial lung disease	n = 30	
To discharge	13/30	43.3%
1-year	7/24	29.2%
2-year	5/22	22.7%
All patients who underwent lung transplantation	n = 40	
To discharge	37/40	92.5%
1-year	28/31	90.3%
2-year	21/25	84.0%
Patients with cystic fibrosis who underwent lung transplantation	n = 27	
To discharge	18/19	94.7%
1-year	16/17	94.1%
2-year	13/15	86.7%
Patients with interstitial lung disease who underwent lung transplantation	n = 30	
To discharge	13/14	92.9%
1-year	7/8	87.5%
2-year	5/6	83.3%

Ann Thorac Surg 2017;104:412–9



Cannot remove the ventilator.
Cannot transfer to general ward
Recurrent sepsis
Expired at POD 6months.



Spirometry

		Ref	Pre	% Ref
FVC	Liters	3.73	2.97	80
FEV1	Liters	2.61	2.81	108
FEV1/FVC	%	71	95	
FEV3	Liters		2.88	
FEV6	Liters		2.96	
FEF25-75%	L/sec	2.60	5.68	219
IsoFEF25-75	L/sec	2.60	5.68	219
FEF50%	L/sec	3.33	6.57	197
PEF	L/sec	7.21	9.53	132
FET100%	Sec		6.74	
FIF50%	L/sec		1.70	

Other considerations

- Rehabilitation
- Nutrition
- Comorbidities

SEVERANCE

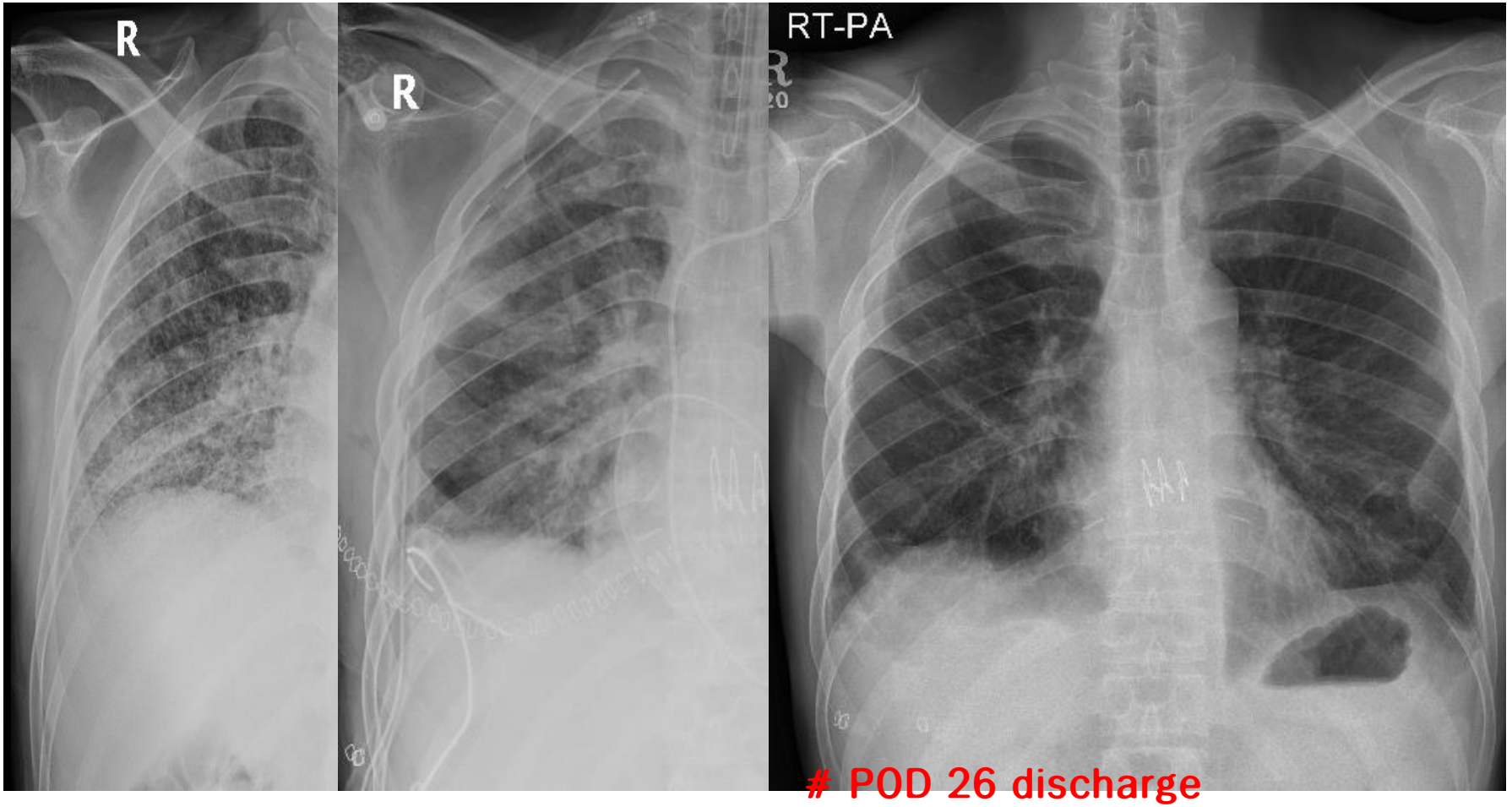
M/41 IPF

Admission for w/u before LTx

#HOD 80 bilateral LTx

Mask 10L ambulation

Independent gait



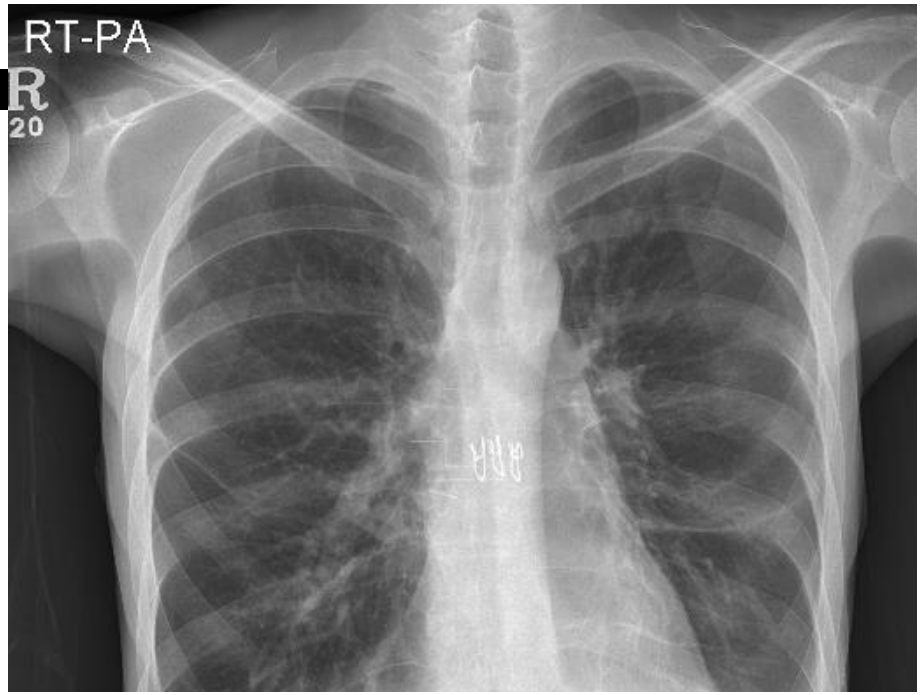
POD 26 discharge

HOD 105

M/27 , BO after HSCT
Admission for w/u before LTx
#HOD 100 bilateral LTx

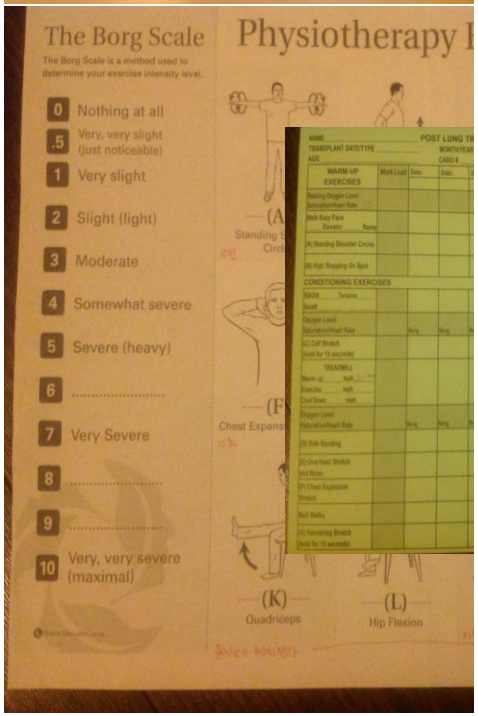
HFNC FiO2 0.6 ~0.7
Gait : pelvis assist
Rolling/Sit : minimal assist

		Ref	Pre	% Ref
Spirometry				
FVC	Liters	5.31	1.51	29
FEV1	Liters	4.25	0.80	19
FEV1/FVC	%	79	53	
FEV3	Liters		1.30	
FEV6	Liters		1.51	
FEF25-75%	L/sec	4.58	0.47	10
IsoFEF25-75	L/sec	4.58	0.47	10
FEF50%	L/sec	5.48	0.50	9
PEF	L/sec	9.90	2.04	21
017-05-15 결과] 00%	Sec		7.14	
FIF50%	L/sec		2.33	
Diffusing Capacity				
DLCO	mL/mmHg/min	23.2	10.5	45
DL Adj	mL/mmHg/min	23.2	10.5	45
DLCO/VA	mL/mHg/min/L	4.69	3.84	82
DL/VA Adj	mL/mHg/min/L		3.84	
VA	Liters		2.73	
IVC	Liters		1.31	



Cannot discharge (current #POD 6m)

Gait : pelvis assist
Rolling : independent
Sit, Stand: independently using hands



Severance

만성호흡부전 재활치료 환자교육용 책자

만성호흡부전 재활치료 환자를 위한 자가운동

[호흡 운동]

- 호흡의 근력, 지구력 및 협응력을 향상시키기 위해 시행한다.
- 비효율적이거나 비정상적인 호흡패턴을 교정하고 호흡의 노력을 감소시킨다.
- 가능한 편안하고 이완된 자세를 취하고 제한하는 옷은 느슨하게 한다.
- 한 동작을 5회 반복하여 시행한 후 편안한 호흡으로 충분한 휴식을 취한다.
- 매일 5회씩 3회 반복하여 하루 중 3번 시행하며 개인의 상태에 따라 횟수는 조절한다.
- 과도한 호흡을 하지 않도록 주의한다.

1. 복식 호흡

들숨: 배를 내밀면서 코로 천천히 들이마시며 숨을 3~5초 정도 참는다.
날숨: 천천히 배를 집어 넣으면서 숨을 치아 사이로 조금씩 내쉰다.

2. 갈비뼈 가쪽 팽창법

무릎을 구부리고 바로 누운 자세에서 아래 갈비뼈 바깥 측면에 양 손을 올려 놓는다. 천천히 숨을 들이마시며 양 갈비뼈를 바깥 쪽으로 팽창시킨다. 숨을 내쉬며 갈비뼈가 아래방향과 안쪽으로 움직이는 것을 느낀다.

3. 흉부 저항 운동

4. 기침 훈련

5. 흉부 가동성 훈련

머리 뒤에 손을 깍지 낀 채로 바로 앉은 자세에서 깊은 들숨 동안 양 팔을 벌려준다. 날숨 동안 양 팔꿈치 관절을 모아 앞으로 숙인다.

6. 날개뼈 당기기

허리 펴고 바로 앉은 자세에서 날개뼈가 서로 마주하도록 숨을 들이쉬면서 어깨를 뒤쪽으로 모으고 숨을 내쉬면서 제자리로 돌아온다.

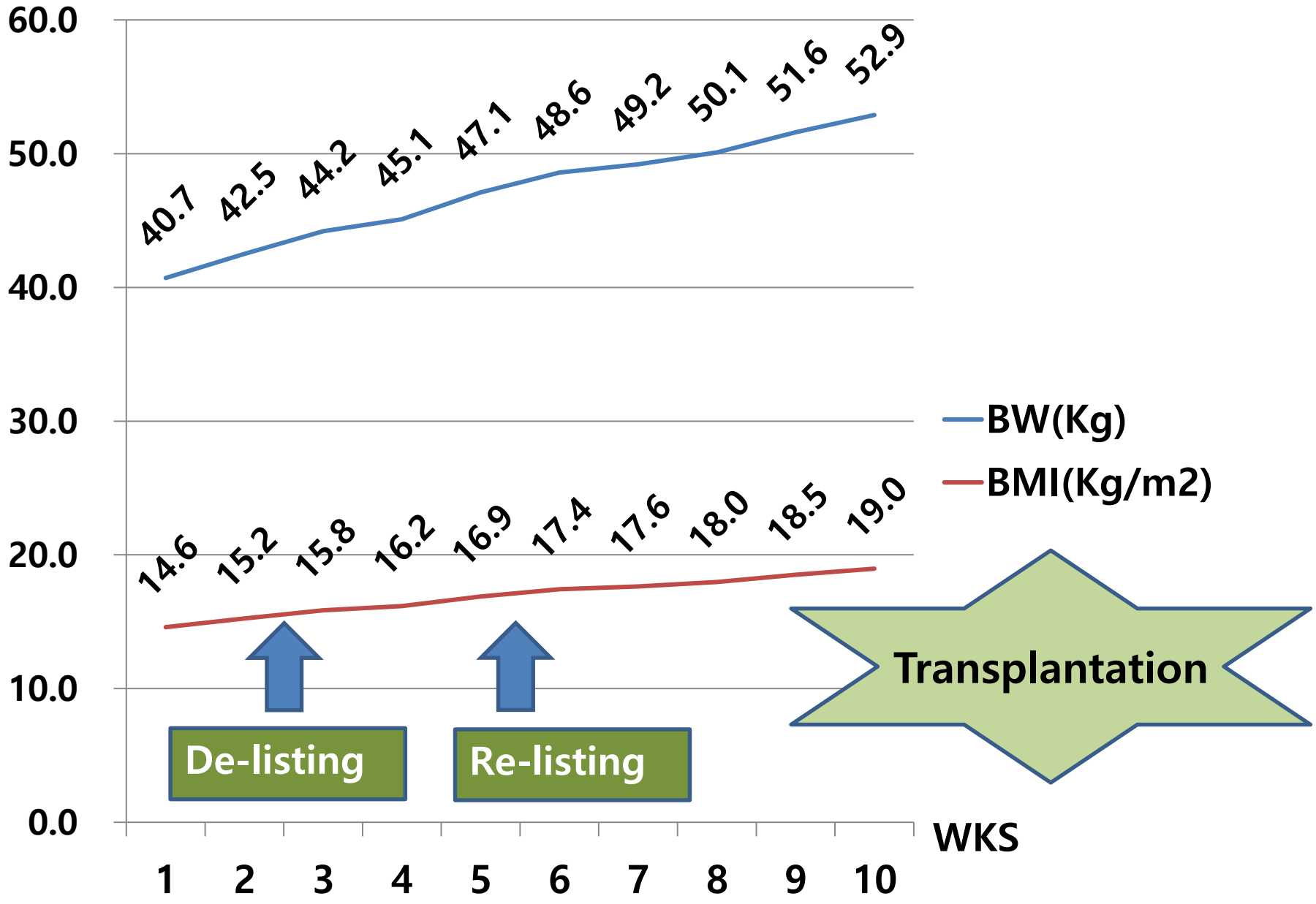
[상체 운동]

- 스트레칭 및 관절 가동성 운동을 통해 긴장되고 짧아진 근육을 이완시키고 흉곽의 가동성을 향상시킨다.
- 호흡에 직접 관여하는 상지의 근력운동을 통하여 호흡능력을 향상시킨다.
- 한 동작을 5~10회 반복하여 시행한 후 심호흡으로 충분한 휴식을 취한다.
- 매일 5~10회씩 3회 반복하여 하루 중 3번 시행하며 개인의 상태에 따라 횟수는 조절한다.
- 통증이 없는 범위에서 시행하며 통증발생 시 중단한다.

1. 목 당기기

허리 펴고 바로 앉은 자세에서 턱을 당긴 상태로 고개를 좌, 우, 위, 아래로 지긋이 굽혀 15초 유지한다.

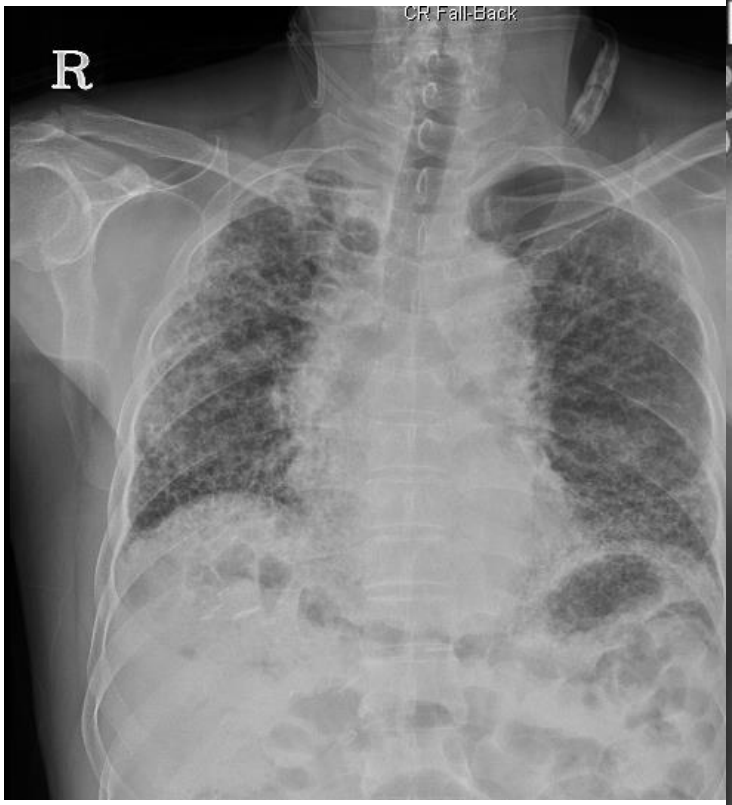
?

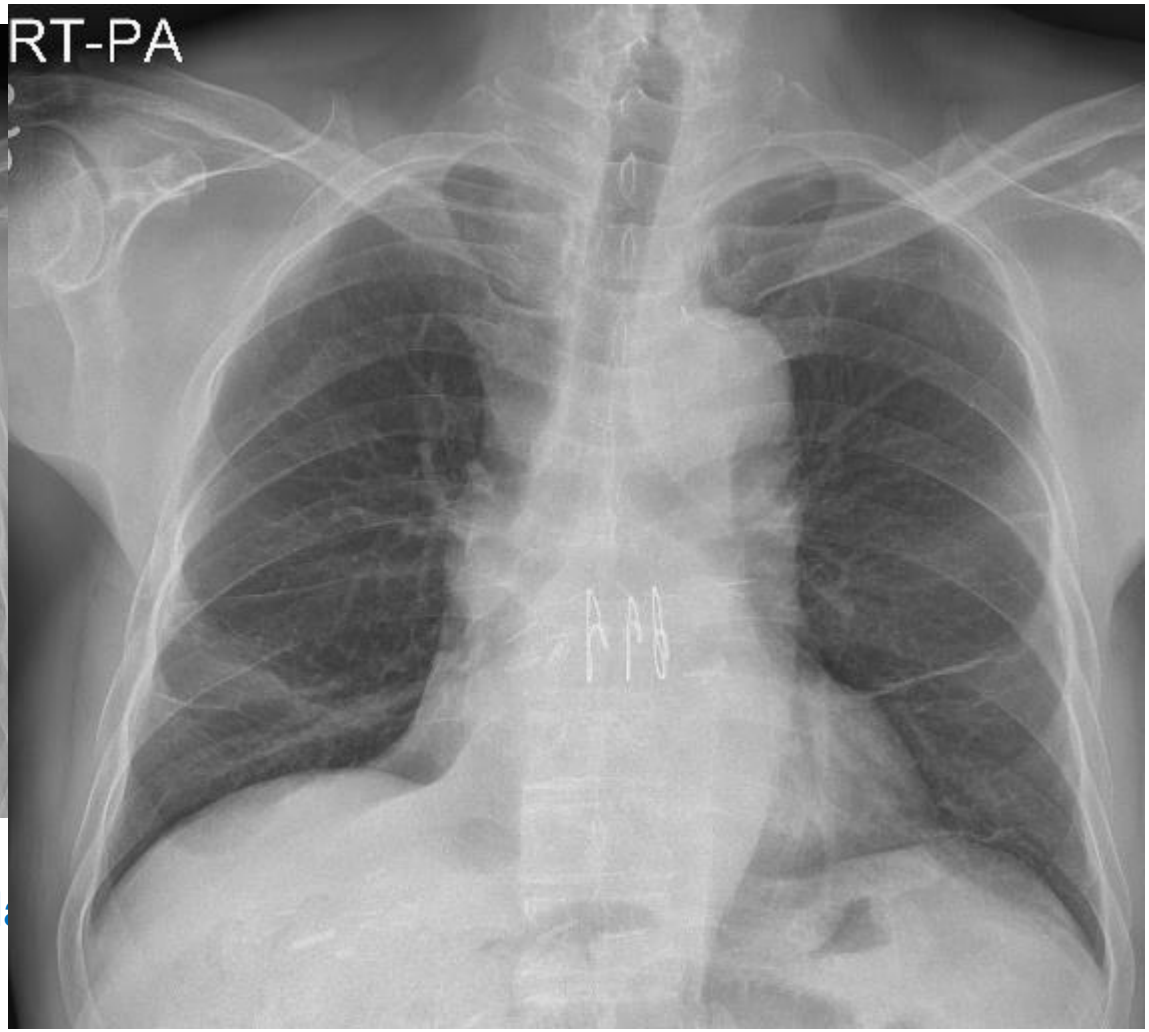

60.0
50.0
40.0
30.0
20.0
10.0
0.0
40.7
42.5
44.2
45.1
47.1
48.6
49.2
50.1
51.6
52.9
14.6
15.2
15.8
16.2
16.9
17.4
17.6
18.0
18.5
19.0
BW(Kg)
BMI(Kg/m2)
Transplantation
De-listing
Re-listing
WKS
1
2
3
4
5
6
7
8
9
10

		Ref	Pre	% Ref
Spirometry				
FVC	Liters	4.42	3.21	73
FEV1	Liters	3.38	2.35	69
FEV1/FVC	%	76	73	
FEV3	Liters		2.88	
FEV6	Liters		3.11	
FEF25-75%	L/sec	3.59	1.65	46
IsoFEF25-75	L/sec	3.59	1.65	46
FEF50%	L/sec	4.30	2.51	58
PEF	L/sec	8.21	7.90	96
FET100%	Sec		10.26	
FIF50%	L/sec		2.44	

M/65 , IPF

Pre op c-angio : 80% LM + 70% mLAD



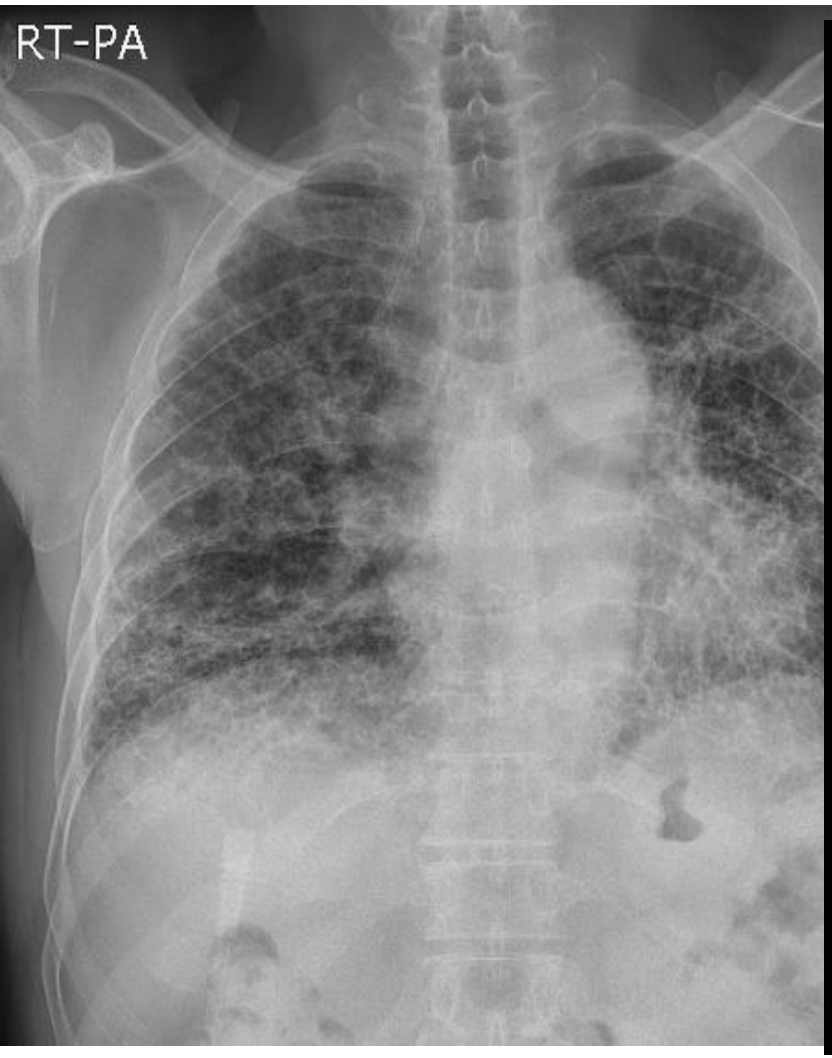


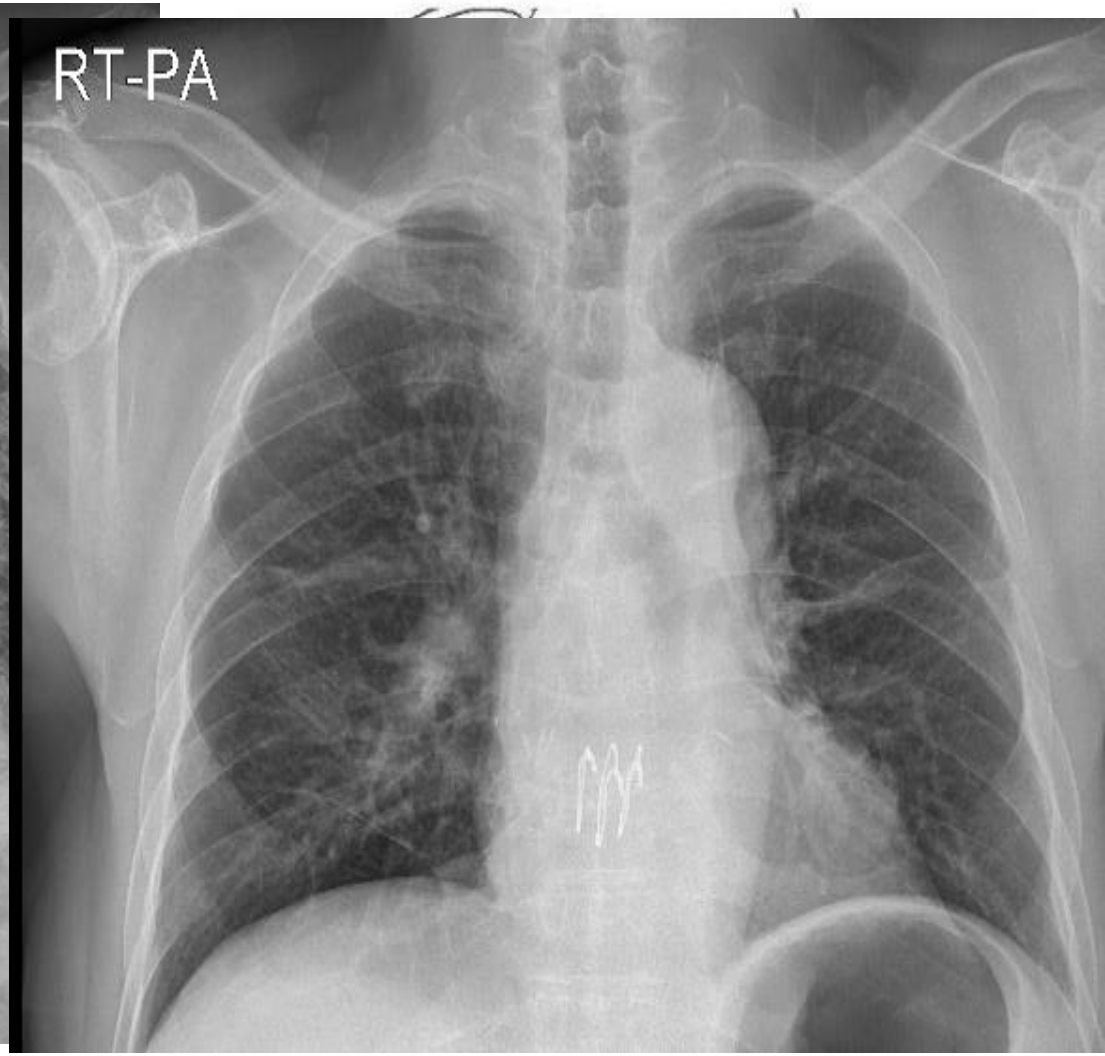
- **PCI** 이후 세달간 **aspirin, pl**
- 이후 **aspirin**
- **PCI** 이후 **3**달 **9**일째 **LTx**
- **2**년 **1**개월 **: ok no CAD**

M/62 , IPF

CAOD 3VD

-mRCA total , pLCX 30%, mLAD 30%





- **C-angio 이후 2달뒤 CABG + LTx, both**
- **2년 10개월 ; ok no CAD**

Take home message

- Lung transplantation could be valid treatment option in IPF patients.
- However, recipient selection is important.
- Specific issues should be considered.
- Early referral and appropriate recipient management is important.

SEVERANCE

팔각정

문의 양성산은 충청북도 청주시 상당구 문의면에 위치한 산으로서 정상부에는 474년(신라 자비왕)에 축조한 석축산성이 있다. 신라시대 화랑도 출신 화운대사가 양성산에서 승병을 길러 삼국통일에 일조를 하였다고 전해지며 승병을 길렀다고 하여 양승산(養僧山)이라고도 불렸다. 정상에 오르면 대청호가 한눈에 보이며 산 중턱에는 독수리바위가 높게 서 있다.

주변 관광지

- **문의문화재단지**

대청댐 건설로 충청북도 청원군에서 사라져 가는 우리 전통문화를 보전·계승하기 위하여 1997년 조성한 문화재단지이다. 총 4만여평의 대지에 충청북도 유형문화재, 문화유물전시관, 민가, 양반가옥, 주막집등이 건립되어 있고 고인돌과 불상·석조유물등이 전시되어 있다.

- **대청호공원**

1981년에 건설된 대청댐 주변으로 아름다운 공원과 500리 둘레길이 조성되어 있다. 공원내에는 대청호 미술관,자연박물관,조각공원등 볼거리가 많다.

- **청남대**

'따뜻한 남쪽의 청와대' 라는 의미로 국내 유일의대통령 별장으로 이용되다, 2003년도에 민간에게 개방이 되었다.

2018년

제4회 폐이식인과 산행의 만남

지난 해 청주 상당산성 산행에 이어
금년 양성산 산행에 환우 및 가족 여러분들을 초대합니다.

일 시 | 2018년 4월 28일(토) 오전 10시
장 소 | 청주시 상당구 문의면 양성산

Thank you !